Surveillance2011

Vermont Yankee Nuclear Power Station

Report on Public Health Monitoring
December 2012

VERMONT
DEPARTMENT OF HEALTH
Agency of Human Services

108 Cherry Street, PO Box 70
Burlington, VT 05402

healthvermont.gov

Table of Contents

Executive Summary

The Vermont Department of Health has been monitoring and reporting on radiation emissions and radiological effluents (discharges) from the Vermont Yankee Nuclear Power Station since 1971. The purpose of this environmental surveillance is to protect the public's health from excess amounts of radiation.

This *2011 Surveillance Report* details more than 4,100 separate measurements of more than 3,000 samples of air, water, milk, soil, vegetation, sediment and fish taken during the year at the Vermont Yankee site boundary (property line), on site at Vermont Yankee, from the Connecticut River, and from the towns surrounding the station.

The Health Department enforces the state's Radiological Health Rule, which limits the amount of ionizing radiation that any member of the public could be exposed to if standing at the site boundary of the station. The Rule also limits the amount of gaseous, liquid, radioiodine and radioactive particulate effluents that any member of the public could possibly be exposed to as a result of operations at Vermont Yankee.

The Rule specifically limits the annual direct gamma radiation from Vermont Yankee to a measured exposure value of 20 milliroentgen above background radiation at the site boundary on land. This measured exposure value represents a 5 millirem effective dose equivalent to any member of the general public. The Rule also limits specific emissions or discharges from Vermont Yankee to an effective dose of no more than 5 millirem from each pathway to any member of the general public.

The Connecticut River site boundary around Vermont Yankee is regulated by the U.S. Nuclear Regulatory Commission, which limits the annual direct gamma radiation to any member of the general public at this boundary to 100 millirem.

2011 Surveillance Results:

- Measurements in this report confirm no dose in excess of any limit established by the Vermont Department of Health's Radiological Health Rule.

- The numerous samples and measurements of the environment on site and around Vermont Yankee in 2011 show no instances of non-compliance with the Radiological Health Rule, from either operations at Vermont Yankee or the tritium-contaminated plume of groundwater first detected in January 2010.

- The Health Department's continuing analysis of cancer statistics for people who live in the communities surrounding Vermont Yankee shows that cancer incidence and mortality do not differ significantly from people in the rest of Windham County, elsewhere in Vermont, or in the U.S. as a whole.

- Measurements taken during and after the events at the nuclear facilities in Fukushima, Japan indicated very low levels of human-made radioactive materials were deposited in Vermont.

For questions or more information – The information presented in this report is sometimes complex. We invite interested readers to contact the Health Department's Radiological and Toxicological Sciences program at 802-865-7730 with any questions.

Introduction

This *2011 Surveillance Report* describes the amount and types of radiation found on and near the Vermont Yankee Nuclear Power Station located in Vernon, Vermont. As an operating nuclear power station, Vermont Yankee generates and emits ionizing radiation in the form of direct gamma radiation, and discharges radioactive materials that emit alpha-, beta- and gamma-radiations. A person could be exposed to radiation released from Vermont Yankee in air or liquid discharges from the station, or from unmonitored releases or leaks.

The Vermont Department of Health enforces the state's Radiological Health Rule, which limits the amount of ionizing radiation that a member of the public could be exposed to if standing at the site boundary (property line) of the station. The Rule also limits the amount of gaseous, liquid, radioiodine and radioactive particulate effluents that a member of the public could possibly be exposed to as a result of operations at Vermont Yankee.

The Rule specifically limits the annual direct gamma radiation from Vermont Yankee to a measured exposure value of 20 milliroentgen above background radiation at the site boundary on land. This measured exposure value represents a 5 millirem effective dose equivalent to any member of the general public. The Rule also limits specific emissions or discharges from Vermont Yankee to an effective dose of no more than 5 millirem from each pathway to any member of the general public.

The Health Department monitors radiation levels on and near Vermont Yankee. Because both naturally occurring and human-made radiation is all around us in the environment, the Health Department also tests other areas of the state to provide background data on types and amounts of environmental radiation. Background measurements are compared to the types and amounts of radiation found on site and in areas near Vermont Yankee. The two sets of values are compared to determine if Vermont Yankee's operations are resulting in an increased radiation risk to the public.

This report presents more than 4,100 measurements taken from over 3,000 samples that were obtained at Vermont Yankee and from background locations during 2011. Air, water, milk, soil, vegetation, fish, and sediment samples were collected and tested. Maps of locations where many samples or measurements were taken, as well as the testing procedures, are provided.

Most samples are tested by the Health Department Laboratory located in Burlington, Vermont. Measurements of direct gamma radiation exposures using thermoluminescent dosimeters (TLDs) are tested by a National Voluntary Laboratory Accreditation Program vendor of dosimetry. Analyses for the hard-to-detect radioactive metals strontium-89, strontium-90, iron-55 and nickel-63 are performed by only a small number of laboratories in the U.S. The Health Department contracted with a certified laboratory to perform these tests on our environmental samples.

The primary human health concern with chronic low-level exposure to ionizing radiation is the potential to develop cancer. For this reason, the Health Department also presents cancer incidence and cancer mortality data for the area near Vermont Yankee, compared to the same type of data for Vermont as a whole, and for the U.S. population.

Tritium Contamination

Testing and evaluation of the tritium contamination described in the 2010 Surveillance report continued in 2011. Thirty-eight wells on site were tested routinely throughout the year. The concentration of tritium in the contaminated wells generally continued to decline over the year. Several water samples taken at the interface of the soil and the Connecticut River had detectable amounts of tritium. No tritium was found in any river water downstream from the station. The Health Department's full report on the investigation is available at:
http://www.healthvermont.gov/enviro/rad/yankee/tritium.aspx

Fukushima Nuclear Power Station

In March 2011 a strong earthquake and tsunami occurred off the coast of Japan. These events resulted in extensive structural and electrical damage throughout Japan, including at the Fukushima Daiichi Nuclear Power Station. Failures resulted in nuclear meltdowns at multiple reactors and caused the release of radioactive material into the air and water. To assess the impact of these radioactive releases, the Health Department began more frequent environmental sampling in April and continued through June 2011. Trace amounts of human-made radioactive materials were detected in samples taken in Vermont. These results were consistent with results from other parts of the country. There was no significant increase in dose to the public in Vermont. All test results related to this event are reported on the Health Department's website: http://www.healthvermont.gov/enviro/rad/japan2011.aspx.

Results Presented in this Report:

- Direct gamma radiation measured continuously from more than 70 sites
- Air samples tested for radioactive particulates, gases, vapors and radioactive iodine collected by continuous air samplers
- Groundwater, drinking water wells and Connecticut River water near Vermont Yankee tested for tritium, gamma-emitting materials, total alpha radioactivity, total beta radioactivity, and hard-to-detect radioactive metals (iron-55, nickel-63, strontium-89 and strontium-90)
- Milk, vegetation, maple products, river sediments, fish and off-site soil tested for natural and human-made radioactive materials

These data show no radiation dose in excess of the Health Department's limits as a result of Vermont Yankee operations in 2011.

The full *Surveillance 2011* report is published at the Vermont Department of Health web site: www.healthvermont.gov. For questions about the content, call the Health Department's Radiological and Toxicological Sciences program at 802-865-7730.

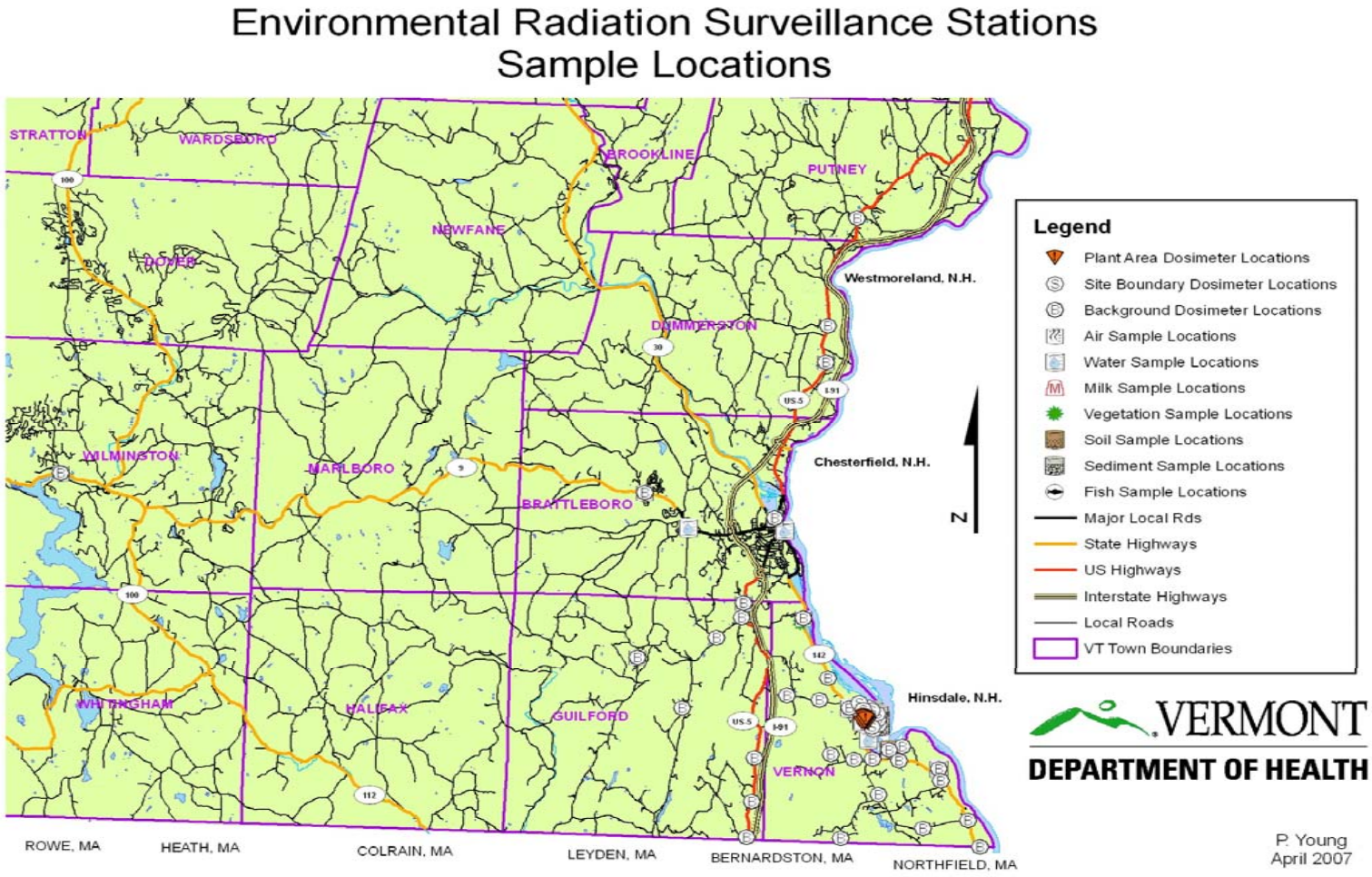
Program Results Summary

An overview of the 2011 sample data is presented in this summary. Detailed descriptions of sample measurement techniques and analyses are presented in further sections of this report. The total number, type of sample collected, type of analysis performed and summary results are reported in Table 1. Routine environmental sampling sites are shown in Maps 1 and 2. Map 1 shows all of the locations where routine samples were taken. Map 2 shows the sample locations in Vernon.

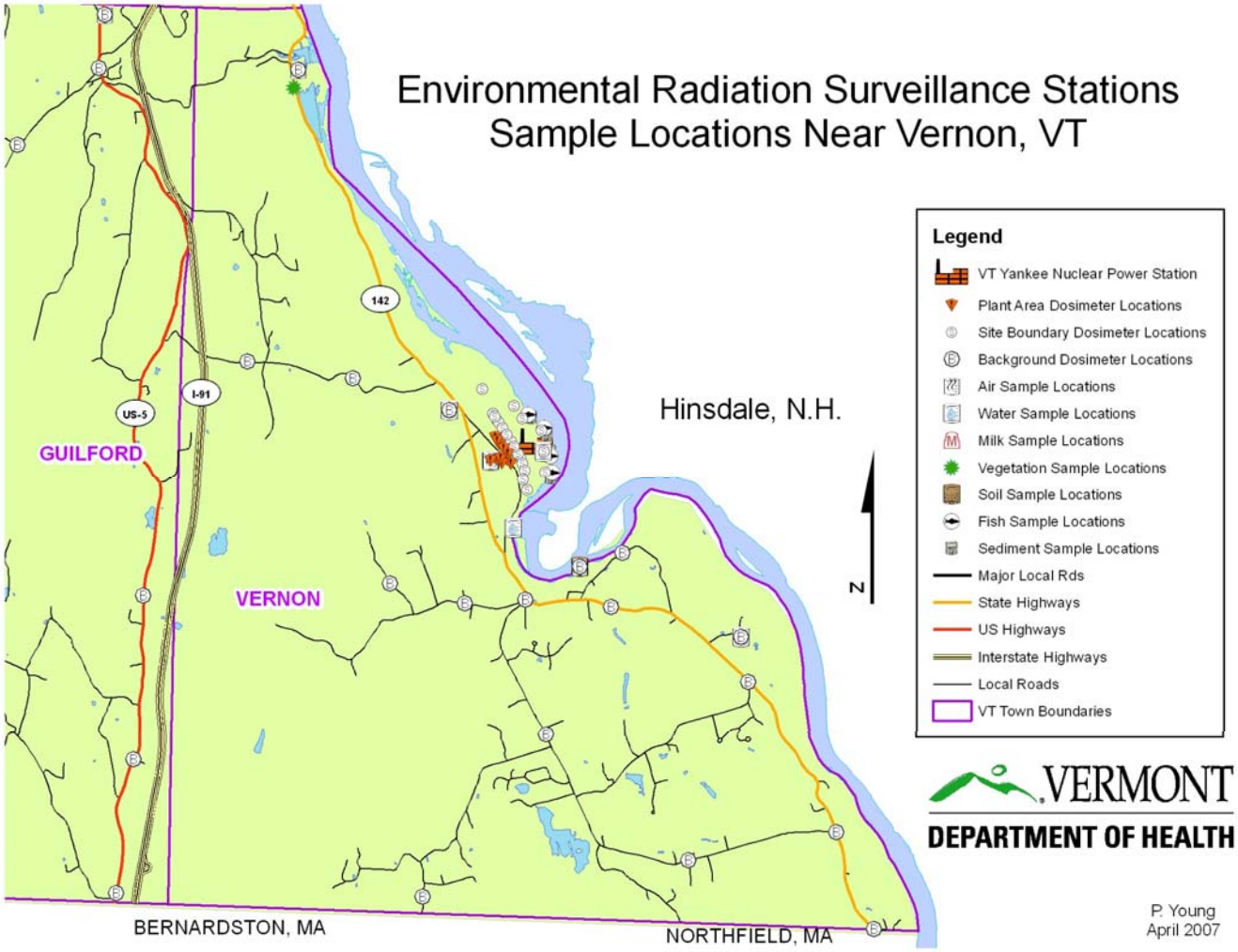
Table 1. 2011 Summary of Samples, Tests and Results

Sample Type	Sites	Number of Tests	Test Type	Results
Direct Gamma Radiation	72	288	Thermoluminescent dosimeters	Less than 20 milliroentgen per year at the land site boundary; no single quarter exceeded 10 milliroentgen.
Air: Particulates, Gases and Vapors	10	198	Total Alpha Radioactivity	Alpha radioactivity within the historical range. No increase observed as a result of operations at Vermont Yankee.
		198	Total Beta Radioactivity	Beta radioactivity within the historical range. No increase observed as a result of operations at Vermont Yankee.
		198	Iodine-131	Most samples less than the limit of detection. Low levels were detected at all sampling locations between March 15 - April 5, 2011 as a result of the nuclear event in Fuskushima, Japan.
		198	Gamma (gas/vapors) Radioactivity	Most gamma radioactivity detected is of natural origin. Some human-made radioactivity was detected as a result of the nuclear event in Fukushima, Japan.
		7	Gamma (particulates) Radioactivity	Most gamma radioactivity detected is of natural origin. Some human-made radioactivity was detected as a result of the nuclear event in Fukushima, Japan.
Water	10	116	Total Alpha Radioactivity	Alpha radioactivity within the historical range. No increase observed as a result of operations at Vermont Yankee.
		116	Total Beta Radioactivity	Beta radioactivity within the historical range. No increase observed as a result of operations at Vermont Yankee.
	57	1379	Tritium	All off-site, on-site active drinking water locations less than the lower limit of detection. 18 on-site groundwater monitoring wells test positive for tritium. Range of positive well results: 504 to 453,000 pCi/L. Several positive results at interface of plume and Connecticut River.
		1066	Gamma Radioactivity	All detected gamma radioactivity of natural origin. Three additional public water supplies tested in March-May 2011 and no gamma emitting materials were found.
	54	211	Iron-55, Nickel-63, Strontium-89, Strontium-90	All samples less than the lower limit of detection.
Milk	7	32	Iodine-131	All samples less than the lower limit of detection. Additional farms were tested March-May.
		32	Gamma Radioactivity	All samples less than the lower limit of detection. Additional farms were tested March-May.
Vegetation	6	8	Gamma Radioactivity	Radioactivity related to Fukushima nuclear event (iodine-131) detected in April samples. No other human-made radioactivity was detected.
Maple sap/syrup	2	2	Gamma Radioactivity	Both samples less than the lower limit of detection.
Soil (routine)	3	3	Gamma Radioactivity	All detected gamma radioactivity attributable to natural, Chernobyl or above-ground nuclear weapons testing origin.
Soil (AOG)	13	40	Iron-55, Nickel-63, Strontium-89, Strontium-90	Strontium-90 detected indicated reactor condensate leak on-site.
Sediments	18	36	Gamma Radioactivity	Detected gamma radioactivity attributable to natural, Chernobyl or above-ground nuclear weapons testing origin.
Fish	2	19	Gamma Radioactivity	All detected gamma radioactivity attributable to natural, Chernobyl or above-ground nuclear weapons testing origin.
		21	Iron-55, Nickel-63, Strontium-89, Strontium-90	All detected radioactivity attributable to natural, Chernobyl or above-ground nuclear weapons testing origin.
Total number of tests		**4168**	*Representing 181 unique sample sites*	

Map 1


Environmental Radiation Surveillance Stations
Sample Locations
STRATTON
WARDSBORO
BROOKLINE
PUTNEY
NEWFANE
DOVER
Westmoreland, N.H.
DUMMERSTON
WILMINGTON
MARLBORO
BRATTLEBORO
Chesterfield, N.H.
N
WHITINGHAM
HALIFAX
GUILFORD
Hinsdale, N.H.
VERNON
ROWE, MA
HEATH, MA
COLRAIN, MA
LEYDEN, MA
BERNARDSTON, MA
NORTHFIELD, MA
Legend
Plant Area Dosimeter Locations
Site Boundary Dosimeter Locations
Background Dosimeter Locations
Air Sample Locations
Water Sample Locations
Milk Sample Locations
Vegetation Sample Locations
Soil Sample Locations
Sediment Sample Locations
Fish Sample Locations
Major Local Rds
State Highways
US Highways
Interstate Highways
Local Roads
VT Town Boundaries
VERMONT
DEPARTMENT OF HEALTH
P. Young
April 2007

Map 2


Environmental Radiation Surveillance Stations
Sample Locations Near Vernon, VT
Hinsdale, N.H.
GUILFORD
VERNON
BERNARDSTON, MA
NORTHFIELD, MA
142
I-91
US-5
N
Legend
VT Yankee Nuclear Power Station
Plant Area Dosimeter Locations
Site Boundary Dosimeter Locations
Background Dosimeter Locations
Air Sample Locations
Water Sample Locations
Milk Sample Locations
Vegetation Sample Locations
Soil Sample Locations
Fish Sample Locations
Sediment Sample Locations
Major Local Rds
State Highways
US Highways
Interstate Highways
Local Roads
VT Town Boundaries
VERMONT
DEPARTMENT OF HEALTH
P. Young
April 2007

Types of Ionizing Radiation

There are three main types of ionizing radiation that could be released from Vermont Yankee: alpha particles, beta particles and gamma rays. The risk of adverse health effects from ionizing radiation is linked to the type and energy of radiation, and the length and method of exposure to the radiation. The Health Department tests for these forms of radiation in many sample types.

Alpha and Beta (particle) Radiation

Alpha and beta radiation are particle forms of radiation energy. Alpha- and beta-charged particles can only travel a short distance and are completely blocked by simple materials.

Alpha radiation is the most biologically hazardous form of ionizing radiation. For the same amount of alpha, beta and gamma radiation energy, the alpha radiation causes about 20 times more tissue damage. It is also the type of radiation that people can most easily shield against. A sheet of paper can stop an alpha particle, and so can the dead layer of skin that covers the outer surface of our bodies. Alpha particles can only cause harm if alpha-emitting materials are inhaled, ingested or otherwise taken into the body. The most common alpha radiation exposure for people is from naturally-occurring radon gas in their homes.

Table 2. Examples of Radioactive Elements that Produce Alpha-Radiations

Naturally-occurring alpha emitters	
Uranium-238	Radon-222
Thorium-232	Polonium-210
Radium-226	Bismuth-212
Human-made alpha emitters	
Americium-241	Plutonium-239

Beta radiation is also easily stopped by simple materials like plastics, aluminum and wood. Beta radiations may be able to go through the first few millimeters of human skin. Beta radiation can cause damage to internal tissues and organs if a beta-emitting material is inhaled, ingested or otherwise taken into the body.

Alpha and beta-emitting materials are released from the station's air stack at Vermont Yankee. They may also be emitted in liquid discharges from contaminated reactor systems.

Figure 1. Relative Ability of Ionizing Radiations to go through Materials

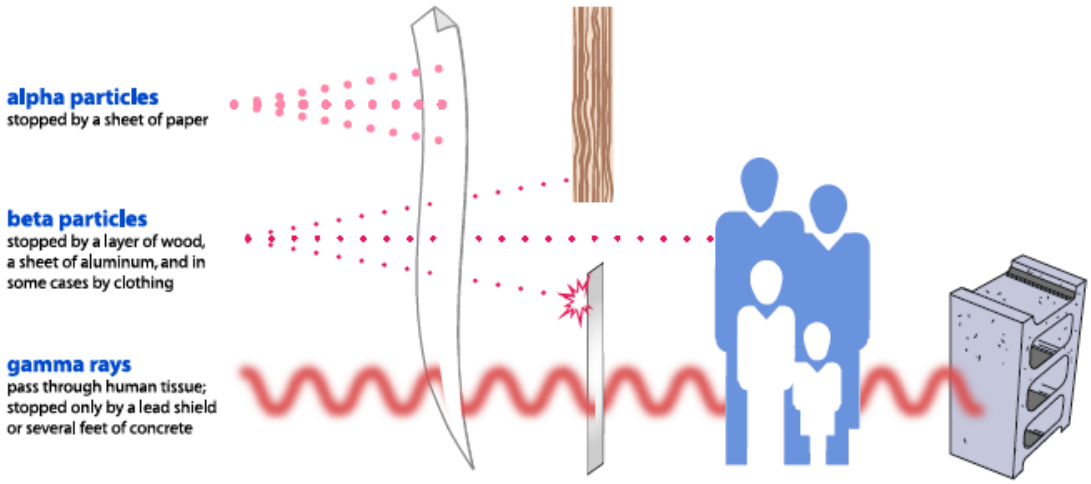


Table 3. Examples of Radioactive Elements that Produce Beta-Radiations

Naturally-occurring beta emitters	
Carbon-14	Potassium-40
Radium-228	Hydrogen-3, "tritium" (also human-made)
Human-made beta emitters	
Iodine-131	Technetium-99
Strontium-90	Hydrogen-3, "tritium" (also naturally-occurring)
Nickel-63	Iron-59

Gamma Radiation

Direct gamma radiation is an electromagnetic wave of energy similar to light, except that it passes through most materials in the form of an energy wave. Gamma radiation can also scatter off materials. Direct gamma radiation loses strength as it travels away from the source. It is also reduced after large numbers of collisions with electrons in the atom.

Gamma radiation passes through the skin and may pass through the whole body. If gamma radiation passes through the body, it may damage tissues. People can be affected by gamma radiation if they are located in an area where direct gamma radiation exists, or if they ingest a gamma-emitting material.

Direct gamma radiation is emitted from reactor and turbine systems such as those at Vermont Yankee. Gamma-emitting materials may also be released as gases or particles from the station's air stack.

Table 4. Examples of Radioactive Elements that Produce Gamma-Radiations

Naturally-occurring gamma emitters		
Beryllium-7	Potassium-40	Thallium-208
Bismuth-212	Bismuth-214	Lead-210
Lead-212	Lead-214	Polonium-210
Actinium-228	Radium-224	Radium-226
Radium-228	Thorium-228	Thorium-229
Thorium-230	Thorium-231	Thorium-232
Thorium-234	Uranium-233	Uranium-234
Uranium-235	Uranium-238	
Human-made gamma emitters		
Antimony-124	Antimony-126	Barium-140/ Lanthanum-140
Cerium-144/ Promethium-144	Cesium-134	Cesium-136
Chromium-51	Cobalt-56	Cobalt-58
Cobalt-60	Iodine-131	Iodine-132
Iodine-133	Iodine-135	Krypton-85
Krypton-88	Manganese-54	Neptunium-239
Plutonium-239	Plutonium-240	Ruthenium-103
Tellurium-132	Strontium-85	Strontium-89
Zinc-65	Xenon-133	Xenon-133m
Xenon-135	Zirconium-95/Niobium-95	

Ionizing Radiation Risks

The radiations to which people may be exposed as a result of Vermont Yankee operations are ionizing radiations. According to the International Agency for Research on Cancer (IARC), ionizing radiation can cause cancer in humans. The energy released by ionizing radiation may directly or indirectly damage the DNA of human cells and over time cause cancer. It has been shown that people who are exposed to high doses of ionizing radiation, in excess of 10,000 millirem, have a statistically higher risk of cancer. As with other cancer-causing agents, it is not possible to prove that low doses of ionizing radiation are without risk. The risk of developing cancer from chronic exposure to very low doses of radiation, such as the doses detailed in this report, is considered very low.

The risk management approach used for public health protection with ionizing radiation is called the ALARA Principle. The ALARA Principle states that every reasonable effort must be made to maintain radiation exposures ***A**s **L**ow **A**s **R**easonably **A**chievable*. The Health Department's Radiological Health Rule not only requires that exposures to ionizing radiation be less than specific limits, but also that Vermont Yankee and all other radiation users in industry, medicine and education use the ALARA Principle.

For more information about ionizing radiation risk:

- The National Academies of Science
- The Health Physics Society
- The International Agency for Research on Cancer monograph

Cancer Prevalence, Incidence & Mortality

The primary health concern with chronic low-level exposure to ionizing radiation is the potential to develop cancer. Starting in 2007, the Health Department began presenting cancer-related health outcome data for the population in the area of Vermont Yankee. The Health Department tabulates, analyzes and provides data for cancer incidence (new cancer cases diagnosed) and cancer mortality (people dying from cancer) for Windham County and for the six towns nearest Vermont Yankee that make up the Emergency Planning Zone. The Health Department evaluates trends in all cancer types (all ages, all sites) and evaluates invasive thyroid cancers, leukemia and pediatric (childhood) cancers separately because these types of cancers can be associated with excess radiation exposure or radiation exposure during fetal development.

Cancer Prevalence

Cancer is not one disease, but a group of more than 100 different diseases. Cancer is very common. Roughly one out of every two men and one out of every three women will develop some type of cancer in their lifetime. A cancer usually develops gradually as a result of a complex mix of factors related to personal behaviors, environment and genetics. Each type of cancer is caused by a different set of factors, some well-established, some uncertain, and some unknown.

Cancer *prevalence* means the number of people alive today who have ever been diagnosed with cancer. According to 2010 Behavioral Risk Factor Surveillance System (BRFSS) data, approximately 29,000 or 6 percent of Vermonters age 18 and older have ever been told by a doctor they had cancer. This includes people who are newly diagnosed, in active treatment, or have completed active treatment, and people living with progressive symptoms of their disease.

With 9 percent of people age 50 and older living with cancer in the U.S., it is not unusual to know several people who have cancer. As a population ages, the occurrence of new cancer cases can be expected to increase. With treatment advances, people are living

longer with a cancer diagnosis. The number of cancer survivors has doubled in the past 20 years.

Cancer Incidence

Cancer *incidence* means the number of newly diagnosed cases during a specific time period. Incidence data in Table 5 were compiled from Vermont Cancer Registry data. Incidence rates are shown for all cancers, invasive thyroid cancers, leukemia, and childhood (pediatric) cancers for the 10 year period 2000 to 2009.

The data in Table 5 indicate that:

- Incidence rates for invasive thyroid cancer and leukemia in the Emergency Planning Zone are not different from Windham County, Vermont as a whole, or the U.S. population.
- The incidence of thyroid cancer in Windham County is not different from Vermont, but it is lower than the U.S. rate.
- Incidence rates for pediatric cancers in the six towns could not be calculated as there were too few cases (fewer than six) over the time period studied (10 years).
- For all cancer types combined, the rate of cancer incidence in the six towns near Vermont Yankee (Brattleboro, Dummerston, Guilford, Halifax, Marlboro and Vernon) is lower than rates in Windham County, Vermont as a whole, and the U.S. population.
- The U.S. incidence rates and mortality rates are all races population rates. Previous years' analyses compared only U.S. white population incidence and mortality rates to Vermont rates. This change is consistent with current Health Department publications that compare Vermont (all races) to U.S. (all races) rates.

Table 5. Cancer Incidence Rates Near Vermont Yankee, in Vermont & U.S.

Age Adjusted Vermont and U.S. Cancer Incidence, All Sites, Males and Females per 100,000 population, 2000-2009. (Urinary Bladder includes malignant and in situ)

	Rate	Lower CL	Upper CL	Avg. cases per year
U.S.	482.2	481.4	483.1	132,559
Vermont	495.1	489.8	500.5	3,409
Windham County	473.8	455.2	493.0	253
Emergency Planning Zone	418.3	392.6	445.4	102

Age Adjusted Vermont and U.S. Cancer Incidence, Invasive Thyroid, Males and Females per 100,000 population, 2000-2009.

	Rate	Lower CL	Upper CL	Avg. cases per year
U.S.	10.7	10.6	10.8	3,011
Vermont	10.7	9.9	11.5	69
Windham County	7.4	5.1	10.3	4
Emergency Planning Zone	7.6	4.3	12.6	2

Age Adjusted Vermont and U.S. Cancer Incidence, Leukemia, Males and Females per 100,000 population, 2000-2009.

	Rate	Lower CL	Upper CL	Avg. cases per year
U.S.	13.3	13.1	13.4	3,630
Vermont	13.5	12.6	14.4	89
Windham County	16.0	12.7	19.9	8
Emergency Planning Zone	9.6	6.1	14.7	2

Age Adjusted Vermont and U.S. Cancer Incidence, Pediatric Cancers (Ages 0-19), Males and Females per 100,000 population, 2000-2009. (Urinary Bladder includes malignant and in situ)

	Rate	Lower CL	Upper CL	Avg. cases per year
U.S.	16.9	16.6	17.2	1,312
Vermont	18.3	16.3	20.5	30
Windham County	15.9	9.4	25.4	2
Emergency Planning Zone	--	--	--	--

-- Rates are only presented when the number of cases is 6 or greater.
Emergency Planning Zone towns: Brattleboro, Dummerston, Guilford, Halifax, Marlboro, and Vernon.
All rates are age adjusted to the 2000 U.S. standard population and are per 100,000 population.

Cancer Mortality

In Table 6, mortality rates from the U.S., Vermont, Windham County, and the Emergency Planning Zone towns are presented for the 10 years 2000 to 2009. The Vermont data are from the Vermont Department of Health's Vital Statistics System. Data for U.S. cancer mortality rates are from the Vital Statistics System of the United States. Cancer mortality data are presented for all cancers, invasive thyroid cancers, leukemia, and pediatric cancers.

The data in Table 6 indicate:

- For the years 2000 to 2009, cancer mortality rates in the six towns of the Emergency Planning Zone around Vermont Yankee do not differ from those for Windham County, Vermont or the U.S.
- Similar results were seen in mortality rates in the 2010 report.

Table 6. Cancer Mortality Rates Near Vermont Yankee, in Vermont & U.S.

**Age Adjusted Vermont and U.S. Cancer Mortality, All Sites,
Males and Females per 100,000 population, 2000-2009.**

	Rate	Lower CL	Upper CL	Avg. deaths per year
U.S.	185.5	185.4	185.7	559,000
Vermont	179.9	176.7	183.1	1,229
Windham County	183.1	171.7	195.1	98
Emergency Zone	188.0	171.1	206.6	47

**Age Adjusted Vermont and U.S. Cancer Mortality, Thyroid,
Males and Females per 100,000 population, 2000-2009.**

	Rate	Lower CL	Upper CL	Avg. deaths per year
U.S.	0.5	0.5	0.5	1,467
Vermont	0.5	0.3	0.7	3
Windham County	0.4	0.0	1.6	<1
Emergency Zone	0.4	0.0	3.2	<1

**Age Adjusted Vermont and U.S. Cancer Mortality, Leukemia,
Males and Females per 100,000 population, 2000-2009.**

	Rate	Lower CL	Upper CL	Avg. deaths per year
U.S.	7.3	7.3	7.3	21,837
Vermont	7.3	6.7	8.0	49
Windham County	8.0	5.7	10.9	4
Emergency Zone	7.3	4.2	12.4	2

**Age Adjusted Vermont and U.S. Cancer Mortality, Pediatric Cancers (Ages 0-19),
Males and Females per 100,000 population, 2000-2009.**

	Rate	Lower CL	Upper CL	Avg. deaths per year
U.S.	2.6	2.6	2.7	2,151
Vermont	2.7	2.0	3.6	4
Windham County	0.8	0.0	5.0	<1
Emergency Zone	1.8	0.0	12.9	<1

Emergency Zone towns include: Brattleboro, Dummerston, Guilford, Halifax, Marlboro, and Vernon.
All rates are age adjusted to the 2000 U.S. standard population and are per 100,000 population.

Cancer Surveillance Methodology

The rates in this report are calculated at a 95 percent confidence level. This means, for example, given a reported incidence rate of 482.2 per 100,000 for the U.S. in 2000-2009, that we are 95 percent confident (not due to chance alone) that the true 2000 to 2009 U.S. rate is in the range of 481.4 to 483.1 per 100,000. In the six towns near Vermont Yankee, the cancer incidence rate for all types of cancer combined is 418.3 cases per 100,000 people. Statistically speaking, this means we are 95 percent confident that the actual rate is between 392.6 cases and 445.4 cases per 100,000 people. Because the *ranges* for these populations do not overlap, we conclude that there is a meaningful statistical difference between the two rates.

In Table 6, it may appear that the cancer mortality rate, all sites, all ages, in the Emergency Planning Zone around Vermont Yankee is higher than in Windham County or Vermont. However, the confidence intervals (ranges) for these rates overlap, and the cancer mortality rates are *not* statistically different. In Windham County, the death rate from cancer, all sites, males and females, was 183.1 deaths per 100,000 people, while the death rate in the six towns near Vermont Yankee was 188.0 deaths per 100,000 people. The same conclusion is drawn for Vermont as a whole. All sites, all ages cancer mortality rates are not significantly different.

Data Limitations

One limitation of these data is that the numbers of cancer cases and the number of cancer deaths in the six towns near Vermont Yankee are small. There are challenges associated with computing rates for small geographical areas, such as the Vermont Yankee Emergency Planning Zone, with an estimated population of 20,000 people in 2009. When the rates are based on a small number of cases, it is almost impossible to distinguish random fluctuation from true changes in the underlying risk of disease. This is an issue in a state like Vermont, which has many communities with small populations. To improve rate stability, the cases have been combined for the 10 year period from 2000 through 2009.

For more information about cancer and for resources to assist those living with cancer in Vermont: http://healthvermont.gov/prevent/cancer/cancer_programs.aspx#stats.

Environmental Surveillance Methods

The types of surveys and analyses performed by the Vermont Department of Health are described here in relationship to their role in protecting the public from ionizing radiation resulting from operations at Vermont Yankee.

Direct Gamma Radiation Monitoring

Direct gamma radiation in air is measured by the Health Department by using thermoluminescent dosimeters (TLDs). Gamma radiation energy interacts with and changes the materials inside the TLDs. The more gamma energy, the more change occurs in the materials. The TLDs are then tested in a laboratory, by reversing the physical changes. When this occurs, light is emitted, and the amount of light measured in the process is directly related to the amount of gamma radiation energy the TLD received in the environment. These instruments are calibrated to provide a measure of radiation *exposure,* reported in milliroentgen.

TLDs are placed to measure how much direct gamma radiation is being given off from Vermont Yankee and how much exists from natural or other human-made sources in background areas of Vermont. The Health Department's dosimeters are located on the site boundary (property line), in the area of the station and at background locations in Windham County. A total of 72 locations are monitored. Samples are tested quarterly.

Vermont Yankee emits direct gamma radiation from components and nuclear reactor systems. Direct gamma radiation may also result when gases and particulates are released from the station's air stack. Measuring the amount emitted ensures that no member of the public is exposed to increased levels of gamma radiation as a result of operations at Vermont Yankee.

Continuous Flow Air Sampling

Continuous air samplers are located in Vernon, Guilford, Dummerston, Wilmington and Brattleboro. In 2011, an additional air sampler was added in Burlington. These air

samplers have a mechanical pump that pulls air through two types of sample media. The samplers have an in-line flow meter that tracks the volume of air pulled through the sample. The air samplers run continuously.

The samplers collect alpha-, beta- and gamma-emitting materials in air. Each sampler has two collection media to capture these radioactive materials. The first medium is a glass fiber filter. As outdoor air is pulled through the sampler, particulates are collected on the glass fiber filter. Particulates that contain alpha-, beta- and gamma-emitting materials are collected on the glass fiber filter.

Located behind the glass fiber filter is the second medium, a charcoal cartridge. The cartridge is treated with triethylenediamine (TEDA), a compound that attracts radioactive iodine vapors. As air passes through, radioactive iodine as well as other gamma-emitting gases and vapors are collected.

The filter is sent to the Health Department Laboratory where the alpha- and beta-emitting materials are counted on a gas flow proportional counter. The charcoal cartridge is tested by the Health Department Laboratory on a gamma spectrometer. Samples are collected and tested monthly. In addition, every three months the filters are grouped together and tested by gamma spectroscopy. These grouped samples are called quarterly composites.

Measurements of total alpha and beta radiation, gamma radiation and specifically iodine-131 ensure that operations at—and discharges from—Vermont Yankee are within limits and do not result in an increased radiation exposure to the public.

Water Monitoring

Water samples are collected both on site at Vermont Yankee and off site at nearby locations. Off-site water samples include drinking water wells, a municipal water supply, and samples from the Connecticut River. These locations allow the Health Department to determine if radioactive materials have left the Vermont Yankee site and entered these

waters. On-site groundwater monitoring wells are sampled and tested to determine if any radioactive materials are leaking from systems at Vermont Yankee. Several on-site wells are located side-by-side. These are coupled wells. They are in the same, with one well set slightly deeper than the other. The shallower well is designated with an "S" after the well number, the deeper well has a "D" designation. On-site drinking water wells are also sampled and tested to ensure that the drinking water supplies are not contaminated.

Water samples can be tested for total alpha and beta radioactivity, and gamma-emitting materials. Alpha and beta radioactivity are tested with a gas proportional counter. Gamma-emitting materials are measured with a gamma spectrometer.

Water samples are also tested for tritium. Tritium is a radioactive form of hydrogen, and is a weak beta-emitter. Tritium is created when water passes through the reactor core and the hydrogen atoms in the water molecules and other trace elements like boron absorb neutrons from the fission of the reactor fuel. Tritiated water can leave the power station in the same ways that non-radioactive water leaves the station: in the air, in groundwater, and through discharges into surface water. Tritium is also created from atmospheric radiation. Tritium is tested with a liquid scintillation counter.

Since 2010, water samples have also been tested for four hard-to-detect radioactive metals: strontium-89, strontium-90, iron-55, and nickel-63. The Health Department contracts with a certified laboratory to perform these analyses. Strontium-90 is associated with nuclear reactor fission, but was also released in significant quantities in the 1940s, 50s and 60s during above-ground nuclear weapons testing, and as a result of global nuclear events like Chernobyl. Nickel-63 and iron-55 are associated with nuclear facility operations. These radioactive metals can be released from leaking reactor systems or through permitted discharges. They are not identifiable by routine laboratory test methods.

Monitoring Food Chain Inputs

The Health Department also routinely tests milk, sediment, soil, vegetation and fish in the Vernon and Brattleboro area.

Milk Sampling

Milk samples are collected from two farms located in the vicinity of Vermont Yankee. Raw cows' milk samples are taken twice a month and tested for gamma-emitting materials and specifically for iodine-131 (I-131).

Sediment Sampling

Sediments from the bottom of the Connecticut River are collected twice a year. They are tested for gamma-emitting materials.

Soil and Vegetation Sampling

Soil and vegetation are collected in areas near Vermont Yankee and tested for gamma-emitting materials. A variety of natural and cultivated plants are sampled to determine if radioactive materials are accumulating in the food chain. Vegetation samples are taken both in the immediate vicinity of Vermont Yankee and in the surrounding community. Soil samples are collected in areas near Vermont Yankee.

Fish Sampling

Fish are collected monthly at two sites in the Connecticut River by an environmental contractor. One site is outside the Vermont Yankee discharge and the other site is about nine miles upstream from Vermont Yankee, where the Route 9 bridge crosses the Connecticut River. Fish are caught by a method known as electro-fishing. This involves putting a weak electric current in the water. Fish exposed to the current are temporarily stunned and float to the surface where they are collected. Sport and pan fish species are caught and tested: large and small mouth bass, yellow perch and pumpkinseed.

Before testing, fish are divided into edible and inedible portions. The extent of the testing that can be done depends on the mass of fish collected. Fish are tested for gamma-emitting materials and strontium-90 and other hard-to-detect radioactive metals strontium-89, nickel-63, iron-55.

Laboratory Testing and Measurements

Laboratory instruments at the Health Department that are used to test samples are able to measure very small amounts of radioactivity. Each instrument has a limit as to how low it can measure or identify radioactivity. This limit is determined by the Health Department radiochemists and reported as the *Lower Limit of Detection* (LLD). Lower Limits of Detection are calculated for each sample, taking into account the specific instrument and sample characteristics such as type (*e.g.* water, soil, milk, air), length of time the sample is tested, and the amount of the sample tested. The Health Department's Lower Limits of Detection for routine gamma spectroscopy tests are presented in Table 8.

All the Health Department's instruments meet strict quality control checks. Data reported by the Health Department is thoroughly reviewed by both the radiochemists and data review personnel.

Units of Measurement

For most results in this report, radioactivity is reported in units of *picocuries per mass or volume* of sample. One picocurie is one trillionth of a curie or 0.000000000001 curie. Curies and picocuries are units that measure the amount of radiation "activity" in the sample.

Direct gamma exposure is measured and reported in milliroentgen. Milliroentgen is a unit of exposure to ionizing radiation. One milliroentgen is equal to one thousandth of a roentgen or 0.001 roentgens.

Table 7. Units of Measurement

Type	Unit	Abbreviation	Measures (amount of)	Equivalent to
Radiation units	curie	Ci	activity of a radioactive material	1,000,000,000,000 picocuries (pCi)
	picocurie	pCi	activity of a radioactive material	0.000000000001 curie (Ci)
	roentgen	R	*exposure* to ionizing radiation	1000 milliroentgens (mR)
	milliroentgen	mR	*exposure* to ionizing radiation	0.001 roentgen (R)
	roentgen **e**quivalent **m**an	rem	*dose* equivalent of ionizing radiation	1000 millirem (mrem)
	milli**rem**	mrem	*dose* equivalent of ionizing radiation	0.001 roentgen equivalent man (rem)
Mass & Volume units	gram	g	mass	0.001 kilogram (kg)
	kilogram	kg	mass	1000 grams (g)
	liter	L	volume of liquid	1000 milliliters (mL)
	milliliter	mL	volume of liquid	0.001 liter (L)
	cubic meter	m^3	volume of air	

Roentgens are units of radiation exposure in air. To determine the effect that the exposure would have on a person, roentgens are converted to **rem** ("**r**oentgen **e**quivalent **m**an"). A rem accounts for both the amount of radiation energy absorbed by a person and the potential biological effects of that energy in the human body. The Health Department's Radiological Health Rule provides limits for gamma radiation emitted from Vermont Yankee in units of measured exposure and relates it to a *biological dose*. As the Vermont Yankee site boundary TLDs measure exposure in milliroentgen, the corresponding limit in milliroentgen applies. Personal TLDs, like those worn by workers in nuclear power, medical or research facilities, are calibrated to provide a measure of *biological dose* for the wearer and are reported in millirem.

Uncertainty of Radiation Measurements

Measurements reported by a laboratory have an amount of *uncertainty* associated with them. Uncertainty is sometimes called error. Uncertainty results from variability in sampling and testing. The smaller the uncertainty associated with a measurement, the more accurate the number reported is likely to be. The uncertainty associated with a measurement is calculated by radiochemists and reported as a plus/minus (+/-) value. All of the measurements in this report are presented at the 95 percent confidence level. This means it is 95 percent certain (not due to chance alone) that the results are within the value and error range reported. Uncertainty can be minimized by increasing instrument efficiency, sample size and counting time.

Uncertainty of Thermoluminescent Dosimeter (TLD) Measurements

Dosimeter measurements over time are estimates and are also subject to uncertainty. The error for the sum of the quarterly results is the total propagated error at the 95 percent confidence level. The formula for the propagation of error is a root-mean-square formula:

$$[(\sigma_1^2) + (\sigma_2^2) + (\sigma_3^2) + (\sigma_4^2)]^{1/2}$$

Where (σ_1^2) is the uncertainty for quarter 1, (σ_2^2) is the uncertainty for quarter 2, (σ_3^2) is the uncertainty for quarter 3 and (σ_4^2) is the uncertainty for quarter 4. The Health Department regulates the direct gamma radiation exposure on the reported measurement.

Table 8. Health Department Gamma Spectroscopy Calculated Lower Limit of Detections

Radioactive element	Calculated Lower Limit of Detection: fish, water, vegetation & milk (pCi/L or pCi/kg)	Calculated Lower Limit of Detection: soil, sediment (pCi/kg)
Antimony-124	3	24
Antimony-126	3	23
Barium-133	4	30
Beryllium-7	24	183
Cadmium-109	48	349
Cerium-139	3	18
Cerium-141	4	29
Cerium-144	16	115
Cesium-134	4	25
Cesium-136	3	23
Cesium-137	4	24
Chromium-51	24	182
Cobalt-57	2	14
Cobalt-58	3	23
Cobalt-60	3	23
Iodine-131	3	23
Manganese-54	4	24
Mercury-203	3	22
Potassium-40	48	367
Ruthenium-103	3	22
Ruthenium-106	29	220
Silver-110m	3	23
Strontium-85	4	26
Tin-113	4	31
Yttrium-88	4	26
Zinc-65	6	46

Direct Gamma Radiation Results

Thermoluminescent dosimeters (TLDs) are located along the Vermont Yankee site boundary (property line) and in public areas in Vernon and in other Windham County towns. Thirteen TLDs placed at the Vermont Yankee site boundary are evaluated for compliance with the regulations detailed in the Health Department's Radiological Health Rule. The Health Department limits the measured exposure at the site boundary to no more than 20 milliroentgen per year above background radiation, and no more than 10 milliroentgen per calendar quarter above background radiation. The limit corresponds to the annual effective dose equivalent limit of 5 millirem for any member of the public in an unrestricted area.

Site boundary TLDs:

- VY North Fence
- VY North Fence #2
- VY SW Fence
- VY SW Fence #2
- VY Parking Lot A
- VDH T07A
- Governor Hunt Road # 39
- VDH T07B
- VDH DR42
- VDH DR48
- VDH DR51A
- VDH DR52A
- VDH DR53A

Five additional TLDs—VDH DR43, DR44, DR45, DR46 and DR47—are located on the Connecticut River site boundary and are subject to the U.S. Nuclear Regulatory Commission limit of 100 millirem per year.

Additional Health Department TLDs are located in other areas of Vernon, and in Guilford, Brattleboro, Dummerston, Putney and Wilmington. These provide the background measurements of direct gamma radiation from both natural and human-made sources unrelated to the operation of Vermont Yankee. All TLDs are collected and tested every three months (quarterly).

Comparison to Background Levels

To determine the amount of direct gamma radiation exposure attributed to emissions from Vermont Yankee, the background gamma radiation is subtracted from the site boundary (property line) measurements. Background gamma radiation unrelated to Vermont Yankee may be from naturally-occurring sources, other industrial applications, and global contaminants remaining from above-ground weapons testing during the 1940s, 50s and 60s and global nuclear incidents like Chernobyl.

To measure the background of direct gamma radiation the additional 34 TLDs are placed in locations beyond the immediate area of Vermont Yankee's operations. These locations are as far west as Wilmington, as far north as Putney, and as far south as the Massachusetts state line in Guilford and Vernon. Each quarter's average exposure to these 34 TLDs is calculated and used to estimate environmental background radiation. Background gamma radiation levels for the four quarters of 2011 are presented in Table 9.

The exposures reported in Tables 10 and 11 show the total (gross) dosimeter measurement and the net value. The net value is calculated by subtracting the background radiation measurement from the total radiation measurement. For regulatory purposes, the net values are compared to the quarterly and annual limits.

Table 9. 2011 Average Direct Gamma Background Radiation Results

Calendar **Quarter**	Average Background Exposure Measurements (milliroentgen)
January 1 to March 31	11.8 ± 2.6
April 1 to June 30	14.2 ± 3.4
July 1 to September 30	14.0 ± 5.4
October 1 to December 31	16.1 ± 2.4
Total for Calendar **Year 2011**	56.1 ± 7.3
Calendar Year 2010	59.2 ± 7.1
Calendar Year 2009	57.9 ± 4.8
Calendar Year 2008	56.4 ± 4.6
Calendar Year 2007	56.2 ± 5.2

2011 Direct Gamma Radiation Exposure Results

The following tables are the results of the Health Department's TLD measurements of direct gamma radiation. Table 10 contains the results for the Vermont Yankee site boundary, and the dosimeters in the immediate area around the power station. Table 11 contains the results for the 34 dosimeters placed in locations beyond the immediate area of Vermont Yankee.

In 2011:

- 288 TLDs were tested for direct gamma radiation.
    - 136 of those provided background exposure measurements
    - 152 of those provided exposure measurements at the site boundary and in the immediate area of Vermont Yankee

Dosimeter locations on the site boundary bordered by land and used for direct gamma radiation compliance measurements reflect Vermont Yankee property purchases on or before August 1, 2008. The site boundary dosimeter location data are bolded in Table 10.

For 2011, the net site boundary results used for verifying compliance ranged from 0 to 14.8 milliroentgen.

Map 3 shows the locations of the site boundary and station area dosimeters. Maps 4 and 5 show the locations of the background dosimeters. The ID numbers on the maps can be matched to the locations in Tables 10 and 11.

For 2011, the quarterly limit of 10 milliroentgen and the annual limit of 20 milliroentgen were not exceeded. As neither exposure limit was exceeded at the site boundary bordered by land, Vermont's annual effective dose equivalent limit of 5 millirem for any member of the general public in an unrestricted area was not exceeded for 2011.

Map 3

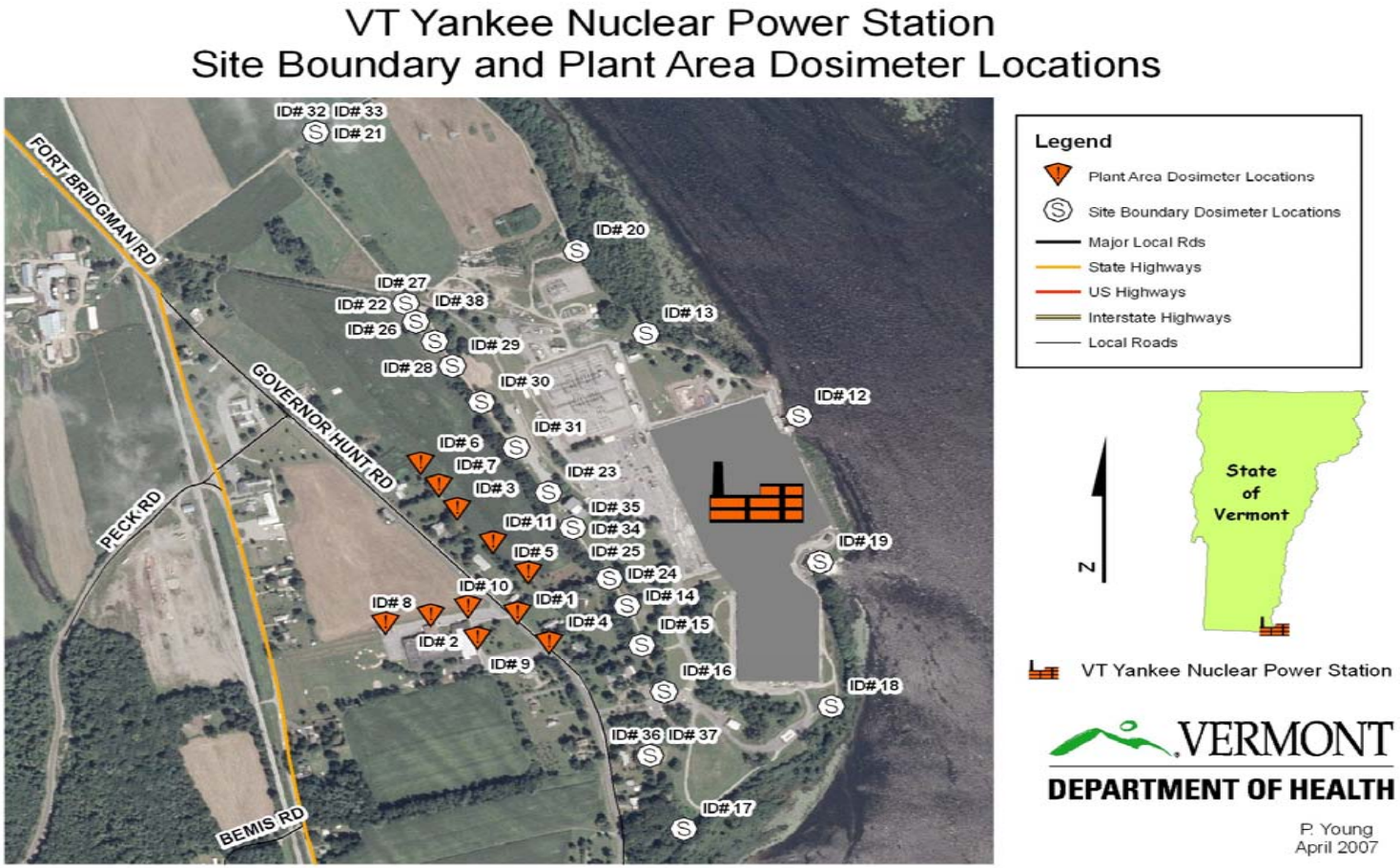

VT Yankee Nuclear Power Station
Site Boundary and Plant Area Dosimeter Locations
FORT BRIDGMAN RD
GOVERNOR HUNT RD
PECK RD
BEMIS RD
ID# 32
ID# 33
ID# 21
ID# 20
ID# 27
ID# 22
ID# 38
ID# 26
ID# 29
ID# 28
ID# 30
ID# 31
ID# 6
ID# 7
ID# 23
ID# 3
ID# 35
ID# 11
ID# 34
ID# 5
ID# 25
ID# 24
ID# 10
ID# 1
ID# 14
ID# 8
ID# 4
ID# 15
ID# 2
ID# 9
ID# 16
ID# 36
ID# 37
ID# 17
ID# 13
ID# 12
ID# 19
ID# 18
Legend
Plant Area Dosimeter Locations
Site Boundary Dosimeter Locations
Major Local Rds
State Highways
US Highways
Interstate Highways
Local Roads
N
State of Vermont
VT Yankee Nuclear Power Station
VERMONT
DEPARTMENT OF HEALTH
P. Young
April 2007

Table 10. 2011 Thermoluminescent Dosimeter Exposure Measurements and Net Gamma Radiation: Station Area & Site Boundary Locations

2011 **Site Boundary and Station Area** Dosimeter Exposure (milliroentgen)

Location	Map ID #	Qtr1 Gross	Avg Bkgrd	Qtr1 Net	Net Q1 >=0	2SD Error	Qrtr2 Gross	Avg Bkgrd	Qtr2 Net	Net Q2 >=0	2SD Error	Qrtr3 Gross	Avg Bkgrd	Qtr3 Net	Net Q3 >=0	2SD Error	Qrtr4 Gross	Avg Bkgrd	Qtr4 Net	Net Q4 >=0	2SD Error	Annual Net	2SD Error
Gov Hunt Road #39	**1**	**14.5**	**11.8**	**2.7**	**2.7**	**1.7**	**15.0**	**14.2**	**0.8**	**0.8**	**1.4**	**15.9**	**14.0**	**1.9**	**1.9**	**1.4**	**17.8**	**16.1**	**1.7**	**1.7**	**2.0**	**7.1**	**3.3**
VDH DR06	2	12.6	11.8	0.9	0.9	1.7	14.3	14.2	0.0	0.0	1.5	15.6	14.0	1.6	1.6	1.3	17.0	16.1	0.9	0.9	1.5	3.4	3.0
VDH DR51A	**3**	**13.4**	**11.8**	**1.7**	**1.7**	**2.3**	**16.2**	**14.2**	**1.9**	**1.9**	**1.4**	**16.1**	**14.0**	**2.1**	**2.1**	**1.6**	**17.8**	**16.1**	**1.7**	**1.7**	**2.0**	**7.4**	**3.7**
VDH DR52A	**4**	**13.9**	**11.8**	**2.2**	**2.2**	**2.2**	**15.9**	**14.2**	**1.6**	**1.6**	**1.4**	**16.7**	**14.0**	**2.7**	**2.7**	**1.3**	**17.6**	**16.1**	**1.5**	**1.5**	**1.8**	**7.9**	**3.4**
VDH DR53A	**5**	**15.2**	**11.8**	**3.5**	**3.5**	**3.4**	**17.2**	**14.2**	**3.0**	**3.0**	**1.6**	**18.4**	**14.0**	**4.4**	**4.4**	**1.6**	**20.1**	**16.1**	**4.0**	**4.0**	**2.0**	**14.8**	**4.5**
VDH T07A	**6**	**12.9**	**11.8**	**1.1**	**1.1**	**2.5**	**15.3**	**14.2**	**1.1**	**1.1**	**1.8**	**15.7**	**14.0**	**1.7**	**1.7**	**1.6**	**17.3**	**16.1**	**1.2**	**1.2**	**1.8**	**5.1**	**3.9**
VDH T07B	**7**	**11.7**	**11.8**	**0.0**	**0.0**	**2.1**	**16.1**	**14.2**	**1.8**	**1.8**	**1.7**	**16.4**	**14.0**	**2.4**	**2.4**	**1.4**	**17.9**	**16.1**	**1.7**	**1.7**	**1.9**	**6.0**	**3.6**
Vernon School (air sampler)	8	13.4	11.8	1.6	1.6	1.9	14.7	14.2	0.5	0.5	1.4	15.6	14.0	1.7	1.7	1.3	17.5	16.1	1.3	1.3	1.7	5.1	3.1
Vernon School Nurse	9	16.5	11.8	4.7	4.7	2.2	15.9	14.2	1.7	1.7	1.7	17.0	14.0	3.0	3.0	1.4	19.2	16.1	3.0	3.0	2.5	12.4	4.0
Vernon School Pole	10	12.2	11.8	0.4	0.4	1.9	14.5	14.2	0.3	0.3	1.4	14.6	14.0	0.6	0.6	1.4	16.3	16.1	0.2	0.2	2.4	1.5	3.6
VY Parking Lot A	**11**	**13.1**	**11.8**	**1.3**	**1.3**	**1.5**	**17.2**	**14.2**	**2.9**	**2.9**	**1.9**	**17.6**	**14.0**	**3.6**	**3.6**	**1.6**	**19.4**	**16.1**	**3.2**	**3.2**	**1.8**	**11.1**	**3.4**
VDH DR45	12	33.9	11.8	22.1	22.1	4.4	28.2	14.2	13.9	13.9	2.7	27.9	14.0	13.9	13.9	3.2	29.8	16.1	13.7	13.7	3.0	63.6	6.8
VDH DR46	13	20.2	11.8	8.4	8.4	5.2	19.4	14.2	5.2	5.2	1.9	19.0	14.0	5.0	5.0	1.6	20.7	16.1	4.6	4.6	1.9	23.2	6.0
VDH DR08	15	13.0	11.8	1.2	1.2	2.6	18.2	14.2	3.9	3.9	1.5	19.0	14.0	5.0	5.0	1.5	19.8	16.1	3.7	3.7	2.2	13.9	4.0
VDH DR41	16	13.4	11.8	1.7	1.7	1.6	14.7	14.2	0.5	0.5	1.4	15.9	14.0	2.0	2.0	1.3	17.4	16.1	1.3	1.3	2.0	5.4	3.3
VDH DR42	**17**	**17.8**	**11.8**	**6.0**	**6.0**	**2.0**	**16.5**	**14.2**	**2.2**	**2.2**	**1.5**	**15.4**	**14.0**	**1.4**	**1.4**	**1.6**	**17.3**	**16.1**	**1.2**	**1.2**	**1.8**	**10.8**	**3.4**
VDH DR43	18	12.4	11.8	0.7	0.7	2.7	14.5	14.2	0.2	0.2	1.3	17.1	14.0	3.1	3.1	1.7	18.2	16.1	2.0	2.0	1.7	6.1	3.9
VDH DR44	19	20.9	11.8	9.1	9.1	2.4	19.5	14.2	5.2	5.2	2.5	19.6	14.0	5.6	5.6	1.7	21.8	16.1	5.7	5.7	2.0	25.6	4.3
VDH DR47	20	15.1	11.8	3.3	3.3	2.7	17.2	14.2	2.9	2.9	1.5	17.5	14.0	3.5	3.5	1.5	18.6	16.1	2.5	2.5	2.3	12.3	4.1
VDH DR48	**21**	**10.1**	**11.8**	**-1.7**	**0.0**	**1.7**	**13.4**	**14.2**	**-0.9**	**0.0**	**1.1**	**13.2**	**14.0**	**-0.8**	**0.0**	**1.3**	**14.4**	**16.1**	**-1.7**	**0.0**	**1.8**	**0.0**	**3.0**
VDH T01	22	12.0	11.8	0.2	0.2	2.0	13.7	14.2	-0.5	0.0	1.4	14.8	14.0	0.9	0.9	1.2	16.6	16.1	0.5	0.5	1.8	1.6	3.2
VDH DR49	22	12.3	11.8	0.6	0.6	1.8	13.7	14.2	-0.6	0.0	1.1	14.1	14.0	0.1	0.1	1.6	16.1	16.1	-0.1	0.0	1.5	0.7	3.0
VDH DR51	23	15.9	11.8	4.1	4.1	2.1	18.7	14.2	4.4	4.4	2.2	18.1	14.0	4.2	4.2	1.3	20.4	16.1	4.3	4.3	2.2	17.0	4.0
VDH DR52	24	18.9	11.8	7.1	7.1	2.1	20.2	14.2	5.9	5.9	2.1	20.6	14.0	6.7	6.7	1.8	22.1	16.1	6.0	6.0	2.0	25.7	4.0

Site boundary dosimeter measurements are bolded.

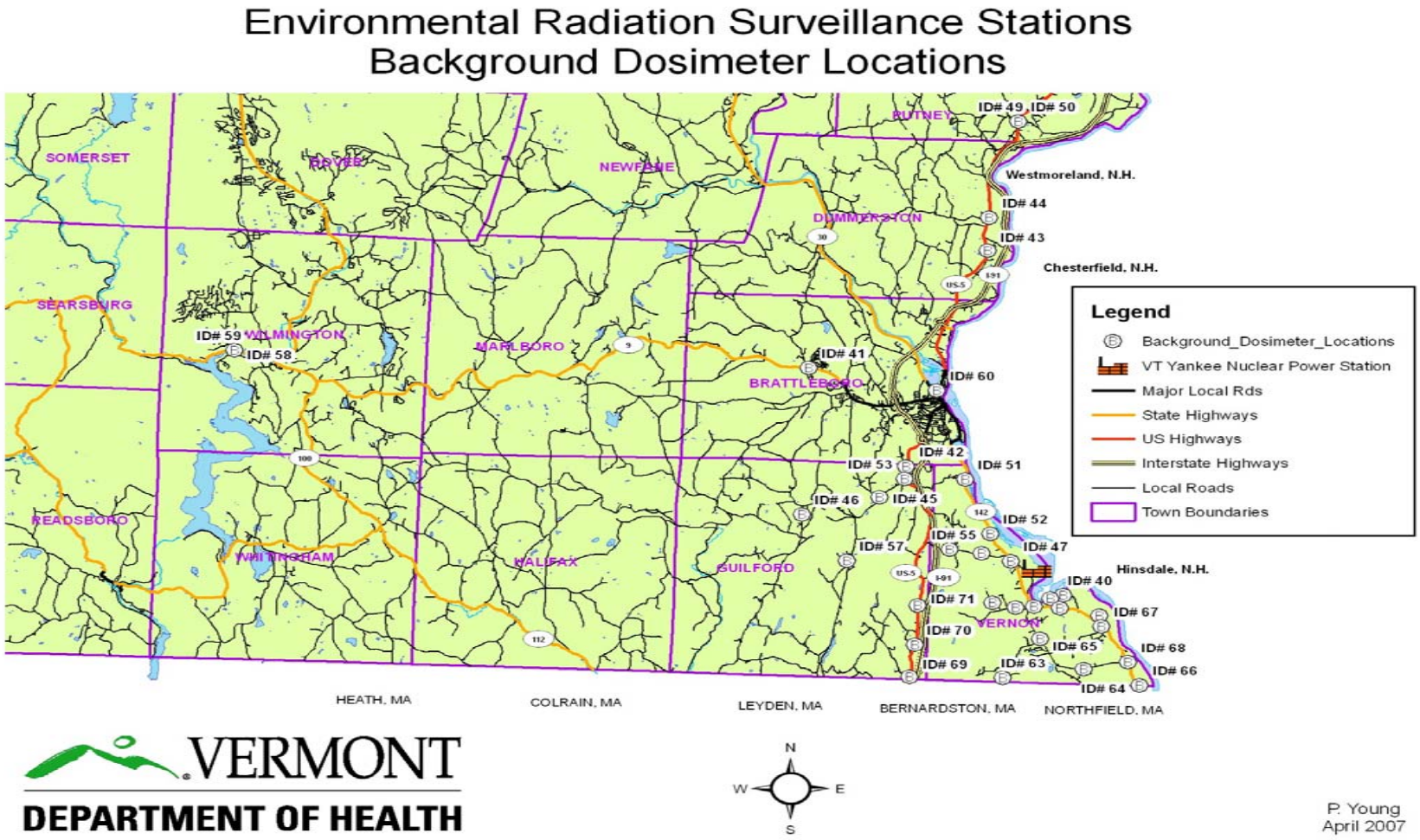
Table 10 (continued). 2011 Thermoluminescent Dosimeter Exposure Measurements and Net Gamma Radiation: Station Area & Site Boundary Locations

2011 **Site Boundary and Station Area** Dosimeter Exposure (milliroentgen)

Location	Map ID #	Qtr1 Gross	Avg Bkgrd	Qtr1 Net	Net Q1 >=0	2SD Error	Qrtr2 Gross	Avg Bkgrd	Qtr2 Net	Net Q2 >=0	2SD Error	Qrtr3 Gross	Avg Bkgrd	Qtr3 Net	Net Q3 >=0	2SD Error	Qrtr4 Gross	Avg Bkgrd	Qtr4 Net	Net Q4 >=0	2SD Error	Annual Net	2SD Error
VDH DR53	25	19.6	11.8	7.8	7.8	2.4	21.0	14.2	6.8	6.8	1.6	21.6	14.0	7.7	7.7	1.7	24.2	16.1	8.1	8.1	2.1	30.4	4.0
VDH T03	26	12.3	11.8	0.5	0.5	1.8	15.0	14.2	0.8	0.8	1.6	15.1	14.0	1.1	1.1	1.2	17.0	16.1	0.8	0.8	2.2	3.2	3.5
VDH DR49	27	12.3	11.8	0.6	0.6	1.8	13.7	14.2	-0.6	0.0	1.1	14.1	14.0	0.1	0.1	1.6	16.1	16.1	-0.1	0.0	1.5	0.7	3.0
VDH T05	28	13.5	11.8	1.7	1.7	1.6	15.4	14.2	1.1	1.1	1.8	15.8	14.0	1.9	1.9	1.5	17.2	16.1	1.1	1.1	1.8	5.8	3.4
VDH T04	29	13.4	11.8	1.6	1.6	2.0	15.7	14.2	1.4	1.4	1.4	15.2	14.0	1.3	1.3	1.3	17.5	16.1	1.4	1.4	1.8	5.7	3.3
VDH T06	30	14.6	11.8	2.9	2.9	2.2	15.8	14.2	1.6	1.6	1.3	17.1	14.0	3.1	3.1	1.7	18.1	16.1	2.0	2.0	2.0	9.6	3.7
VDH DR07	31	15.9	11.8	4.1	4.1	2.0	17.5	14.2	3.3	3.3	1.4	17.8	14.0	3.8	3.8	1.6	19.0	16.1	2.9	2.9	1.6	14.0	3.4
VY North Fence	**32**	**11.2**	**11.8**	**-0.5**	**0.0**	**1.9**	**13.8**	**14.2**	**-0.5**	**0.0**	**1.6**	**14.5**	**14.0**	**0.5**	**0.5**	**1.4**	**16.6**	**16.1**	**0.4**	**0.4**	**1.9**	**1.0**	**3.5**
VY North Fence #2	**33**	**11.1**	**11.8**	**-0.6**	**0.0**	**1.3**	**14.9**	**14.2**	**0.6**	**0.6**	**1.4**	**14.9**	**14.0**	**0.9**	**0.9**	**1.7**	**16.4**	**16.1**	**0.3**	**0.3**	**1.8**	**1.9**	**3.1**
VY Parking Lot #2	34	19.2	11.8	7.5	7.5	3.1	20.4	14.2	6.2	6.2	1.9	21.0	14.0	7.0	7.0	1.8	22.0	16.1	5.9	5.9	2.4	26.5	4.7
VY Parking Lot, ID	35	18.6	11.8	6.9	6.9	2.1	21.2	14.2	7.0	7.0	3.3	19.9	14.0	5.9	5.9	2.3	22.2	16.1	6.1	6.1	2.2	25.9	5.0
VY SW Fence	**36**	**11.3**	**11.8**	**-0.4**	**0.0**	**1.6**	**13.7**	**14.2**	**-0.5**	**0.0**	**1.3**	**14.3**	**14.0**	**0.3**	**0.3**	**1.6**	**15.8**	**16.1**	**-0.3**	**0.0**	**2.0**	**0.3**	**3.3**
VY SW Fence #2	**37**	**12.1**	**11.8**	**0.3**	**0.3**	**1.5**	**14.2**	**14.2**	**-0.1**	**0.0**	**1.8**	**15.5**	**14.0**	**1.6**	**1.6**	**2.2**	**16.3**	**16.1**	**0.2**	**0.2**	**2.1**	**2.1**	**3.9**
VDH T02	38	12.9	11.8	1.1	1.1	2.4	13.6	14.2	-0.6	0.0	1.5	14.8	14.0	0.9	0.9	1.5	16.4	16.1	0.3	0.3	2.1	2.3	3.8
Meteorology Tower	n/a	12.4	11.8	0.6	0.6	2.2	14.7	14.2	0.5	0.5	1.3	14.3	14.0	0.3	0.3	1.4	16.9	16.1	0.8	0.8	1.8	2.2	3.4

Site boundary dosimeter measurements are bolded.

Map 4


Environmental Radiation Surveillance Stations
Background Dosimeter Locations
SOMERSET
ROYER
NEWFANE
BUTNEY
DUMMERSTON
SEARSBURG
WILMINGTON
MARLBORO
BRATTLEBORO
READSBURG
WHITINGHAM
HALIFAX
GUILFORD
VERNON
Westmoreland, N.H.
Chesterfield, N.H.
Hinsdale, N.H.
ID# 49
ID# 50
ID# 44
ID# 43
ID# 59
ID# 58
ID# 41
ID# 60
ID# 53
ID# 42
ID# 51
ID# 46
ID# 45
ID# 52
ID# 55
ID# 57
ID# 47
ID# 40
ID# 71
ID# 67
ID# 70
ID# 65
ID# 68
ID# 69
ID# 63
ID# 66
ID# 64
HEATH, MA
COLRAIN, MA
LEYDEN, MA
BERNARDSTON, MA
NORTHFIELD, MA
Legend
Background_Dosimeter_Locations
VT Yankee Nuclear Power Station
Major Local Rds
State Highways
US Highways
Interstate Highways
Local Roads
Town Boundaries
VERMONT
DEPARTMENT OF HEALTH
N
W
E
S
P. Young
April 2007

Map 5

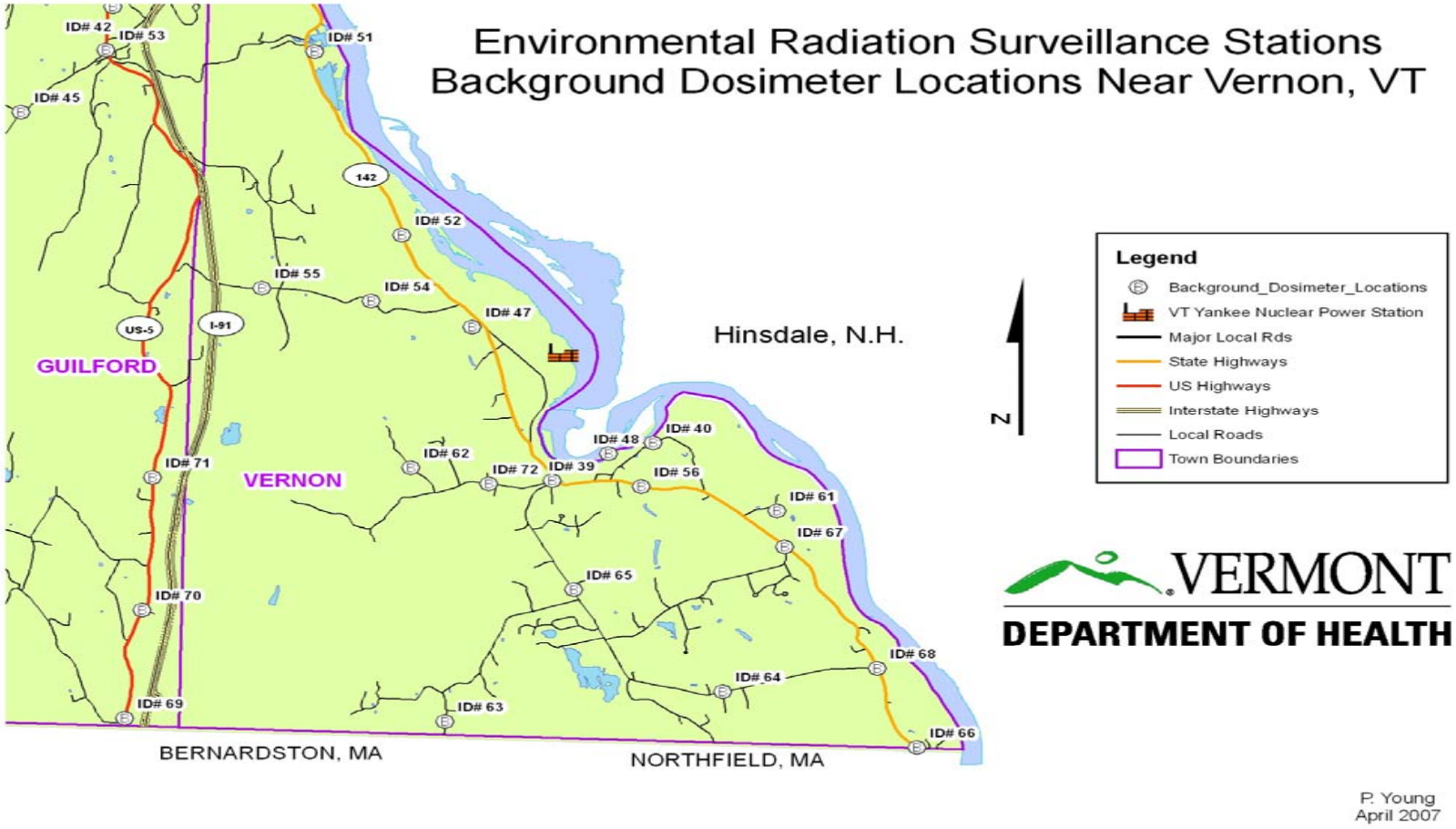

Environmental Radiation Surveillance Stations
Background Dosimeter Locations Near Vernon, VT
ID# 42
ID# 53
ID# 51
ID# 45
142
ID# 52
ID# 55
ID# 54
ID# 47
US-5
I-91
GUILFORD
Hinsdale, N.H.
ID# 48
ID# 40
ID# 62
ID# 72
ID# 39
ID# 56
ID# 71
VERNON
ID# 61
ID# 67
ID# 65
ID# 70
ID# 68
ID# 64
ID# 69
ID# 63
ID# 66
BERNARDSTON, MA
NORTHFIELD, MA
N
Legend
Background_Dosimeter_Locations
VT Yankee Nuclear Power Station
Major Local Rds
State Highways
US Highways
Interstate Highways
Local Roads
Town Boundaries
VERMONT
DEPARTMENT OF HEALTH
P. Young
April 2007

Table 11. 2011 Thermoluminescent Dosimeter Exposure Measurements and Net Gamma Radiation: Background Locations

2011 **Background** Dosimeter Exposure (milliroentgen)

Location	Map ID #	Qtr1 Gross	Avg Bkgrd	Qtr1 Net	Net >=0	2SD Error	Qrtr2 Gross	Avg Bkgrd	Qtr2 Net	Net >=0	2SD Error	Qrtr3 Gross	Avg Bkgrd	Qtr3 Net	Net >=0	2SD Error	Qrtr4 Gross	Avg Bkgrd	Qtr4 Net	Net >=0	2SD Error	Annual Net	2SD Error
142/Pond Road (N)	39	11.9	11.8	0.1	0.1	1.4	6.8	14.2	-7.5	0.0	0.7	0.0	14.0	-14.0	0.0	0.0	15.4	16.1	-0.7	0.0	3.0	0.1	3.4
A&M Auto/Smead Rd	40	11.5	11.8	-0.2	0.0	1.4	13.6	14.2	-0.6	0.0	2.0	14.0	14.0	0.0	0.0	1.5	16.2	16.1	0.0	0.0	2.6	0.0	3.9
West Brattleboro State Police	41	10.5	11.8	-1.3	0.0	2.2	13.0	14.2	-1.3	0.0	1.2	12.8	14.0	-1.2	0.0	1.1	15.9	16.1	-0.3	0.0	1.5	0.0	3.2
D&E Tree, Rt 5, Guilford	42	9.8	11.8	-1.9	0.0	1.8	14.6	14.2	0.3	0.3	1.6	13.4	14.0	-0.6	0.0	1.2	15.2	16.1	-0.9	0.0	2.1	0.3	3.4
Dummerston AOT	43	12.5	11.8	0.7	0.7	1.4	13.7	14.2	-0.5	0.0	1.6	14.6	14.0	0.6	0.6	1.2	16.7	16.1	0.5	0.5	2.6	1.9	3.6
Dummerston School	44	11.1	11.8	-0.7	0.0	1.4	14.1	14.2	-0.2	0.0	1.4	14.6	14.0	0.7	0.7	1.2	16.2	16.1	0.0	0.0	2.4	0.7	3.3
Guilford Center Rd/Tater Rd	45	10.9	11.8	-0.9	0.0	1.5	15.0	14.2	0.8	0.8	1.8	14.4	14.0	0.4	0.4	1.3	15.6	16.1	-0.5	0.0	1.6	1.2	3.1
Guilford Town Garage	46	13.7	11.8	1.9	1.9	2.5	15.5	14.2	1.3	1.3	1.2	14.9	14.0	0.9	0.9	1.3	17.6	16.1	1.5	1.5	1.9	5.6	3.6
Miller Farm	47	12.5	11.8	0.7	0.7	1.4	12.9	14.2	-1.4	0.0	1.2	12.7	14.0	-1.3	0.0	1.3	14.6	16.1	-1.5	0.0	1.4	0.7	2.6
Power Line River Crossing	48	12.0	11.8	0.3	0.3	2.2	14.3	14.2	0.0	0.0	1.4	14.1	14.0	0.1	0.1	1.2	15.8	16.1	-0.3	0.0	2.2	0.4	3.6
Putney Pole	49	12.7	11.8	0.9	0.9	1.9	15.3	14.2	1.1	1.1	1.5	15.1	14.0	1.1	1.1	1.5	16.5	16.1	0.4	0.4	2.0	3.5	3.5
Putney Town Clerk	50	10.3	11.8	-1.5	0.0	1.3	15.3	14.2	1.0	1.0	2.2	12.6	14.0	-1.4	0.0	1.1	14.4	16.1	-1.7	0.0	1.8	1.0	3.3
Renaud Brothers	51	14.9	11.8	3.1	3.1	2.0	15.1	14.2	0.8	0.8	1.7	16.9	14.0	2.9	2.9	2.0	18.4	16.1	2.3	2.3	1.9	9.1	3.8
Rt 142 N Trans Line	52	12.1	11.8	0.4	0.4	1.6	13.3	14.2	-1.0	0.0	1.4	14.8	14.0	0.8	0.8	1.6	16.0	16.1	-0.1	0.0	2.0	1.2	3.3
Rt 5/Guilford Ctr Rd	53	11.9	11.8	0.2	0.2	1.6	14.8	14.2	0.5	0.5	1.1	13.5	14.0	-0.5	0.0	1.1	15.0	16.1	-1.1	0.0	1.6	0.7	2.7
Tyler Hill Road	54	11.3	11.8	-0.4	0.0	1.6	14.5	14.2	0.3	0.3	1.6	15.1	14.0	1.1	1.1	1.8	16.5	16.1	0.4	0.4	2.4	1.8	3.8
Tyler Rd/Franklin Rd	55	12.7	11.8	0.9	0.9	1.6	15.1	14.2	0.9	0.9	1.4	14.8	14.0	0.8	0.8	1.6	15.8	16.1	-0.3	0.0	2.0	2.6	3.3
Vernon Fire Station	56	10.5	11.8	-1.3	0.0	1.7	14.2	14.2	-0.1	0.0	1.5	14.4	14.0	0.4	0.4	1.7	15.9	16.1	-0.2	0.0	1.7	0.4	3.3
Weatherhead Hll Rd	57	10.0	11.8	-1.8	0.0	1.5	13.2	14.2	-1.1	0.0	1.5	13.0	14.0	-0.9	0.0	1.1	15.4	16.1	-0.7	0.0	1.8	0.0	3.0
Wilmington AOT Pole	58	12.7	11.8	0.9	0.9	2.1	14.4	14.2	0.1	0.1	1.3	15.1	14.0	1.1	1.1	1.3	16.8	16.1	0.6	0.6	1.7	2.8	3.3
Wilmington AOT (air sampler)	59	14.6	11.8	2.8	2.8	2.0	17.1	14.2	2.9	2.9	1.5	17.7	14.0	3.7	3.7	1.3	19.6	16.1	3.5	3.5	2.0	12.9	3.5
Windham County Court	60	12.5	11.8	0.8	0.8	1.6	15.1	14.2	0.8	0.8	1.8	14.8	14.0	0.9	0.9	1.5	16.8	16.1	0.7	0.7	1.6	3.1	3.2
Blodgett Farm	61	14.0	11.8	2.2	2.2	1.7	14.7	14.2	0.4	0.4	1.3	13.6	14.0	-0.4	0.0	1.0	16.6	16.1	0.5	0.5	1.6	3.2	2.9

Table 11. 2011 Thermoluminescent Dosimeter Exposure Measurements and Net Gamma Radiation: Background Locations (continued)

2011 **Background** Dosimeter Exposure (milliroentgen)

Location	Map ID #	Qtr1 Gross	Avg Bkgrd	Qtr1 Net	Net >=0	2SD Error	Qrtr2 Gross	Avg Bkgrd	Qtr2 Net	Net >=0	2SD Error	Qrtr3 Gross	Avg Bkgrd	Qtr3 Net	Net >=0	2SD Error	Qrtr4 Gross	Avg Bkgrd	Qtr4 Net	Net >=0	2SD Error	Annual Net	2SD Error
Fairman Road	62	11.0	11.8	-0.7	0.0	1.5	14.3	14.2	0.0	0.0	2.1	14.5	14.0	0.5	0.5	1.2	16.4	16.1	0.3	0.3	1.5	0.8	3.2
Huckle Hill Rd.VT Ln	63	12.9	11.8	1.1	1.1	1.8	16.9	14.2	2.6	2.6	1.5	16.1	14.0	2.2	2.2	1.6	18.0	16.1	1.8	1.8	2.1	7.7	3.5
Pond Rd & Houghton	64	11.0	11.8	-0.8	0.0	1.9	14.0	14.2	-0.2	0.0	1.6	14.2	14.0	0.2	0.2	1.2	15.7	16.1	-0.4	0.0	1.8	0.2	3.3
Pond Rd/Vernon Rec	65	9.7	11.8	-2.0	0.0	1.3	12.3	14.2	-2.0	0.0	1.1	12.6	14.0	-1.4	0.0	1.1	13.4	16.1	-2.8	0.0	1.5	0.0	2.5
Rt 142 & Depot St	66	12.6	11.8	0.8	0.8	1.9	14.5	14.2	0.3	0.3	1.3	14.6	14.0	0.7	0.7	1.1	15.8	16.1	-0.3	0.0	1.5	1.8	3.0
Rt 142 & Newton Rd	67	10.1	11.8	-1.6	0.0	1.4	12.6	14.2	-1.7	0.0	1.3	12.7	14.0	-1.3	0.0	1.1	14.6	16.1	-1.5	0.0	1.9	0.0	2.9
Rt 142 & Pond Rd (S)	68	11.0	11.8	-0.8	0.0	1.4	13.6	14.2	-0.7	0.0	1.5	14.0	14.0	0.1	0.1	1.3	15.8	16.1	-0.3	0.0	2.7	0.1	3.6
Route 5/Wolosko Rd	69	12.5	11.8	0.7	0.7	1.9	16.7	14.2	2.4	2.4	1.8	17.5	14.0	3.5	3.5	2.0	18.4	16.1	2.3	2.3	2.1	9.0	3.9
Rt 5/Andrews Cmtry	70	11.1	11.8	-0.7	0.0	1.6	14.6	14.2	0.3	0.3	1.3	14.1	14.0	0.1	0.1	1.1	15.6	16.1	-0.5	0.0	1.5	0.5	2.8
Rt 5/Tkaczyk Frm Rd	71	11.5	11.8	-0.2	0.0	1.4	15.5	14.2	1.3	1.3	2.2	14.4	14.0	0.5	0.5	1.2	16.0	16.1	-0.1	0.0	1.9	1.7	3.5
West Rd/Edgewood	72	10.2	11.8	-1.6	0.0	1.3	14.0	14.2	-0.2	0.0	1.5	13.7	14.0	-0.3	0.0	1.3	15.1	16.1	-1.0	0.0	1.4	0.0	2.8
Average Background (Avg)		**11.8**					**14.2**					**14.0**					**16.1**					**56.1**	

Continuous Flow Air Sampling Results

The Health Department uses continuously operating air samplers to monitor the air near Vermont Yankee. They are located in Vernon, Guilford, Brattleboro, Dummerston and Wilmington. The locations of the air samplers are shown on Map 6. In March, to provide another background location during the nuclear event in Fukushima, an air sampler was sited in Burlington at the Health Department.

Air filters are tested monthly for alpha- and beta-emitting materials and are then grouped quarterly to test for gamma-emitting materials. Air cartridges are collected and tested monthly for iodine-131 (I-131) and other gamma-emitting materials at the Health Department Laboratory. In the early part of 2011, mechanical and weather issues did not allow for several samples to be collected. As a result of the nuclear events at Fukushima Daiichi in Japan, sampling and testing frequency increased from March 15 through the month of May. Routine environmental sample test procedures were changed for these weekly air samples to achieve lower detection limits. For these reasons, air data from the May to June samples are separated from monthly collections, and averages for historical trends do not include these results. As a result of the amount of data associated with the air filters, the data are provided in Appendix A.

For 2011:

- 198 air cartridges were tested for iodine-131 and gamma-emitting materials.
- 198 air filters were tested for total alpha and beta radioactivity.
- 7 sets of air filters were grouped and tested for gamma-emitting materials.

Air Filter Total Alpha and Beta Radioactivity Results

In 2011, the average result for total alpha radioactivity was 0.00160 picocuries per cubic meter (pCi/m^3). The 2011 average result for total beta radioactivity was 0.0127 pCi/m^3. The 2011 total alpha and beta radioactivity air filter results are presented in Appendix A.

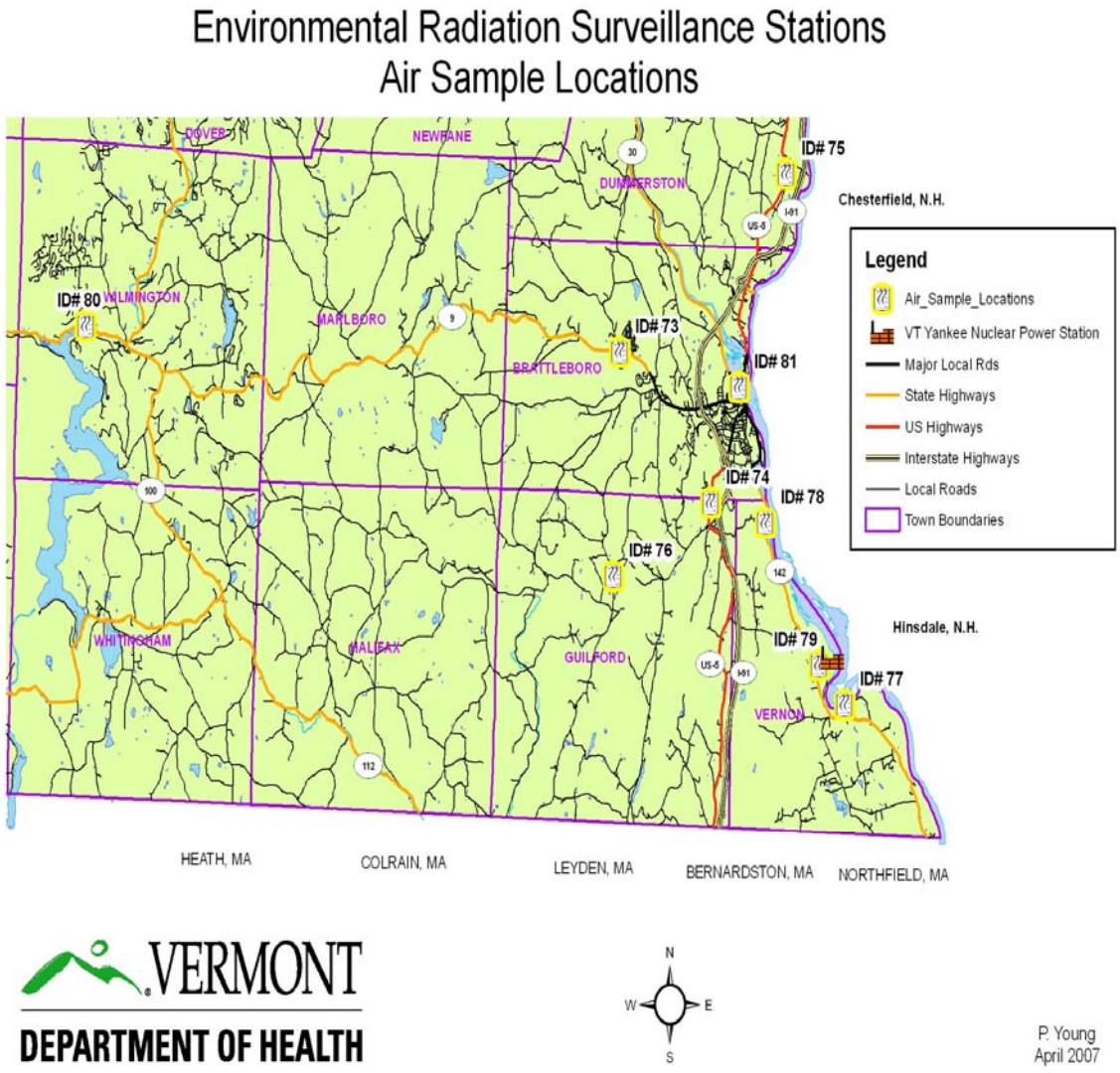
Figures 2 and 3 show the average total alpha and beta radioactivity for the sample locations compared to the 2009 and 2010 results. Very low results that were uncertain because of noted collection problems were removed prior to calculating the average result. This is a conservative approach and results in an increased average.

Air Cartridge and Air Filter Gamma-Emitting Materials Results

After Fukushima, iodine-131 was detected at all air sampling stations beginning with the sample taken on March 24th. Detectable amounts were seen through the middle of April. Concentrations of detected iodine-131 ranged from 0.0188 to 0.2020 picocuries per cubic meter (pCi/m^3). The highest readings were seen in the last week of March and first week of April. No iodine-131 was detected after April 15, 2011. Weekly sampling was continued through the end of May. These detections were from the reactor failures at Fukushima Daiichi Station.

As well as increased sampling of individual filters and cartridges, composited samples were also tested more frequently during March, April and May. Human-made gamma emitting materials cesium-134, cesium-137, and iodine-131, as well as naturally–occurring potassium-40 and beryllium-7 were detected during these months. Only beryllium-7 was detected in the first, third and fourth quarters. Table 12 presents the composite results for the first, third and fourth quarters. The second quarter results are qualitative and presented in Appendix A with other Fukushima-related air data.

Map 6



Sample Location	Map ID	Sample Location	Map ID
D & E Tree	74	Vermont State Police-Brattleboro	73
Dummerston State Garage	75	Vernon Elementary School	79
Guilford Town Garage	76	Wilmington State Highway Garage	80
Power Line River Crossing	77	Windham County Courthouse	81
Renaud Brothers	78	108 Cherry St. Burlington	n/a

Figure 2. 2009-2011 Average Alpha Radioactivity in Air

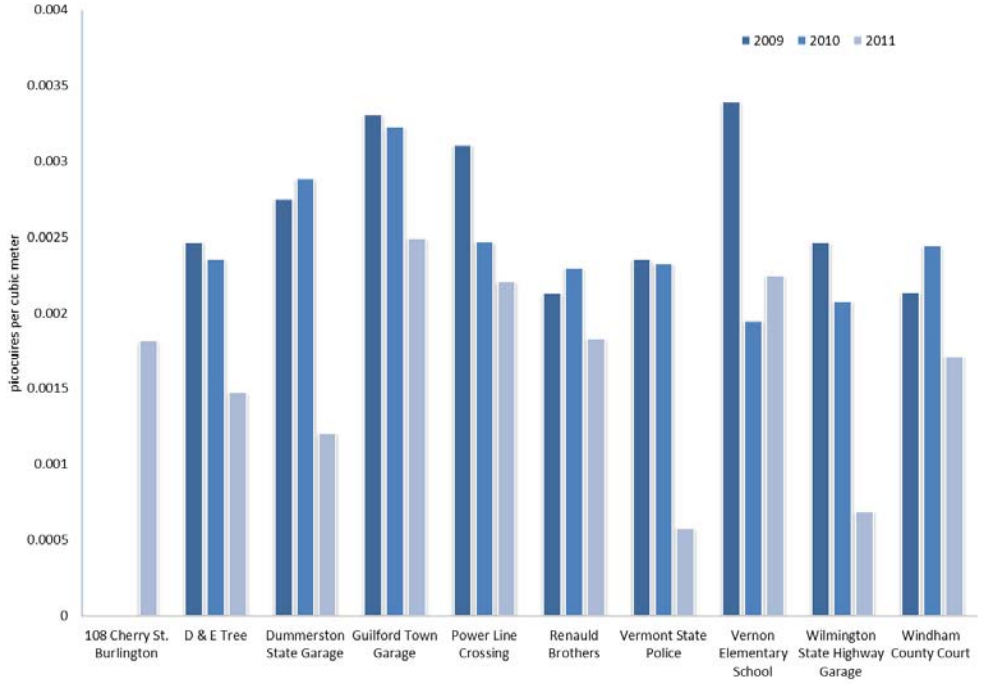


Figure 3. 2009-2011 Average Beta Radioactivity in Air

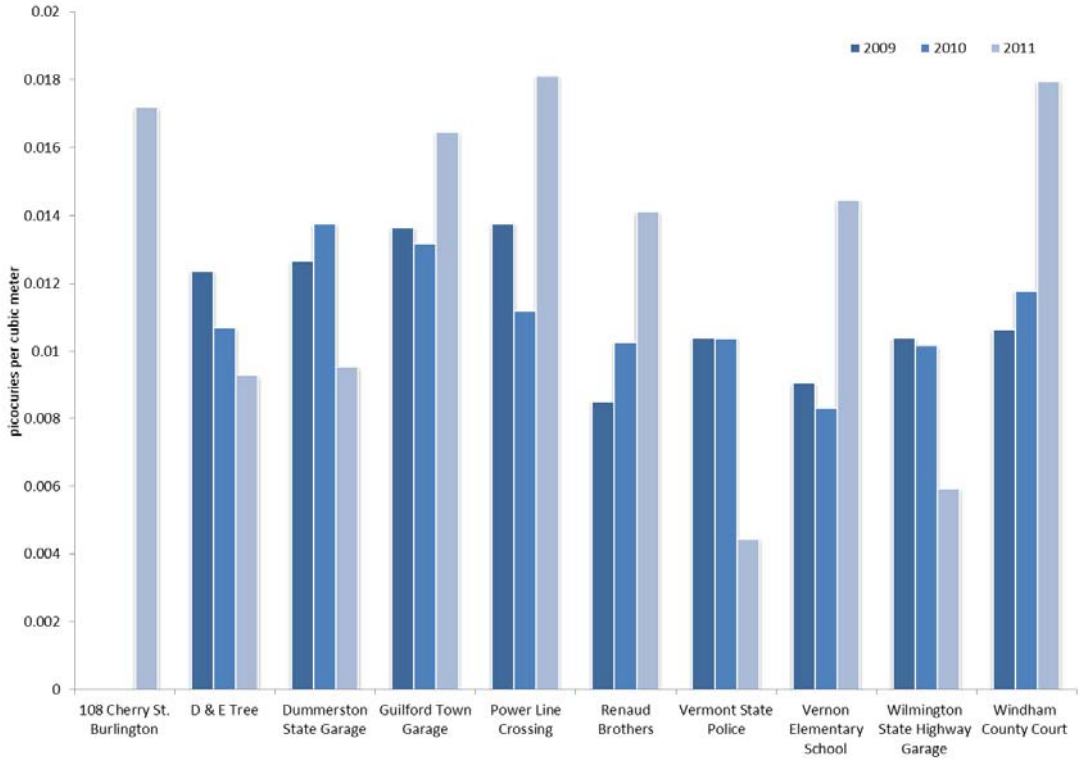


Table 12. 2011 Air Filter Composite Results (Gamma Spectroscopy)

Quarter	Last Date of Quarter	Element	Concentration +/- error (pCi)		
1st Quarter	03/31/10	Beryllium-7	3770	+/-	350
2nd Quarter	*See Appendix A for air filter data for the second quarter*				
3rd Quarter	09/30/10	Beryllium-7	5420	+/-	550
4th Quarter	12/31/10	Beryllium-7	4020	+/-	420

In 2011, no alpha, beta or gamma radioactivity related to the operations of Vermont Yankee was identified in the continuous flow air samples. Low levels of human-made radioactive materials were identified during the months of March and April. Levels of human-made radioactive materials measured in the Burlington air sampler were comparable to those detected in the Windham County samples. These measurements were consistent with detections from around the world as a result of the nuclear events in Fukushima, Japan. The levels of radioactivity did not pose an increased health risk to people in Vermont.

Water Sampling Results

The Health Department has routinely collected off-site monthly water samples from six locations around Vermont Yankee. These routine water samples are tested for tritium, gamma-emitting materials, and total alpha and beta radioactivity. Collections are taken from drinking water wells (3), a public water supply (1) and the Connecticut River (2). These sample locations are shown on Map 7.

In addition, Vermont Yankee routinely collected at four Connecticut River sites monthly, stations 3-3, 3-4, 3-8 and the Discharge Forebay. These sample locations are shown in Map 8. Additional off-site samples are collected at private residences and a nursing home.

As a result of the tritium investigation, Vermont Yankee sampled on-site groundwater monitoring wells, on-site drinking water supplies, and an additional site in the Connecticut River next to where the plume was projected to enter the river. These on-site water sample sites are shown on Map 9. The Health Department received field duplicate water samples of these tritium-related monitoring sites.

Routine off-site water samples are tested for total alpha and beta radioactivity, gamma radioactivity and tritium. Water samples that were collected as a result of the tritium leak were tested by the Health Department for tritium and gamma-emitting materials. Other tests were performed by a contract laboratory. Ninety-four water samples were sent to the contract laboratory as a quality control check for tritium and gamma spectroscopy tests. Public water supplies in other counties of the state were sampled during Fukushima for gamma-emitting materials.

For 2011:

- 116 water samples were tested for total alpha and beta radioactivity.
- 1379 water (ground, drinking, surface) samples were tested for tritium.
- 1066 water samples were tested for gamma-emitting materials.

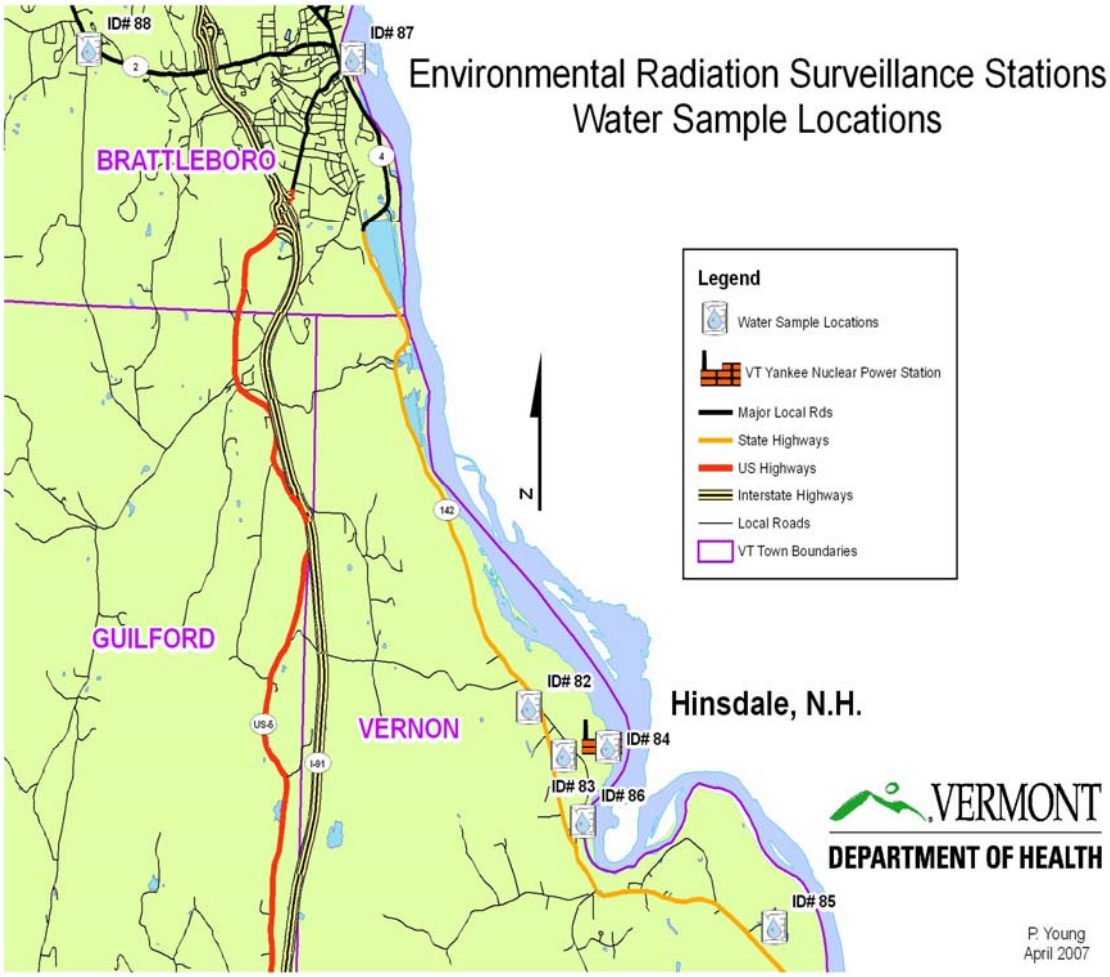
- 211 water samples were tested for hard-to-detect metals: iron-55, nickel-63, strontium-89, and strontium-90.

Due to the large number of results associated with tritium, gamma spectroscopy, and hard-to-detect analyses, the individual data for these tests are presented in Appendices B, C and D.

Water Total Alpha and Beta Radioactivity Results

The alpha and beta radioactivity measured in the water samples is within the historical range for both types of radioactivity. Water alpha and beta radioactivity measurements around Vermont Yankee have both historically ranged from below the lower limit of detection to 15 picocuries per liter (pCi/L). The 2011 range for alpha radioactivity is -1.67 to 8.56 pCi/L. The 2011 range for beta radioactivity is from -0.58 to 7.81 pCi/L. Results from 2011 are presented in Table 14. Comparisons of 2009-2011 data are presented in Figures 4 and 5. Trends for both alpha and beta results are similar to past years: Vernon Elementary School and Blodgett Farm have historically had higher levels of natural radioactivity in the water.

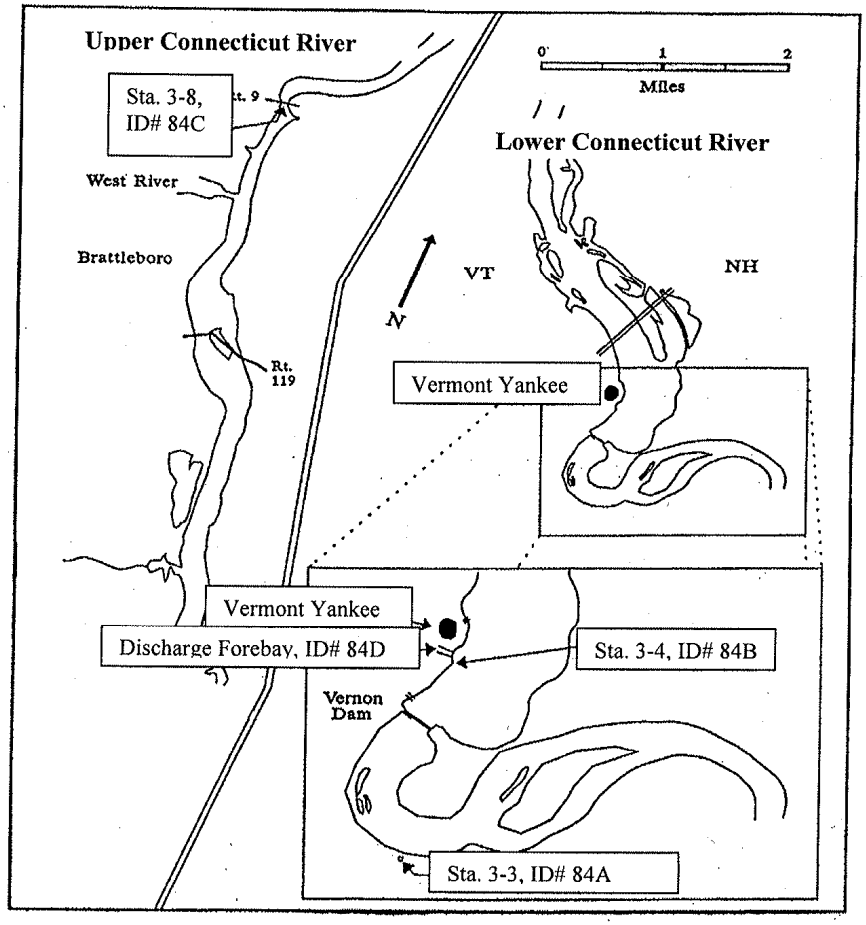
Map 7



Sample Location	Map ID
Miller Farm	82
Vernon Elementary School	83
Blodgett Farm	85
Connecticut River, Downstream	86
Connecticut River, Upstream	87
Brattleboro Fire Dept., West Station	88

Map 8

Routine Connecticut River Water Sample Locations



Sample Location	Map ID
3-3 Connecticut River Station	84A
3-4 Connecticut River Station	84B
3-8 Connecticut River Station	84C
Discharge Forebay	84D

Table 13. 2011 Water Results for Total Alpha and Beta Radioactivity

Sample Location	Date of Sample	Total Alpha Radioactivity +/- error (pCi/L)	Total Beta Radioactivity +/- error (pCi/L)
3-3 Connecticut River Station	1/14/2011	1.33 +/- 1.37	1.58 +/- 1.65
	2/16/2011	1.59 +/- 1.57	2.02 +/- 1.66
	3/16/2011	0.00 +/- 1.36	1.27 +/- 1.63
	4/14/2011	0.80 +/- 1.44	1.47 +/- 1.76
	5/13/2011	0.72 +/- 0.81	0.07 +/- 0.84
	6/15/2011	0.00 +/- 1.35	-0.58 +/- 1.66
	7/13/2011	0.55 +/- 1.34	2.50 +/- 1.58
	8/15/2011	1.59 +/- 1.40	1.40 +/- 1.65
	9/14/2011	1.60 +/- 1.48	3.46 +/- 1.71
	10/13/2011	0.55 +/- 1.47	1.71 +/- 1.67
	11/14/2011	0.27 +/- 1.34	1.12 +/- 1.62
	12/15/2011	-0.92 +/- 1.46	1.90 +/- 1.73
3-4 Connecticut River Station	1/13/2011	2.13 +/- 1.43	1.01 +/- 1.63
	2/16/2011	0.55 +/- 1.54	2.17 +/- 1.66
	3/16/2011	1.27 +/- 1.39	0.42 +/- 1.61
	4/14/2011	1.77 +/- 1.45	1.03 +/- 1.74
	5/13/2011	0.73 +/- 0.81	0.44 +/- 0.85
	6/15/2011	-0.77 +/- 1.27	0.14 +/- 1.68
	7/13/2011	1.10 +/- 1.39	2.08 +/- 1.57
	8/15/2011	0.00 +/- 1.28	0.84 +/- 1.63
	9/14/2011	0.00 +/- 1.41	2.74 +/- 1.69
	10/13/2011	0.85 +/- 1.53	3.41 +/- 1.71
	11/14/2011	0.27 +/- 1.35	0.56 +/- 1.61
	12/15/2011	-0.57 +/- 0.90	1.61 +/- 0.89
3-8 Connecticut River Station	1/14/2011	2.11 +/- 1.41	1.15 +/- 1.63
	2/16/2011	0.29 +/- 0.55	0.96 +/- 0.56
	3/16/2011	0.29 +/- 0.76	1.34 +/- 0.84
	4/13/2011	1.90 +/- 1.38	-0.15 +/- 1.71
	5/13/2011	-0.38 +/- 0.47	0.73 +/- 0.58
	6/15/2011	-0.26 +/- 1.32	-0.29 +/- 1.67
	7/13/2011	0.53 +/- 1.30	1.80 +/- 1.56
	8/15/2011	0.26 +/- 1.30	0.42 +/- 1.62
	9/14/2011	-0.85 +/- 1.41	1.01 +/- 1.64
	10/13/2011	1.01 +/- 1.40	1.99 +/- 1.67
	11/14/2011	-0.27 +/- 0.64	1.20 +/- 0.83
	12/15/2011	0.25 +/- 0.62	0.53 +/- 0.69

Table 13. 2011 Total Alpha and Beta Radioactivity Water Results (continued)

Sample Location	Date of Sample	Total Alpha Radioactivity +/- error (pCi/L)	Total Beta Radioactivity +/- error (pCi/L)
Blodgett Farm	1/24/2011	4.10 +/- 1.03	7.05 +/- 1.80
	2/14/2011	5.48 +/- 1.15	7.81 +/- 1.82
	3/15/2011	2.91 +/- 0.95	4.24 +/- 1.72
	4/15/2011	4.82 +/- 1.05	5.45 +/- 1.87
	5/10/2011	3.66 +/- 1.03	5.88 +/- 1.84
	6/7/2011	4.50 +/- 1.07	4.62 +/- 1.81
	7/5/2011	4.86 +/- 1.13	6.39 +/- 1.69
	8/2/2011	5.95 +/- 1.19	4.90 +/- 1.75
	9/6/2011	3.59 +/- 1.02	6.21 +/- 1.78
	10/4/2011	3.03 +/- 0.99	4.98 +/- 1.76
	11/1/2011	4.4 +/- 1.07	3.80 +/- 1.70
	12/6/2011	4.62 +/- 1.11	5.85 +/- 1.84
Brattleboro Fire Dept, West Station	1/24/2011	1.59 +/- 1.38	2.30 +/- 1.67
	2/14/2011	0.00 +/- 1.44	1.01 +/- 1.63
	3/15/2011	1.02 +/- 1.37	1.27 +/- 1.63
	4/15/2011	-0.27 +/- 1.36	0.44 +/- 1.73
	6/7/2011	-0.51 +/- 1.28	0.14 +/- 1.68
	7/5/2011	2.10 +/- 1.39	2.22 +/- 1.57
	8/2/2011	0.53 +/- 1.32	1.96 +/- 1.66
	9/6/2011	1.32 +/- 1.44	0.86 +/- 1.63
	10/4/2011	0.55 +/- 1.48	0.85 +/- 1.64
	11/1/2011	-1.67 +/- 1.25	3.80 +/- 1.70
	12/6/2011	-0.88 +/- 1.39	3.51 +/- 1.78
Connecticut River Downstream	1/24/2011	1.60 +/- 1.39	1.44 +/- 1.64
	2/14/2011	0.83 +/- 1.58	1.73 +/- 1.65
	3/15/2011	1.16 +/- 0.82	1.20 +/- 0.83
	4/15/2011	1.90 +/- 0.89	0.44 +/- 0.87
	5/10/2011	3.56 +/- 1.05	2.13 +/- 0.90
	6/7/2011	0.00 +/- 1.31	0.29 +/- 1.69
	7/5/2011	1.90 +/- 1.42	2.36 +/- 1.57
	8/2/2011	-0.27 +/- 1.31	0.70 +/- 1.63
	9/6/2011	4.10 +/- 1.65	3.75 +/- 1.71
	10/4/2011	3.22 +/- 1.76	4.27 +/- 1.74
	11/1/2011	0.55 +/- 1.38	1.69 +/- 1.64
	12/6/2011	1.42 +/- 0.95	2.49 +/- 0.91

Table 13. 2011 Total Alpha and Beta Radioactivity Water Results (continued)

Sample Location	Date of Sample	Total Alpha Radioactivity +/- error (pCi/L)	Total Beta Radioactivity +/- error (pCi/L)
Connecticut River Upstream	3/15/2011	0.88 +/- 0.81	2.19 +/- 0.86
	4/15/2011	1.44 +/- 1.61	1.62 +/- 1.76
	5/10/2011	1.40 +/- 1.56	1.62 +/- 1.72
	6/7/2011	-0.58 +/- 1.46	0.72 +/- 1.70
	7/5/2011	2.03 +/- 1.52	2.78 +/- 1.59
	8/2/2011	-0.58 +/- 1.37	1.12 +/- 1.64
	9/6/2011	1.34 +/- 1.47	3.17 +/- 1.70
	10/4/2011	0.54 +/- 1.44	2.70 +/- 1.69
	11/1/2011	0.85 +/- 1.45	1.69 +/- 1.64
	12/6/2011	-0.33 +/- 1.59	0.88 +/- 1.70
Discharge Forebay	1/13/2011	1.29 +/- 1.33	1.58 +/- 1.65
	2/16/2011	0.55 +/- 1.55	1.01 +/- 1.63
	3/16/2011	1.02 +/- 1.36	1.41 +/- 1.64
	4/14/2011	0.76 +/- 1.39	1.47 +/- 1.75
	5/13/2011	0.87 +/- 0.82	0.95 +/- 0.87
	6/15/2011	-0.26 +/- 1.32	0.43 +/- 1.69
	7/13/2011	0.55 +/- 1.36	2.36 +/- 1.57
	8/15/2011	0.00 +/- 1.36	1.96 +/- 1.66
	9/14/2011	1.56 +/- 1.71	3.90 +/- 1.72
	10/13/2011	2.57 +/- 1.68	1.71 +/- 1.67
	11/14/2011	1.34 +/- 1.41	1.69 +/- 1.64
	12/15/2011	-0.35 +/- 0.83	1.39 +/- 0.88
Miller Farm	1/24/2011	1.08 +/- 0.79	4.02 +/- 1.72
	2/14/2011	0.65 +/- 0.80	3.47 +/- 1.70
	3/15/2011	0.04 +/- 0.70	2.40 +/- 1.67
	5/10/2011	0.10 +/- 0.75	1.17 +/- 1.71
	6/7/2011	0.00 +/- 0.70	2.74 +/- 1.76
	7/5/2011	-0.21 +/- 0.75	5.83 +/- 1.67
	8/2/2011	-0.35 +/- 0.73	4.06 +/- 1.72
	9/6/2011	0.29 +/- 0.75	3.89 +/- 1.72
	10/4/2011	-0.29 +/- 0.71	5.55 +/- 1.77
	11/1/2011	-0.64 +/- 0.66	3.10 +/- 1.68
	12/6/2011	-0.11 +/- 0.74	4.24 +/- 1.80

Table 13. 2011 Total Alpha and Beta Radioactivity Water Results (continued)

Sample Location	Date of Sample	Total Alpha Radioactivity +/- error (pCi/L)	Total Beta Radioactivity +/- error (pCi/L)
Vernon Elementary School	1/24/2011	8.56 +/- 1.31	5.75 +/- 1.76
	2/14/2011	6.99 +/- 1.24	5.93 +/- 1.77
	3/15/2011	7.56 +/- 1.24	3.81 +/- 1.71
	4/15/2011	6.76 +/- 1.18	5.44 +/- 1.86
	5/10/2011	7.29 +/- 1.25	3.67 +/- 1.78
	6/7/2011	8.22 +/- 1.29	4.34 +/- 1.80
	7/5/2011	5.98 +/- 1.20	5.83 +/- 1.67
	8/2/2011	4.74 +/- 1.12	4.48 +/- 1.73
	9/6/2011	5.60 +/- 1.15	5.48 +/- 1.76
	10/4/2011	6.43 +/- 1.21	5.26 +/- 1.77
	11/1/2011	5.46 +/- 1.14	3.38 +/- 1.69
	12/6/2011	7.24 +/- 1.27	5.85 +/- 1.84

Figure 4. 2009-2011 Average Alpha Radioactivity in Water

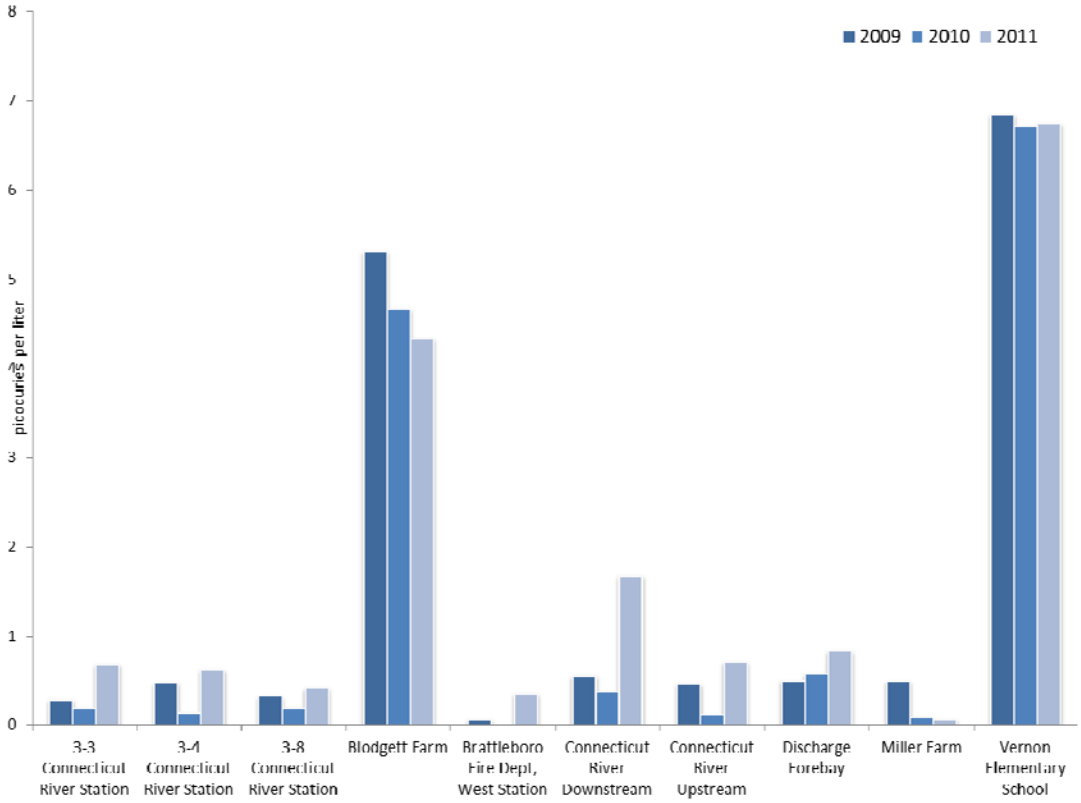
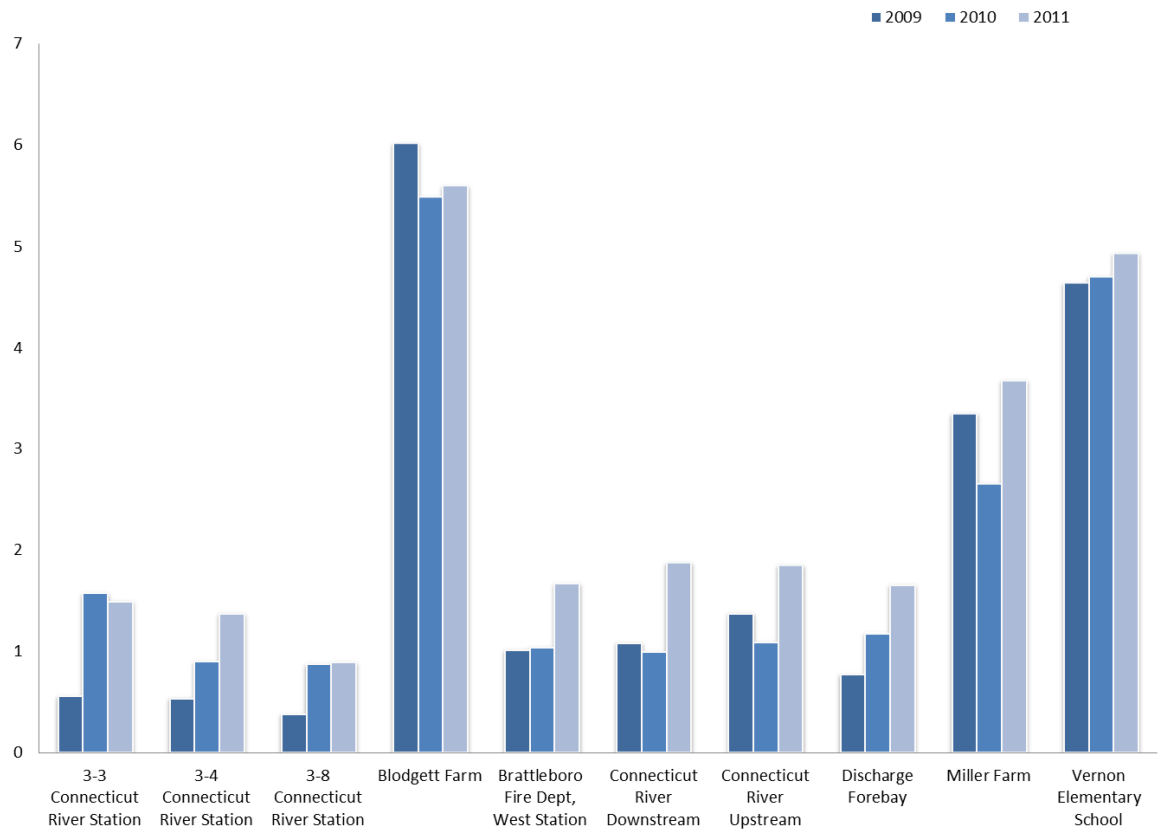


Figure 5. 2009-2011 Average Beta Radioactivity in Water



Water Gamma Spectroscopy Results

A total of 1,058 drinking, ground and surface (Connecticut River) water samples collected from both on and off site locations in 2011 for gamma-emitting materials. No radioactive materials other than naturally-occurring were identified in any water sample collected in 2011. The Health Department calculated limits of detection for gamma-emitting materials are listed in Table 8. All results are presented in Appendix C.

An additional eight water samples were tested from public water suppliers that use surface waters as a source in March, April and May. No human-made radioactive materials were detected in these samples.

Water Tritium Results

In 2011, the Health Department had 1,379 drinking, ground and surface (Connecticut River) water samples tested from both on and off-site locations for tritium. The maximum tritium concentration measured was 453,000 picocuries per liter (pCi/L) in well GZ-14S in January 2011. This well tritium concentration declined to less than 50,000 pCi/L by December 2011.

Tritium concentrations over time, as measured by groundwater well results, generally decreased over the year. The highest concentration of tritium at the year's end was GZ-22D. Only monitoring well GZ-14D had a steady increasing trend in 2011.

No tritium was detected from any off-site water sample or any on-site active drinking water sample. In 2011, the Health Department detected tritium in four Connecticut River samples. These samples were collected at the interface of the soil and water. No measurable detections were observed in any downstream water samples. The Health Department Laboratory's lower limit of detection for tritium is 500 picocuries per liter.

A brief summary of tritium results by each sampling location is presented in Table 14. Graphs demonstrating the trends in tritium concentrations in groundwater monitoring wells are presented in Figures 6-10. All tritium data are presented in Appendix B.

Map 9

Onsite Well Locations at Vermont Yankee

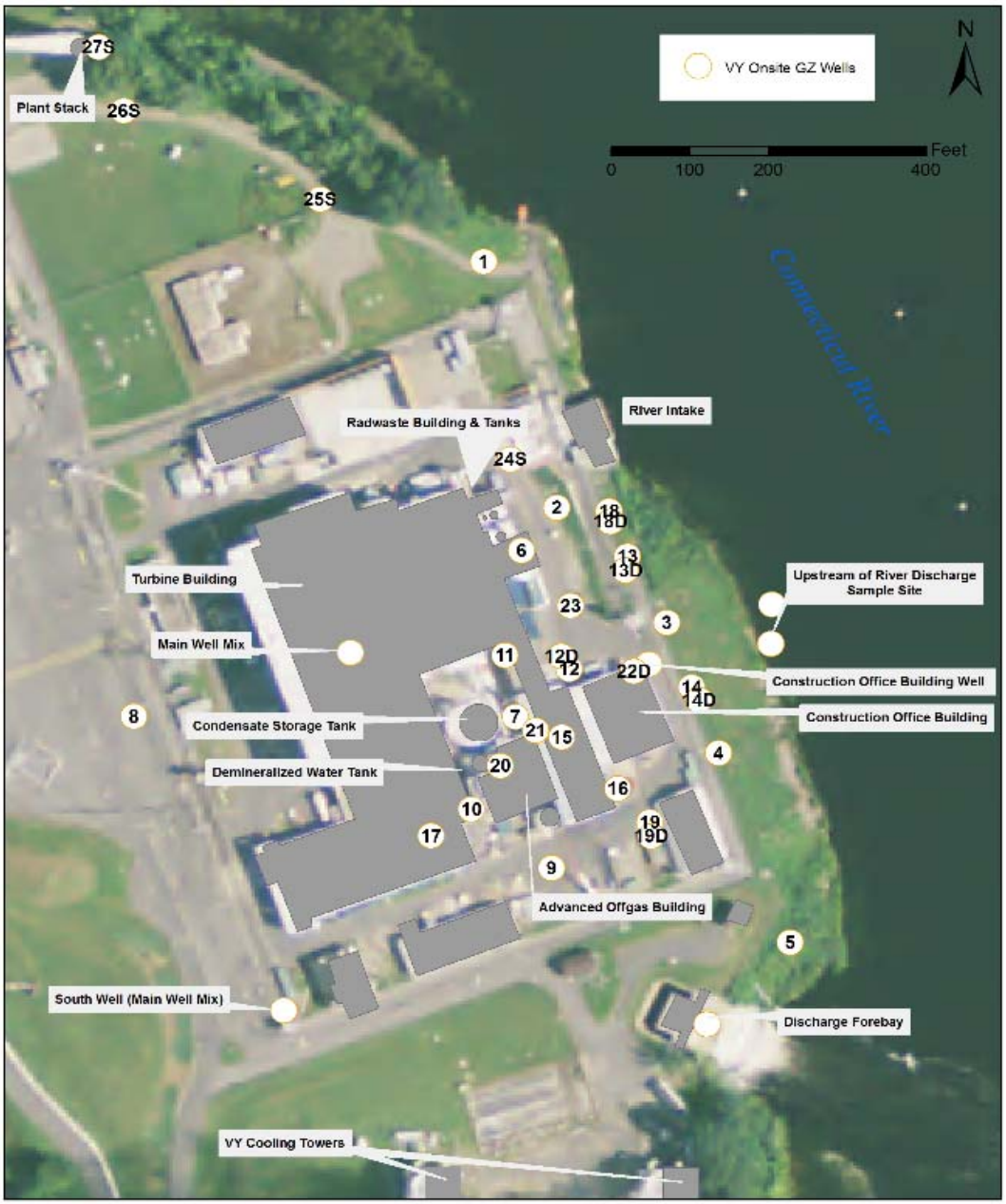


Table 14. 2011 Vermont Yankee Groundwater Wells, Tritium Detected

Monitoring Well	Range of tritium measured in the well (pCi/L) [a] Jan-2011		Dec-2011	Trend of Tritium
GZ-03	153,000	to	827	Decreasing
GZ-04	83,600	to	5,570	Decreasing
GZ-06	631	to	722	Several detections near the lower limit of detection
GZ-07	3,600	to	670	Decreasing
GZ-10	< LLD	to	530	Several detections near the lower limit of detection
GZ-11	< LLD	to	< LLD	One sample had a detection
GZ-12S	3,320	to	795	Slight decrease
GZ-12D	115,000	to	28,800	Decreasing
GZ-13D	802	to	959	Similar range for entire year
GZ-14S	453,000	to	36,100	Decreasing
GZ-14D	< LLD	to	10,500	Increasing
GZ-15	138,000	to	75,500	Decreasing
GZ-18D	< LLD	to	518	Two detections around lower limit of detection
GZ-20	711	to	< LLD	Several detections near the lower limit of detection
GZ-21	8,010	to	9,130	Slight increase early, decreasing since September
GZ-22D	426,000	to	76,600	Decreasing
GZ-23S	< LLD	to	< LLD	Several detections near the lower limit of detection
GZ-24S	1,050	to	< LLD	Decreasing

[a] Ranges presented are from tests performed at the Health Department Laboratory.

< LLD means less than the laboratory's lower limit of detection

Table 15. 2011 Water Sample Locations, Number of TritiumTests

Wells near Vermont Yankee		Connecticut River Sample Sites	
Blodgett Farm	24	Upstream of the VY River Discharge	67
Brattleboro Fire Department, West Station	23	Upstream of the VY River Discharge-30 Feet From Edge	1
Miller Farm	23	3-3 Connecticut River Station	12
Residence - 1	20	3-4 Connecticut River Station	12
Residence - 2	6	3-8 Connecticut River Station	12
Residence - 3	19	Discharge Forebay	12
Vernon Elementary School	23	Connecticut River Upstream	21
Vernon Green Nursing Home	23	Connecticut River Downstream	27
White House	44		
On-site Wells			
GZ-01	27	GZ-18S	25
GZ-02	28	GZ-19D	5
GZ-03	44	GZ-19S	5
GZ-04	25	GZ-20	13
GZ-05	13	GZ-21	45
GZ-06	51	GZ-22D	46
GZ-07	47	GZ-23S	28
GZ-09	12	GZ-24S	49
GZ-10	26	GZ-25S	25
GZ-11	12	GZ-26S	25
GZ-12D	47	GZ-27S	25
GZ-12S	25	WVN0201	4
GZ-13D	25	WVN0202	4
GZ-13S	25	WVN0203	4
GZ-14D	48	WVN0204	4
GZ-14S	46	Main Well	44
GZ-15	41	Plant Support Building	44
GZ-16	25	Southwest Well	11
GZ-17	12	Total number of samples tested for tritium	**1379**
GZ-18D	25		

Figure 6. 2011 Tritium in Groundwater Monitoring Wells: GZ-03, GZ-04, GZ-14S

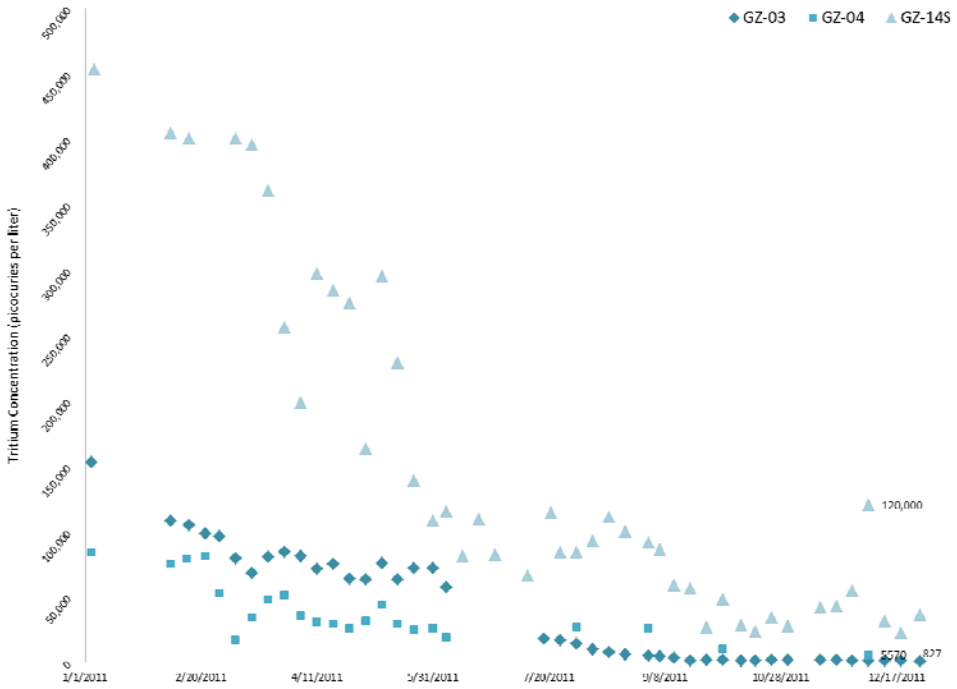


Figure 7. 2011 Tritium in Groundwater Monitoring Wells: GZ-07, GZ-15, GZ-21

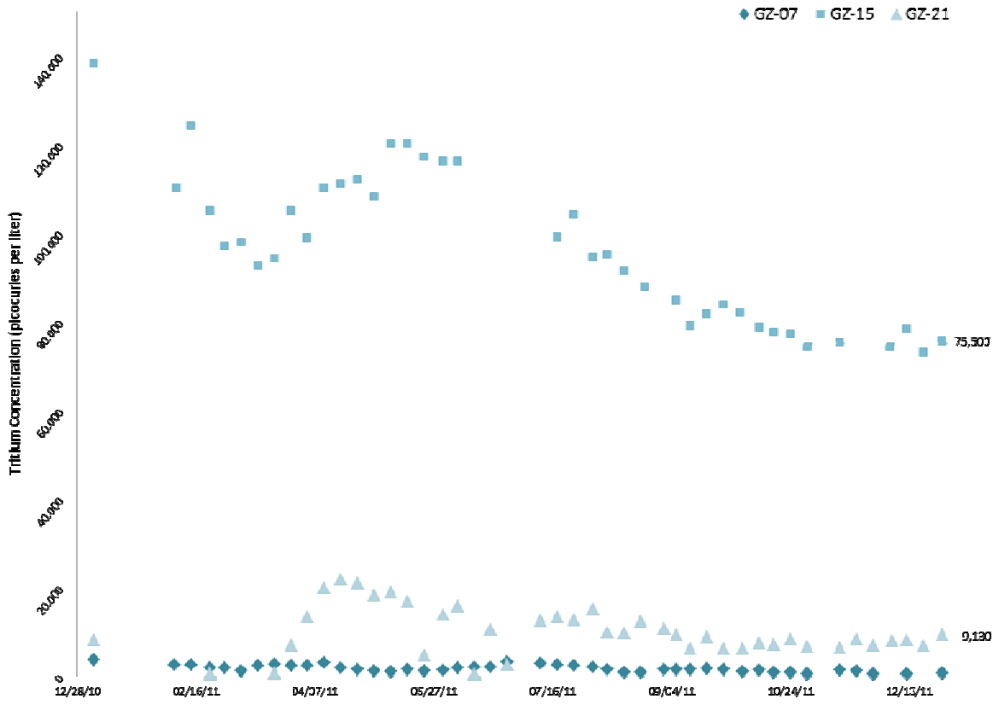


Figure 8. 2011Tritium in Groundwater Monitoring Wells: GZ-12D, GZ-22D

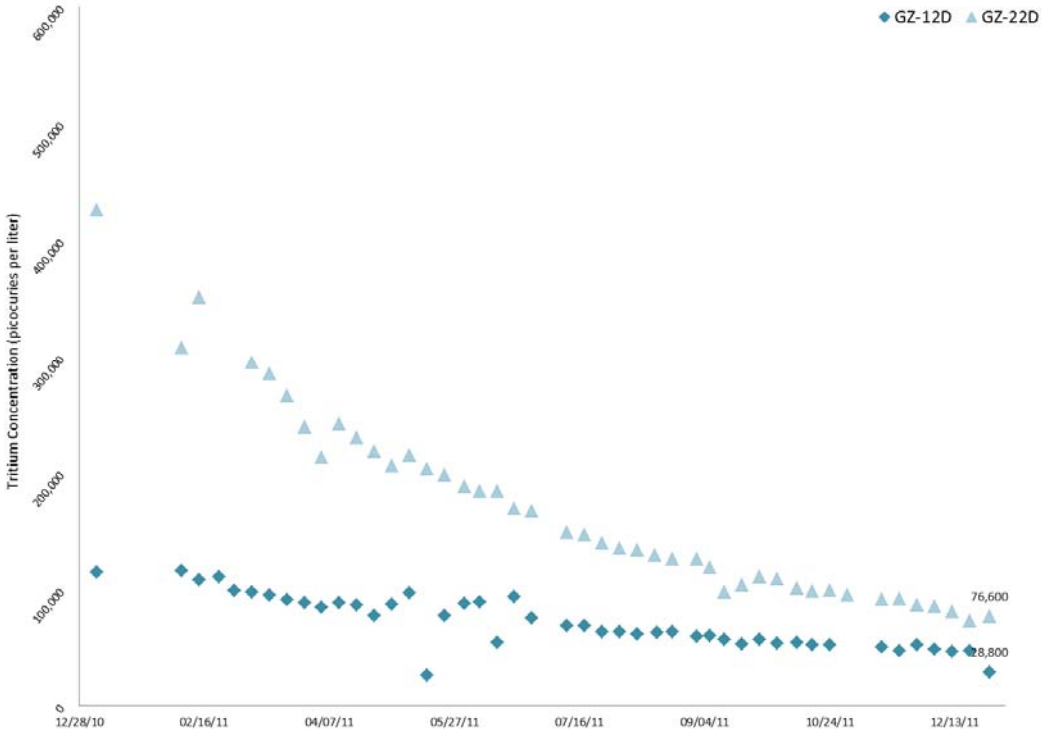


Figure 9. 2011 Tritium in Groundwater Monitoring Wells: GZ-12S, GZ-20

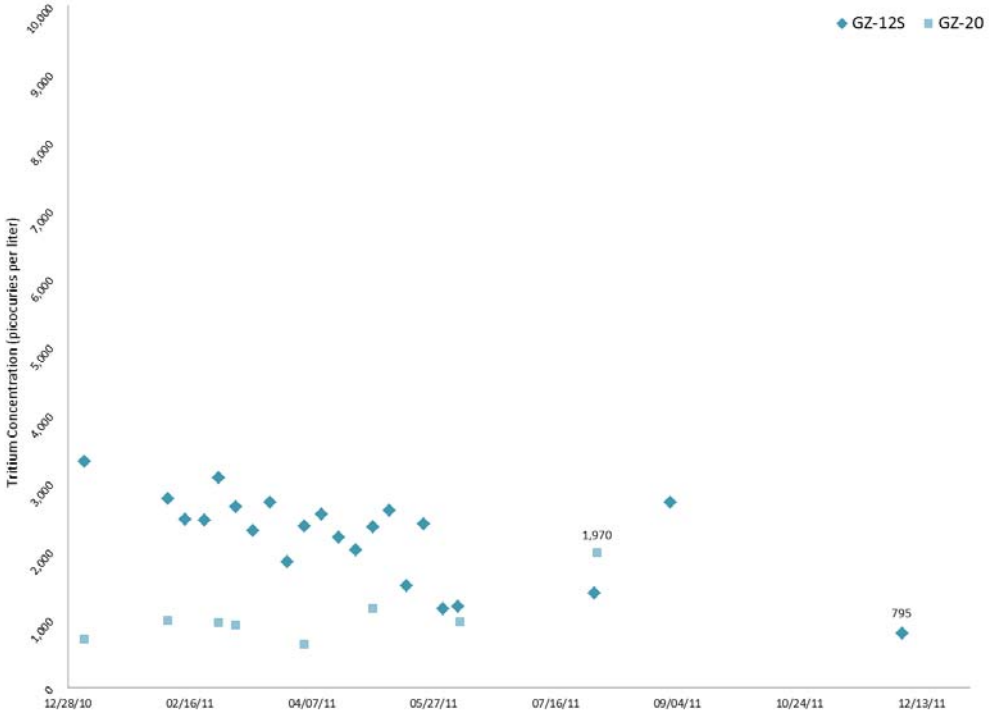
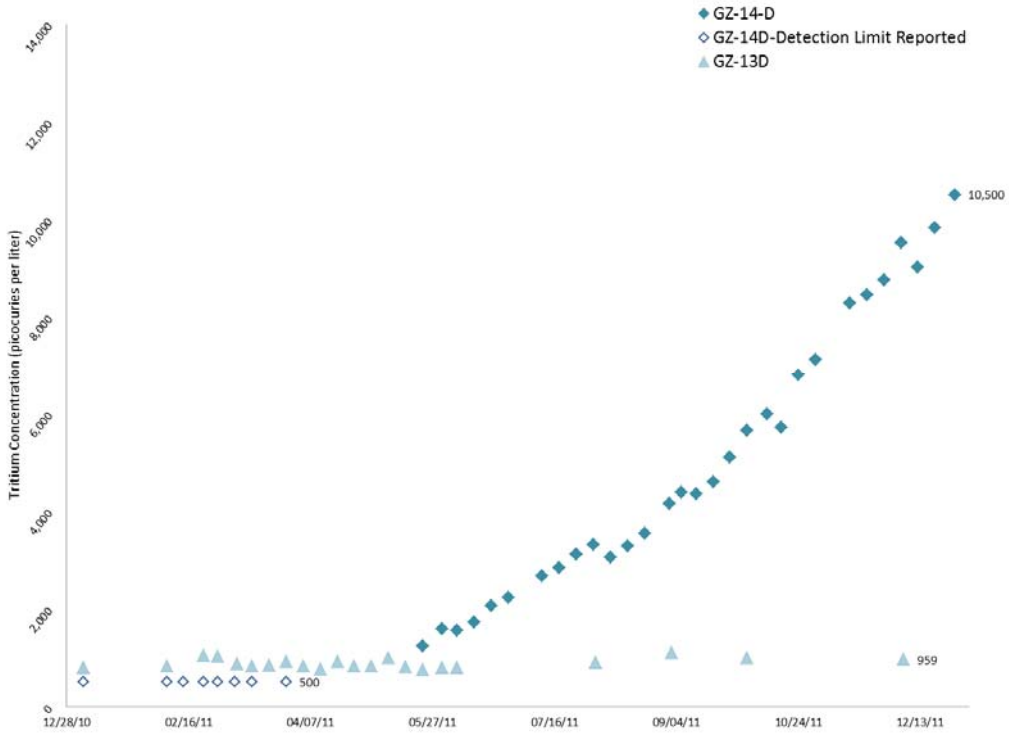


Figure 10. 2011 Tritium in Groundwater Monitoring Wells: GZ-13D, GZ-14D



Hard-to-Detect Results

This is the second year that tests for hard-to-detect metals, iron-55, nickel-63, strontium-89 and strontium-90, have been done by the Health Department. Quarterly water samples taken from each water sampling location were submitted to a contract laboratory for testing. Results for hard-to-detect samples are provided in Appendix D. Of the 211 water samples tested, no iron-55, nickel-63, strontium-89, or strontium-90 was detected

---

In 2011, all off-site water sample locations showed no dose impact of operations at Vermont Yankee for total alpha, total beta, tritium, gamma spectroscopy, and hard-to-detect radioactive elements. In 2011, as in 2010, the one human-made radioactive element that has been measured in water samples is tritium from on-site water sources. The levels of tritium detected show a groundwater plume traveling from the source of the leaks to the Connecticut River. The dose associated with the tritium-contaminated plume

in 2011 at Vermont Yankee did not measurably increase the dose from liquid effluents (discharges) to any member of the general public.

Food Chain Sampling Results

Monitoring the food chain involves direct monitoring of some foods such as milk, cultivated vegetation and fish. It also involves testing the soil and sediment that support land and aquatic species, and natural vegetation like grass, ferns and fungi. Food chain sampling was done mostly in the spring as a result of the events in Fukushima, Japan and as part of trainings.

For 2011:

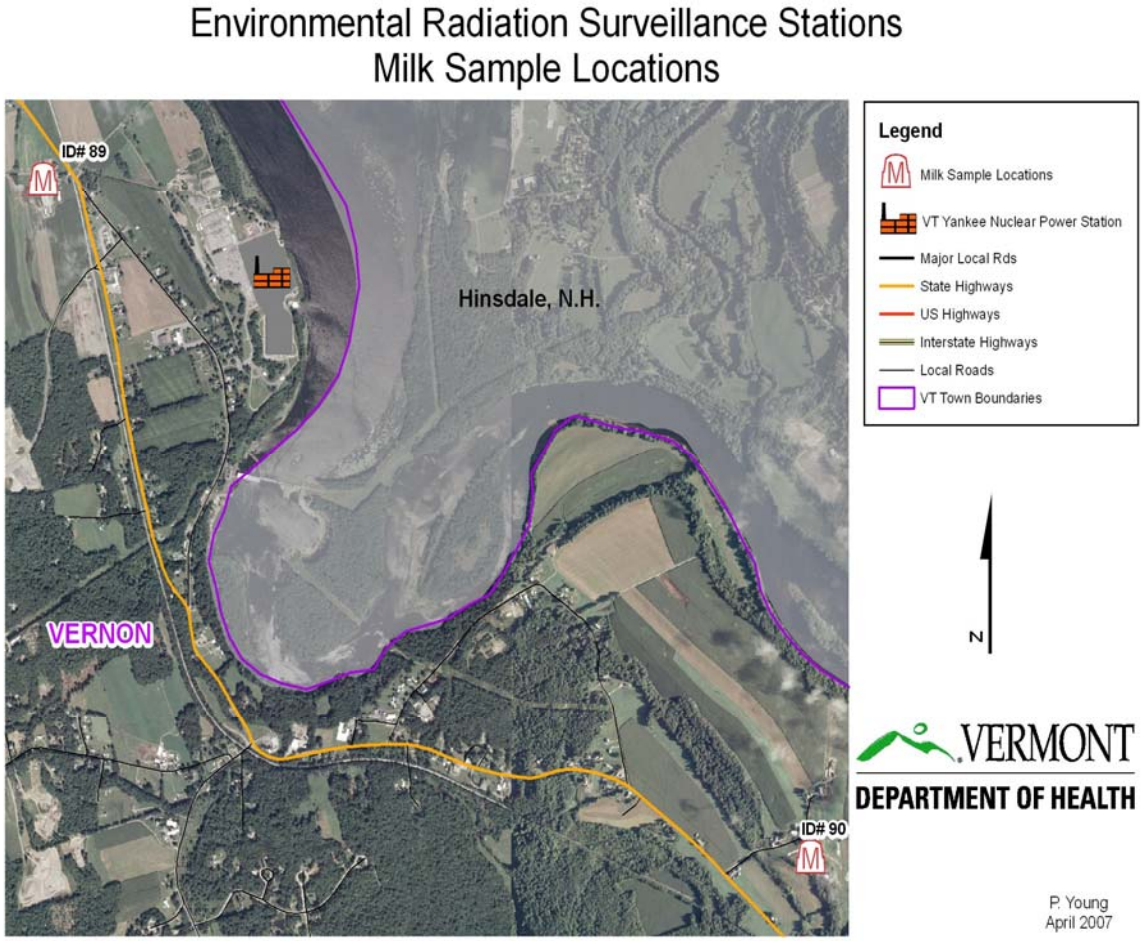
- 32 milk samples were tested for iodine-131 and gamma-emitting materials.
- 36 Connecticut River sediment samples were tested for gamma-emitting materials.
- 3 environmental soil samples were tested for gamma-emitting materials.
- 8 vegetation samples were tested for gamma-emitting materials.
- 19 fish samples were tested for gamma-emitting materials.
- 21 fish samples were tested for iron-55, nickel-63, strontium-89 and strontium-90.

Milk Sample Results

Cows' raw milk is sampled monthly from two farms in Vernon. One farm is about one-half mile north of Vermont Yankee and the other is about three miles south of Vermont Yankee. Map 10 shows the location of these two dairy farms. Additional farms in Windham, Addison, Orleans and Franklin County were sampled during March through May of 2011.

Potassium-40 (K-40) was found in all milk samples. Potassium-40 is a primordial radioactive material. Primordial radioactive materials are those created with the formation of the earth. Potassium-40 has a half-life of 1.28 billion years. In 2011 potassium-40 was detected in milk samples. Results are shown in Table 16. The potassium-40 results for all milk samples ranged from 1,300 to 1,600 picocuries per liter (pCi/L), and fall within the historical range of 1,200 to 2,000 pCi/L. The average potassium-40 result in 2011 was 1,400 pCi/L.

Map 10



Sample Location	Map ID
Miller Farm	89
Blodgett Farm	90

Table 16. 2011 Milk Iodine-131 and Gamma Spectroscopy Results

Sample Location	Date of Sample	Iodine-131 Result	Gamma Spectrometry Result	Potassium-40 Result +/- error (pCi/L)
Blodgett Farm	1/24/2011	< LLD	Natural	1340 +/- 250
Miller Farm	1/24/2011	< LLD	Natural	1370 +/- 250
Blodgett Farm	2/14/2011	< LLD	Natural	1320 +/- 240
Miller Farm	2/14/2011	< LLD	Natural	1380 +/- 250
Blodgett Farm	3/15/2011	< LLD	Natural	1450 +/- 270
Miller Farm	3/15/2011	< LLD	Natural	1370 +/- 250
Windham County	4/6/2011	< LLD	Natural	1520 +/- 260
Windham County	4/6/2011	< LLD	Natural	1600 +/- 270
Blodgett Farm	4/15/2011	< LLD	Natural	1370 +/- 230
Miller Farm	4/15/2011	< LLD	Natural	1480 +/- 250
Orleans County	4/17/2011	< LLD	Natural	1450 +/- 240
Addison County	4/18/2011	< LLD	Natural	1300 +/- 220
Franklin County	4/28/2011	< LLD	Natural	1450 +/- 240
Addison County	5/2/2011	< LLD	Natural	1400 +/- 240
Blodgett Farm	5/10/2011	< LLD	Natural	1440 +/- 240
Miller Farm	5/10/2011	< LLD	Natural	1410 +/- 240
Orleans County	5/15/2011	< LLD	Natural	1300 +/- 220
Franklin County	5/23/2011	< LLD	Natural	1400 +/- 230
Blodgett Farm	6/7/2011	< LLD	Natural	1380 +/- 230
Miller Farm	6/7/2011	< LLD	Natural	1370 +/- 230
Blodgett Farm	7/5/2011	< LLD	Natural	1360 +/- 230
Miller Farm	7/5/2011	< LLD	Natural	1350 +/- 230
Blodgett Farm	8/2/2011	< LLD	Natural	1390 +/- 240
Miller Farm	8/2/2011	< LLD	Natural	1300 +/- 230
Blodgett Farm	9/6/2011	< LLD	Natural	1370 +/- 240
Miller Farm	9/6/2011	< LLD	Natural	1350 +/- 230
Blodgett Farm	10/4/2011	< LLD	Natural	1460 +/- 250
Miller Farm	10/4/2011	< LLD	Natural	1510 +/- 260
Blodgett Farm	11/1/2011	< LLD	Natural	1410 +/- 240
Miller Farm	11/1/2011	< LLD	Natural	1470 +/- 250
Blodgett Farm	12/6/2011	< LLD	Natural	1440 +/- 250
Miller Farm	12/6/2011	< LLD	Natural	1430 +/- 250

< LLD = Less than the laboratory's Lower Limit of Detection
Natural = gamma-emitting materials measured are not related to nuclear reactions
Shaded samples indicate that samples were taken as a result of Fukushima Daiichi events

Vegetation and Soil Sample Results

Three soil samples were collected in the vicinity of Vermont Yankee. The results are shown in Table 17. The soil contained measurable amounts of potassium-40, beryllium-7 and cesium-137. Potassium-40 and beryllium-7 are naturally-occurring. Cesium-137 is human-made. The amounts found are consistent with past years and attributable to above-ground weapons testing and other nuclear incidents.

Table 17. 2011 Soil Sample Results

Sample Location	Date of Sample	Beryllium-7 +/- error (pCi/kg)	Potassium-40 +/- error (pCi/kg)	Cesium-137 +/- error (pCi/kg)
Route 5 and Franklin Rd. Vernon, VT	05/03/11	< LLD	13,200 +/- 2500	505 +/- 46
Franklin Rd. Vernon, VT	05/03/11	451 +/- 171	13,500 +/- 2500	< LLD
Slate Rock Rd. Vernon, VT	05/03/11	507 +/- 139	10,100 +/- 1900	< LLD
< LLD = Less than the laboratory's Lower Limit of Detection				

Vegetation samples were taken in early April and again in May. Samples collected in April showed that low levels of iodine-131 from the release in Fukushima, Japan had deposited on the vegetation. Samples taken a month later had no detectable amounts of iodine-131. Iodine-131 has a half-life of about eight days. There was no risk to public health based on the amount of iodine-131 that was measured. One sample each of maple syrup and maple sap was collected and tested in April, and only potassium-40 was detected. Potassium-40 was found in all soil, vegetation and maple samples.

Table 18. 2011 Vegetation Sample Results

Location	Date of Sample	Sample type	Iodine-131 +/- error (pCi/kg)	Beryllium-7 +/- error (pCi/kg)	Potassium-40 +/- error (pCi/kg)
Dummerston	4/6/2011	collards	42 +/- 13.7	1,060 +/- 140	5,940 +/- 1,030
			36.7 +/- 11.4	415 +/- 96	7,050 +/- 1,210
Westminster	4/6/2011	natural vegetation	328 +/- 43	6,890 +/- 630	1,620 +/- 400
			123 +/- 26	2,910 +/- 300	5,930 +/- 1,050
Westminster	4/6/2011	maple sap	<LLD	<LLD	86 +/- 33
Westminster	4/6/2011	maple syrup	<LLD	<LLD	2,540 +/- 440
Brattleboro	5/4/2011	natural vegetation	<LLD	1,100 +/- 150	4,570 +/- 810
Putney	5/4/2011	forage	<LLD	331 +/- 63	4,770 +/- 810
Dummerston	5/4/2011	natural vegetation	<LLD	4,880 +/- 490	2,540 +/- 550
Vernon	5/4/2011	forage	<LLD	505 +/- 114	5,720 +/- 1,000
<LLD = Less than Laboratory's Lower Limit of Detetction					

Soil samples collected in 2010 on site near the Advanced Off Gas area were tested for hard-to-detect metals this year. Data from those samples is presented in Appendix E.

Sediment Sample Results

Sediment samples were collected from the bottom of the Connecticut River. The sediment samples were taken from four areas of the Connecticut River: Station 3-3 (south of Vernon Dam), Station 3-4 (near Vermont Yankee discharge), Station 3-8 (upstream near the Route 9 bridge) and the North Storm Drain area. In 1997, the North Storm Drain area was identified to have been contaminated with cobalt-60 from Vermont Yankee operations. The North Storm Drain area is sampled at 15 distinct locations: S-1, S-2, T-1, T-2, T-3, U-1, U-2, U-3, U-4, V-3, V-4, V-5, W-4, W-5 and X-5. These sample locations are shown in Map 11. Cobalt-60 was last detected in a sediment sample obtained and tested in 2004.

All sediment locations are sampled each spring and fall. A sediment sample is taken with a mass ranging from 0.75 to 1.25 kilograms. Sediment samples are dried and tested by gamma spectroscopy. Tested sediments contained naturally-occurring potassium-40 (K-40) and beryllium-7 (Be-7), as well as fallout-related cesium-137 (Cs-137). The results are presented in Table 20. No cobalt-60 was detected in samples collected this year. Concentrations of beryllium-7, potassium-40 and cesium-137 were detected generally within historical ranges for Vermont. Comparisons to last year's data are presented in Figures 11 and 12.

Table 19. 2011 Sediment Gamma Spectroscopy Ranges as Compared to Historical Ranges

Radioactive Element	2011 Sediment Concentration Range (pCi/kg)	Historical Sediment Concentration Range (pCi/kg)
Beryllium-7	< LLD-1,890	< LLD-3,000
Potassium-40	9,920-30,400	6,000-26,000
Cesium-137	< LLD-172	< LLD-500

< LLD means less the Laboratory's **L**ower **L**imit of **D**etection

Map 11

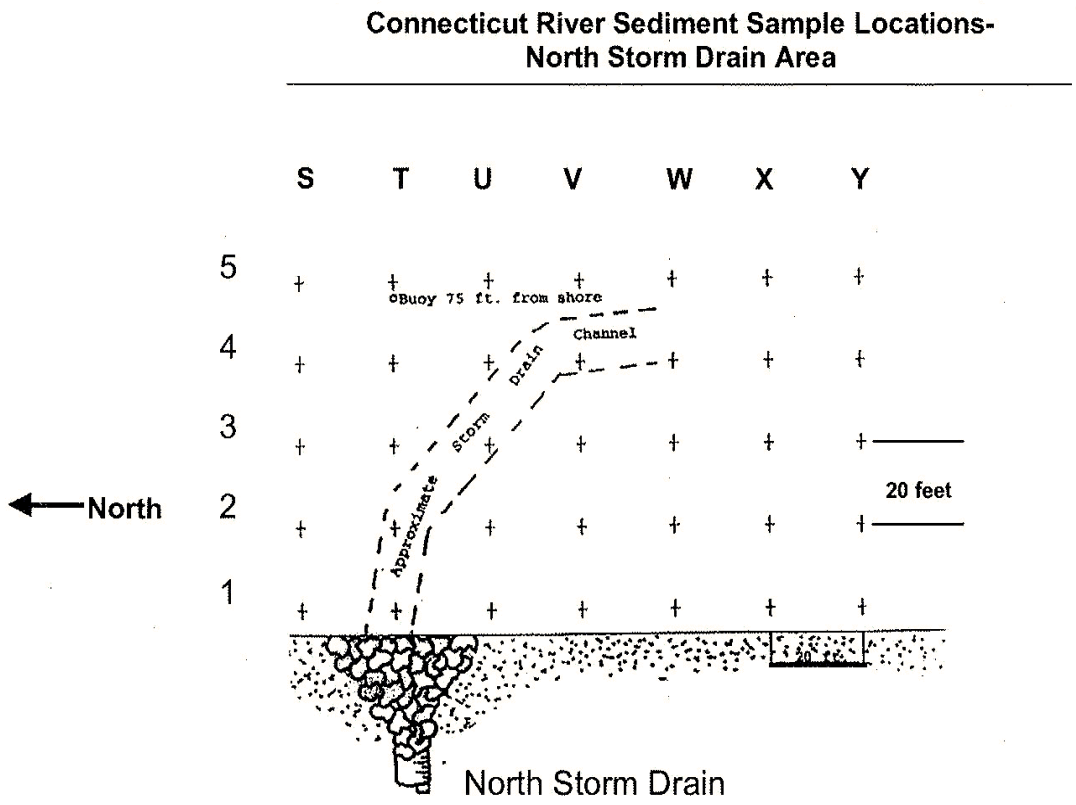

Connecticut River Sediment Sample Locations-
North Storm Drain Area
S
T
U
V
W
X
Y
5
4
3
2
1
Buoy 75 ft. from shore
Channel
Storm Drain
Approximate
North
20 feet
North Storm Drain

Table 20. 2011 Sediment Gamma Spectroscopy Results

Sample Location	Date of Sample	Beryllium-7 Result +/- error (pCi/L)	Potassium-40 Result +/- error (pCi/L)	Cesium-137 Result +/- error (pCi/L)
S-1	5/19/2011	< LLD	14500 +/- 2700	82.8 +/- 25.4
S-2	5/19/2011	< LLD	18000 +/- 3300	97.5 +/- 32.5
T-1	5/19/2011	1170 +/- 400	11800 +/- 2200	48.8 +/- 20.9
T-2	5/19/2011	< LLD	17600 +/- 3300	96.2 +/- 28.8
T-3	5/19/2011	< LLD	18400 +/- 3400	146 +/- 35.0
U-1	5/19/2011	< LLD	17800 +/- 3300	131 +/- 35.0
U-2	5/19/2011	< LLD	19800 +/- 3700	155 +/- 37.0
U-3	5/19/2011	< LLD	20100 +/- 3700	139 +/- 29.0
U-4	5/19/2011	< LLD	20800 +/- 3900	110 +/- 36.0
V-3	5/19/2011	< LLD	22000 +/- 4100	172 +/- 41.0
V-4	5/19/2011	< LLD	19700 +/- 3700	135 +/- 33.0
V-5	5/19/2011	< LLD	19100 +/- 3500	91.3 +/- 29.2
W-4	5/19/2011	< LLD	18500 +/- 3500	117 +/- 31.0
W-5	5/19/2011	< LLD	19800 +/- 3700	135 +/- 30.0
X-5	5/19/2011	< LLD	20900 +/- 3900	117 +/- 34.0
3-3	5/26/2011	< LLD	12300 +/- 2300	157 +/- 28.0
3-4	5/19/2011	< LLD	11000 +/- 2100	25.3 +/- 17.0
3-8	5/19/2011	< LLD	9920 +/- 1880	< LLD
X-5	10/21/2011	< LLD	24200 +/- 4500	< LLD
W-5	10/21/2011	< LLD	21100 +/- 3900	73.5 +/- 27.3
W-4	10/21/2011	< LLD	25200 +/- 4700	90.6 +/- 35.7
V-3	10/21/2011	< LLD	30400 +/- 5700	108 +/- 40.0
V-4	10/21/2011	< LLD	24900 +/- 4600	110 +/- 34.0
V-5	10/21/2011	< LLD	30700 +/- 5700	57.7 +/- 35.6
U-1	10/21/2011	1890 +/- 520	18300 +/- 3400	87.6 +/- 32.1
U-2	10/21/2011	< LLD	24400 +/- 4600	130 +/- 39.0
U-3	10/21/2011	< LLD	28100 +/- 5200	87 +/- 32.6
U-4	10/21/2011	< LLD	24500 +/- 4600	83.9 +/- 31.4
T-1	10/21/2011	1710 +/- 450	21400 +/- 4000	150 +/- 40.0
T-2	10/21/2011	1570 +/- 420	16700 +/- 3200	89.4 +/- 28.3
T-3	10/21/2011	1810 +/- 520	26000 +/- 4800	133 +/- 39.0
S-1	10/21/2011	< LLD	14400 +/- 2700	60.7 +/- 22.1
S-2	10/21/2011	< LLD	22800 +/- 4300	111 +/- 34.0
3-3	10/21/2011	< LLD	13000 +/- 2400	61.9 +/- 20.0
3-4	10/21/2011	< LLD	17700 +/- 3300	50.8 +/- 27.9
3-8	10/21/2011	< LLD	14600 +/- 2700	< LLD

< LLD = Less than the laboratory's Lower Limit of Detection

Figure 11. 2009-2011 Average Potassium-40 Levels in Sediments

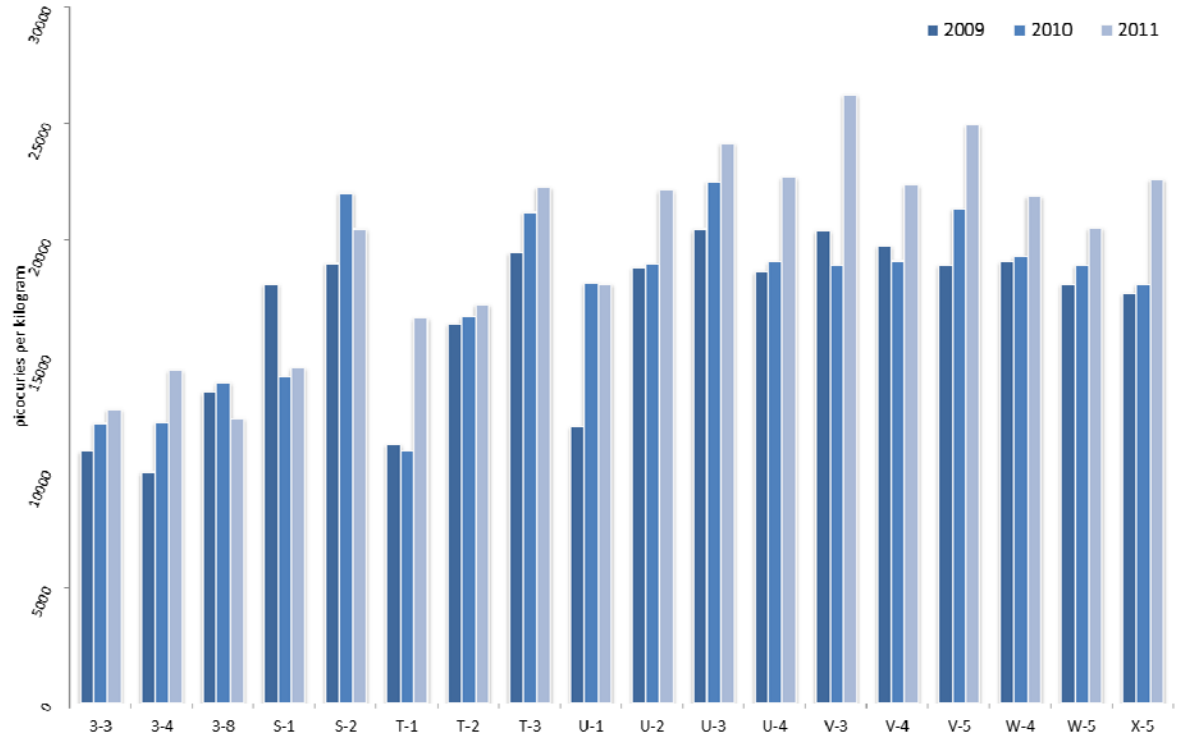
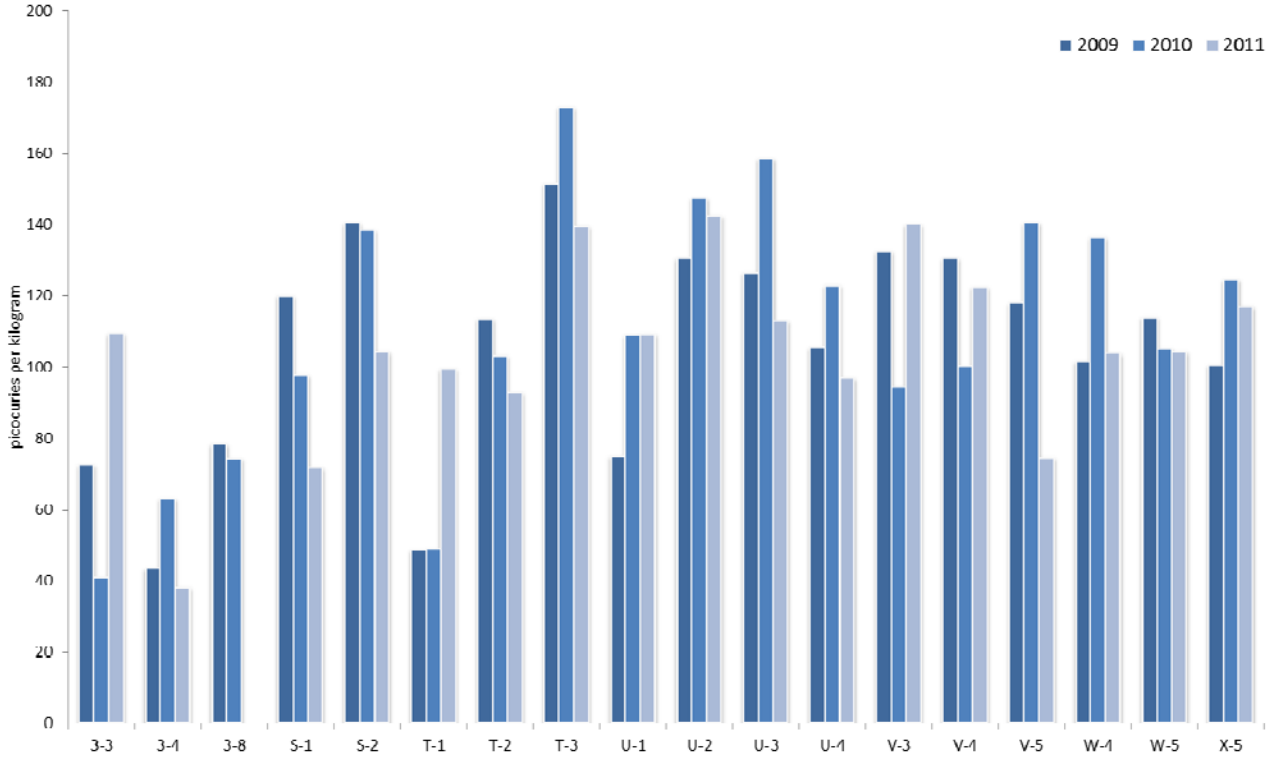


Figure 12. 2009-2011 Average Cesium-137 Levels in Sediments



Fish Sample Results

Fish are collected monthly at two sites in the Connecticut River by an environmental contractor. One site is near the Vermont Yankee discharge and the other site is about nine miles upstream from Vermont Yankee, where the Route 9 bridge crosses the Connecticut River.

Fish samples were divided into edible and inedible portions and tested separately. The Health Department's contract laboratory tests for hard-to-detect radioactive metals and gamma-emitting materials. Fish types tested in 2011 included yellow perch, large and small mouth bass. Twenty-one fish samples were tested for hard-to detect metals in 2011, 19 fish samples were tested for gamma-emitting materials. Most samples were collected from the Connecticut River, two samples were taken from Lake Carmi in Franklin County, Vermont. Fish gamma spectroscopy results are presented in Table 21 and hard-to-detect metal results are in Table 22.

Potassium-40, cesium-137 and strontium-90 were measured in the fish in 2011. Potassium-40, a naturally-occurring radioactive material was detected in all fish. The cesium-137 results are within the historical range of less than the lower limit of detection to 100 picocuries per kilogram (pCi/kg). Strontium-90 was only found in inedible portion on fish in 2011. Levels of radioactive materials in fish from the Connecticut River and Franklin County were similar. The levels of strontium-90 measured in these fish did not pose a health risk. The levels of cesium-137 and strontium-90 measured may be attributed to the fallout from above-ground weapons testing and global nuclear incidents like Chernobyl.

In 2011, no radioactivity in food chain inputs was measured above historical and background ranges. Radioactivity measured in the food chain inputs can be attributed to natural or human-made sources released in above-ground weapons testing or global nuclear incidents.

Table 21. 2011 Connecticut River Fish Gamma Spectroscopy Results

2011 Connecticut River Fish Gamma Spectroscopy Results					
Month Sample Collected	Sample Location	Edible (flesh)		Inedible (bones, head, scales, guts)	
		Potassium-40 +/- error (pCi/kg)	Cesium-137 +/- error (pCi/kg)	Potassium-40 +/- error (pCi/kg)	Cesium-137 +/- error (pCi/kg)
April 2011	Near VY Discharge	3,360 +/- 725	< LLD	3,220 +/- 439	< LLD
	Upstream of VY	2,830 +/- 626	< LLD	2,740 +/-451	< LLD
May 2011	Near VY Discharge	2,520 +/- 471	< LLD	2,660+/- 461	< LLD
	Upstream of VY	2,570 +/- 824	< LLD	2,370 +/- 398	< LLD
June 2011	Near VY Discharge	3,170 +/- 507	< LLD	2,130 +/- 348	< LLD
	Upstream of VY	2,650 +/- 640	< LLD	2,860 +/- 388	< LLD
July 2011	Near VY Discharge	3,930 +/- 1027	< LLD	2,560 +/- 889	< LLD
	Near VY Discharge	2,790 +/- 369	< LLD	2,280 +/- 310	14 +/- 7
	Upstream of VY	3,360 +/- 673	< LLD	2,290 +/- 320	< LLD
August 2011	Near VY Discharge	2,560 +/- 396	< LLD	2,290 +/- 434	< LLD
	Upstream of VY	2,710 +/- 358	< LLD	2,430 +/- 362	< LLD
September 2011	Near VY Discharge	3,160 +/- 428	< LLD	2,310 +/- 307	< LLD
	Upstream of VY	3,140 +/- 384	< LLD	2,780+/- 402	< LLD
October 2011	Near VY Discharge	3,890 +/- 469	25 +/- 9	2,610 +/- 387	< LLD
	Upstream of VY	3,530 +/- 457	17 +/- 9	2,320 +/- 404	< LLD
November 2011	Near VY Discharge	3,090 +/- 426	< LLD	2,050 +/- 299	< LLD
	Upstream of VY	3,480 +/- 426	< LLD	2,230 +/- 312	< LLD
2011 non-Connecticut River Fish Gamma Spectroscopy Results					
October 2011	Lake Carmi	1,870 +/- 387	31.6 +/- 24.1	2,210 +/- 402	30.5 +/- 18.1
		3,380 +/- 548	73.9 +/- 22.9	2,400 +/- 378	36.6 +/- 15.3
< LLD means less than the Laboratory's Lower Limit of Detection					

Table 22. 2011 Connecticut River Fish Hard-to-Detect Results

2011 Connecticut River Fish Hard-to-Detect Results									
Month Sample Collected	Sample Location	Edible (flesh)				Inedible (bones, head, scales, guts)			
		Iron-55 +/- error (pCi/kg)	Nickel-63 +/- error (pCi/kg)	Strontium-89 +/- error (pCi/kg)	Strontium-90 +/- error (pCi/kg)	Iron-55 +/- error (pCi/kg)	Nickel-63 +/- error (pCi/kg)	Strontium-89 +/- error (pCi/kg)	Strontium-90 +/- error (pCi/kg)
April 2011	Near VY Discharge	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD
	Upstream of VY	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	48 +/- 34
	Near VY Discharge	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD
	Upstream of VY	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	85 +/-29
May 2011	Near VY Discharge	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD
	Upstream of VY	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	69 +/-38
June 2011	Near VY Discharge	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	53 +/-18
	Upstream of VY	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD
July 2011	Near VY Discharge	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	54 +/-17
	Near VY Discharge	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD
	Upstream of VY	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD
August 2011	Near VY Discharge	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD
	Upstream of VY	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	63+/-32
September 2011	Near VY Discharge	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD
	Upstream of VY	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	56+/-33
October 2011	Near VY Discharge	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD
	Upstream of VY	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD
November 2011	Near VY Discharge	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD
	Upstream of VY	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	60 +/- 19
2011 non-Connecticut River Fish Hard-to-Detect Results									
October 2011	Lake Carmi	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	70 +/- 30
		< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	39 +/- 25
< LLD means less than the Laboratory's Lower Limit of Detection									

List of Tables

List of Figures

List of Maps

Appendix A

2011 Air Filter Data for Total Alpha & Beta Radioactivity

- 2011 Air Filter Results for Total Alpha & Beta Radioactivity (monthly)
- 2011 Fukushima-related Air Filter Results for Total Alpha & Beta Radioactivity (weekly collections)
- 2011 Composite Air Filter Results: Fukushima-related (weekly collections)

2011 Air Filter Results for Total Alpha & Beta Radioactivity (monthly collections)

Sample Location	Date of Sample	Total Alpha Radioactivity +/- error (pCi/m^3)			Total Beta Radioactivity +/- error (pCi/m^3)		
D & E Tree	1/24/2011	0.00224	+/-	0.00070	0.0121	+/-	0.0012
Dummerston State Garage	1/24/2011	0.00194	+/-	0.00066	0.0123	+/-	0.0012
Power Line River Crossing	1/26/2011	0.00246	+/-	0.00069	0.0152	+/-	0.0013
Renaud Brothers	1/24/2011	0.00221	+/-	0.00071	0.0150	+/-	0.0014
Vernon Elementary School	1/24/2011	0.00328	+/-	0.00079	0.0139	+/-	0.0012
Windham County Courthouse	3/15/2011	*0.000379*	+/-	*0.000178*	*0.00123*	+/-	*0.00027*
Guilford Town Garage	1/24/2011	*0.00119*	+/-	*0.00061*	*0.00498*	+/-	*0.00093*
Vermont State Police-Brattleboro	1/24/2011	*0.000594*	+/-	*0.000449*	*0.00179*	+/-	*0.00061*
D & E Tree	2/14/2011	0.00308	+/-	0.00101	0.0172	+/-	0.0018
Guilford Town Garage	2/14/2011	0.00566	+/-	0.00142	0.0230	+/-	0.0022
Renaud Brothers	2/14/2011	0.00354	+/-	0.0011	0.0224	+/-	0.0021
Vermont State Police-Brattleboro	2/14/2011	*0.000799*	+/-	*0.000619*	*0.00608*	+/-	*0.0012*
Vernon Elementary School	2/14/2011	0.00412	+/-	0.00111	0.0199	+/-	0.0019
Power Line River Crossing	2/14/2011	0.00256	+/-	0.00097	0.0189	+/-	0.002
***see Fukushima table for results from March-June, samples taken weekly in that period*							
D & E Tree	7/5/2011	0.000094	+/-	0.000145	0.00243	+/-	0.0004
Dummerston State Garage	7/5/2011	0.000619	+/-	0.000222	0.00602	+/-	0.00052
Guilford Town Garage	7/5/2011	0.000542	+/-	0.000217	0.00568	+/-	0.00052
Renaud Brothers	7/5/2011	*0.000*	+/-	*0.000134*	*0.00148*	+/-	*0.00037*
Vermont State Police-Brattleboro	7/5/2011	0.000855	+/-	0.000245	0.00999	+/-	0.00062
Vernon Elementary School	7/5/2011	0.00112	+/-	0.00027	0.00954	+/-	0.00061
Wilmington State Highway Garage	7/5/2011	0.00223	+/-	0.00059	0.0204	+/-	0.0014
Windham County Courthouse	7/5/2011	0.00105	+/-	0.00028	0.012	+/-	0.0007
108 Cherry St. Burlington	7/5/2011	0.000818	+/-	0.000393	0.0111	+/-	0.001
108 Cherry St. Burlington	8/2/2011	0.00151	+/-	0.00032	0.0161	+/-	0.0008
D & E Tree	8/2/2011	0.000248	+/-	0.000191	0.00327	+/-	0.00047
Dummerston State Garage	8/2/2011	0.000942	+/-	0.00026	0.0104	+/-	0.0006
Guilford Town Garage	8/2/2011	0.000269	+/-	0.000181	0.00407	+/-	0.00047
Renaud Brothers	8/2/2011	0.000588	+/-	0.000231	0.00551	+/-	0.00053
Vermont State Police-Brattleboro	8/2/2011	0.000796	+/-	0.000243	0.00745	+/-	0.00056
Vernon Elementary School	8/2/2011	0.00148	+/-	0.00031	0.0145	+/-	0.0007
Wilmington State Highway Garage	8/2/2011	0.000379	+/-	0.000129	0.00443	+/-	0.00032
Windham County Courthouse	8/2/2011	0.00152	+/-	0.00032	0.0181	+/-	0.0008

Sample Location	Date of Sample	Total Alpha Radioactivity +/- error (pCi/m^3)			Total Beta Radioactivity +/- error (pCi/m^3)		
108 Cherry St. Burlington	9/6/2011	0.00165	+/-	0.00028	0.0169	+/-	0.0007
D & E Tree	9/6/2011	0.000173	+/-	0.000129	0.00275	+/-	0.00037
Dummerston State Garage	9/6/2011	0.000395	+/-	0.000161	0.00451	+/-	0.00042
Guilford Town Garage	9/6/2011	0.000148	+/-	0.00014	0.0016	+/-	0.00036
Renaud Brothers	9/6/2011	0.000574	+/-	0.000191	0.00527	+/-	0.00046
Vermont State Police-Brattleboro	9/6/2011	0.000535	+/-	0.000178	0.00484	+/-	0.00043
Vernon Elementary School	9/6/2011	0.000241	+/-	0.000131	0.00144	+/-	0.00029
Windham County Courthouse	9/6/2011	0.00150	+/-	0.00028	0.0169	+/-	0.0007
Power Line River Crossing	9/6/2011	*0.00208*	+/-	*0.00030*	*0.0149*	+/-	*0.0006*
108 Cherry St. Burlington	10/4/2011	0.00143	+/-	0.00031	0.0146	+/-	0.0007
D & E Tree	10/4/2011	*-0.000081*	+/-	*0.000169*	*0.0017*	+/-	*0.00043*
Dummerston State Garage	10/4/2011	0.000184	+/-	0.00019	0.00486	+/-	0.00051
Guilford Town Garage	10/4/2011	*-0.000094*	+/-	*0.001042*	*0.0087*	+/-	*0.00242*
Power Line River Crossing	10/4/2011	0.00123	+/-	0.00029	0.0156	+/-	0.0008
Renaud Brothers	10/4/2011	0.000585	+/-	0.000248	0.00531	+/-	0.00053
Vermont State Police-Brattleboro	10/4/2011	0.000574	+/-	0.000248	0.00371	+/-	0.00048
Vernon Elementary School	10/4/2011	0.000374	+/-	0.000201	0.0062	+/-	0.00052
Windham County Courthouse	10/4/2011	0.00147	+/-	0.00032	0.0148	+/-	0.0008
Wilmington State Highway Garage	10/6/2011	*0.000185*	+/-	*0.000085*	*0.00184*	+/-	*0.00019*
108 Cherry St. Burlington	11/1/2011	0.00158	+/-	0.00032	0.0154	+/-	0.0007
D & E Tree	11/1/2011	0.0019	+/-	0.00035	0.0123	+/-	0.0007
Dummerston State Garage	11/1/2011	0.000662	+/-	0.000243	0.00653	+/-	0.00055
Guilford Town Garage	11/1/2011	0.00245	+/-	0.00401	0.02	+/-	0.0009
Power Line River Crossing	11/1/2011	0.00194	+/-	0.00034	0.0166	+/-	0.0008
Renaud Brothers	11/1/2011	0.0017	+/-	0.00035	0.018	+/-	0.0009
Vermont State Police-Brattleboro	11/1/2011	0.000326	+/-	0.000222	0.00283	+/-	0.00047
Vernon Elementary School	11/1/2011	0.00197	+/-	0.000942	0.0174	+/-	0.0008
Wilmington State Highway Garage	11/1/2011	0.000406	+/-	0.00020	0.00445	+/-	0.00046
Windham County Courthouse	11/1/2011	0.00181	+/-	0.00035	0.0175	+/-	0.0008
108 Cherry St. Burlington	12/6/2011	0.00271	+/-	0.00035	0.0215	+/-	0.0008
D & E Tree	12/6/2011	0.000326	+/-	0.000154	0.00363	+/-	0.00039
Dummerston State Garage	12/6/2011	0.00113	+/-	0.00024	0.0122	+/-	0.0006
Guilford Town Garage	12/6/2011	0.00278	+/-	0.00037	0.0256	+/-	0.0009

Sample Location	Date of Sample	Total Alpha Radioactivity +/- error (pCi/m^3)			Total Beta Radioactivity +/- error (pCi/m^3)		
Power Line River Crossing	12/6/2011	0.00256	+/-	0.00033	0.0215	+/-	0.0008
Renaud Brothers	12/6/2011	0.00239	+/-	0.00035	0.0206	+/-	0.0008
Vermont State Police-Brattleboro	12/6/2011	0.000627	+/-	0.000225	0.0031	+/-	0.00044
Vernon Elementary School	12/8/2011	0.00261	+/-	0.00033	0.023	+/-	0.0008
Wilmington State Highway Garage	12/6/2011	0.00103	+/-	0.00022	0.0077	+/-	0.00047
Windham County Courthouse	12/6/2011	0.00223	+/-	0.00033	0.0212	+/-	0.0008
108 Cherry St. Burlington	1/10/2012	0.00203	+/-	0.00030	0.0186	+/-	0.0007
D & E Tree	1/10/2012	0.00103	+/-	0.00024	0.00847	+/-	0.00052
Dummerston State Garage	1/10/2012	0.00112	+/-	0.00025	0.0112	+/-	0.0006
Guilford Town Garage	1/10/2012	0.00231	+/-	0.00035	0.024	+/-	0.00086
Power Line River Crossing	1/10/2012	0.00250	+/-	0.00033	0.0208	+/-	0.0007
Renaud Brothers	1/10/2012	0.00195	+/-	0.00032	0.0196	+/-	0.0008
Vermont State Police-Brattleboro	1/10/2012	0.000596	+/-	0.000202	0.00472	+/-	0.00043
Vernon Elementary School	1/10/2012	0.00212	+/-	0.00031	0.0198	+/-	0.0007
Wilmington State Highway Garage	1/10/2012	0.000933	+/-	0.000206	0.00706	+/-	0.00044
Windham County Courthouse	1/10/2012	0.00175	+/-	0.00030	0.0192	+/-	0.0007

pCi/m^3 is picocurie per cubic meter of air volume
Fukushima Daiichi event started March-2011. More frequent air sampling until June.
Data in italics were qualified due to sampling issues.

2011 Fukushima-related Air Filter Results for Total Alpha & Beta Radioactivity (weekly collections)

Sample Location	Date of Sample	Total Alpha Radioactivity +/- error (pCi/m^3)			Total Beta Radioactivity +/- error (pCi/m^3)		
D & E Tree	3/15/2011	0.00277	+/-	0.00079	0.0146	+/-	0.0014
Dummerston State Garage	3/15/2011	0.00324	+/-	0.00084	0.0143	+/-	0.0014
Guilford Town Garage	3/15/2011	0.00383	+/-	0.00098	0.0169	+/-	0.0016
Power Line River Crossing	3/15/2011	*0.000384*	+/-	*0.000378*	*0.00293*	+/-	*0.00076*
Renaud Brothers	3/15/2011	0.00294	+/-	0.00083	0.0153	+/-	0.0015
Vermont State Police-Brattleboro	3/15/2011	*0.000725*	+/-	*0.000462*	*0.00206*	+/-	*0.00071*
Vernon Elementary School	3/15/2011	0.00403	+/-	0.00091	0.0139	+/-	0.0014
Wilmington State Highway Garage	3/24/2011	*0.00224*	+/-	*0.00016*	*0.0123*	+/-	*0.0002*
D & E Tree	3/25/2011	0.00192	+/-	0.00052	0.0196	+/-	0.0007
Dummerston State Garage	3/25/2011	0.00133	+/-	0.00046	0.0186	+/-	0.0007
Guilford Town Garage	3/25/2011	0.00182	+/-	0.00055	0.0244	+/-	0.0008
Power Line River Crossing	3/25/2011	0.00126	+/-	0.00044	0.0198	+/-	0.0007
Renaud Brothers	3/25/2011	0.00211	+/-	0.00056	0.0207	+/-	0.0007
Vermont State Police-Brattleboro	3/25/2011	0.000982	+/-	0.000405	0.0151	+/-	0.0006
Vernon Elementary School	3/25/2011	0.0018	+/-	0.00050	0.0200	+/-	0.0007
Windham County Courthouse	3/25/2011	0.00114	+/-	0.00042	0.0193	+/-	0.0007
108 Cherry St. Burlington	3/24/2011	0.00228	+/-	0.00072	0.0228	+/-	0.0009
Wilmington State Highway Garage	3/31/2011	0.00120	+/-	0.00063	0.0283	+/-	0.0019
108 Cherry St. Burlington	4/1/2011	0.00189	+/-	0.00081	0.0265	+/-	0.0021
D & E Tree	4/1/2011	0.000897	+/-	0.000661	0.0314	+/-	0.0022
Dummerston State Garage	4/1/2011	0.00130	+/-	0.00072	0.0297	+/-	0.0022
Guilford Town Garage	4/1/2011	0.00147	+/-	0.00081	0.0393	+/-	0.0026
Power Line River Crossing	4/1/2011	0.00157	+/-	0.00075	0.0287	+/-	0.0021
Renaud Brothers	4/1/2011	0.00134	+/-	0.00074	0.0346	+/-	0.0023
Vermont State Police-Brattleboro	4/1/2011	0.00175	+/-	0.00078	0.0311	+/-	0.0022
Vernon Elementary School	4/1/2011	0.00125	+/-	0.00069	0.0316	+/-	0.0022
Windham County Courthouse	4/1/2011	0.00145	+/-	0.00073	0.0280	+/-	0.0021
Wilmington State Highway Garage	4/7/2011	0.0000925	+/-	0.00068	0.0221	+/-	0.0019
108 Cherry St. Burlington	4/8/2011	0.00126	+/-	0.00091	0.0445	+/-	0.0027
D & E Tree	4/8/2011	0.00102	+/-	0.00086	0.0371	+/-	0.0024
Dummerston State Garage	4/8/2011	*-0.00025*	+/-	*0.000693*	*0.00467*	+/-	*0.00141*
Guilford Town Garage	4/8/2011	0.000682	+/-	0.000909	0.0441	+/-	0.0028
Power Line River Crossing	4/8/2011	0.000458	+/-	0.000795	0.0404	+/-	0.0025

Sample Location	Date of Sample	Total Alpha Radioactivity +/- error (pCi/m^3)			Total Beta Radioactivity +/- error (pCi/m^3)		
Renaud Brothers	4/8/2011	0.000581	+/-	0.000839	0.0399	+/-	0.0026
Vermont State Police-Brattleboro	4/8/2011	0.000767	+/-	0.000837	0.0326	+/-	0.0023
Vernon Elementary School	4/8/2011	0.00124	+/-	0.00087	0.0414	+/-	0.0025
Windham County Courthouse	4/8/2011	0.000813	+/-	0.000838	0.0342	+/-	0.0024
Wilmington State Highway Garage	4/14/2011	*0.000228*	+/-	*0.000376*	*0.00629*	+/-	*0.00125*
108 Cherry St. Burlington	4/15/2011	0.00195	+/-	0.00074	0.0282	+/-	0.0022
D & E Tree	4/15/2011	0.00216	+/-	0.00076	0.0284	+/-	0.0021
Dummerston State Garage	4/15/2011	0.00228	+/-	0.00078	0.0265	+/-	0.0021
Guilford Town Garage	4/15/2011	0.00208	+/-	0.00079	0.0312	+/-	0.0023
Power Line River Crossing	4/15/2011	0.00205	+/-	0.00074	0.0282	+/-	0.0021
Renaud Brothers	4/15/2011	0.00221	+/-	0.00076	0.0267	+/-	0.0021
Vermont State Police-Brattleboro	4/15/2011	0.00135	+/-	0.00064	0.0233	+/-	0.0020
Vernon Elementary School	4/15/2011	0.00206	+/-	0.00074	0.0273	+/-	0.0021
Windham County Courthouse	4/15/2011	0.00201	+/-	0.00075	0.0285	+/-	0.0022
Wilmington State Highway Garage	4/19/2011	0.00146	+/-	0.00085	0.0235	+/-	0.0025
108 Cherry St. Burlington	4/22/2011	0.00165	+/-	0.00081	0.0201	+/-	0.0019
D & E Tree	4/19/2011	0.00194	+/-	0.00109	0.0266	+/-	0.003
Dummerston State Garage	4/19/2011	0.00116	+/-	0.00096	0.0238	+/-	0.0029
Guilford Town Garage	4/19/2011	0.00215	+/-	0.00121	0.0281	+/-	0.0033
Power Line River Crossing	4/19/2011	0.00167	+/-	0.00104	0.0286	+/-	0.0031
Renaud Brothers	4/19/2011	0.000866	+/-	0.000962	0.0243	+/-	0.0031
Vermont State Police-Brattleboro	4/19/2011	*0.0000875*	+/-	*0.000722*	*0.00802*	+/-	*0.00227*
Vernon Elementary School	4/19/2011	0.00174	+/-	0.00104	0.0247	+/-	0.0029
Windham County Courthouse	4/19/2011	0.00064	+/-	0.000877	0.0236	+/-	0.0030
D & E Tree	4/26/2011	0.000454	+/-	0.00063	0.0145	+/-	0.0017
Dummerston State Garage	4/26/2011	0.00114	+/-	0.00075	0.0196	+/-	0.0019
Guilford Town Garage	4/26/2011	0.000678	+/-	0.000732	0.0208	+/-	0.0021
Power Line River Crossing	4/26/2011	0.00108	+/-	0.00074	0.0188	+/-	0.0019
Renaud Brothers	4/26/2011	0.00111	+/-	0.00079	0.0214	+/-	0.0021
Vermont State Police-Brattleboro	4/26/2011	*0.000206*	+/-	*0.00060*	*0.00952*	+/-	*0.00155*
Vernon Elementary School	4/26/2011	0.000854	+/-	0.000689	0.0202	+/-	0.0019
Wilmington State Highway Garage	4/26/2011	0.000737	+/-	0.000625	0.0172	+/-	0.0017
Windham County Courthouse	4/26/2011	0.000523	+/-	0.000661	0.0209	+/-	0.002
108 Cherry St. Burlington	4/29/2011	0.000784	+/-	0.000653	0.0119	+/-	0.0016

Sample Location	Date of Sample	Total Alpha Radioactivity +/- error (pCi/m^3)			Total Beta Radioactivity +/- error (pCi/m^3)		
D & E Tree	5/3/2011	0.000564	+/-	0.000607	0.00964	+/-	0.00153
Dummerston State Garage	5/3/2011	0.000312	+/-	0.000569	0.0121	+/-	0.0016
Guilford Town Garage	5/3/2011	0.00110	+/-	0.00073	0.0129	+/-	0.0017
Power Line River Crossing	5/3/2011	-0.00015	+/-	0.00047	0.0105	+/-	0.0016
Renaud Brothers	5/3/2011	0.000794	+/-	0.000661	0.0103	+/-	0.0016
Vermont State Police-Brattleboro	5/3/2011	0.000677	+/-	0.000634	0.0116	+/-	0.0016
Vernon Elementary School	5/3/2011	0.000406	+/-	0.000574	0.0116	+/-	0.0016
Wilmington State Highway Garage	5/3/2011	0.000669	+/-	0.00059	0.0125	+/-	0.0016
Windham County Courthouse	5/3/2011	0.000426	+/-	0.000602	0.0124	+/-	0.0017
108 Cherry St. Burlington	5/10/2011	0.000786	+/-	0.000463	0.0108	+/-	0.0012
D & E Tree	5/10/2011	0.000717	+/-	0.000648	0.0152	+/-	0.0018
Dummerston State Garage	5/10/2011	0.000732	+/-	0.000661	0.0159	+/-	0.0018
Guilford Town Garage	5/10/2011	0.000499	+/-	0.000656	0.0178	+/-	0.002
Power Line River Crossing	5/10/2011	0.000969	+/-	0.000684	0.0154	+/-	0.0018
Renaud Brothers	5/10/2011	0.00105	+/-	0.00071	0.0162	+/-	0.0019
Vermont State Police-Brattleboro	5/10/2011	0.00046	+/-	0.000605	0.0141	+/-	0.0018
Vernon Elementary School	5/10/2011	0.00116	+/-	0.00070	0.0158	+/-	0.0018
Windham County Courthouse	5/10/2011	0.000955	+/-	0.000704	0.0151	+/-	0.0018
108 Cherry St. Burlington	5/17/2011	0.000769	+/-	0.000659	0.00745	+/-	0.00154
D & E Tree	5/17/2011	0.000893	+/-	0.000656	0.00893	+/-	0.00155
Dummerston State Garage	5/17/2011	0.000161	+/-	0.000536	0.00946	+/-	0.00159
Guilford Town Garage	5/17/2011	0.000113	+/-	0.000556	0.00766	+/-	0.00159
Power Line River Crossing	5/17/2011	0.000474	+/-	0.000586	0.00843	+/-	0.00153
Renaud Brothers	5/17/2011	0.000492	+/-	0.000608	0.00952	+/-	0.00162
Vermont State Police-Brattleboro	5/17/2011	0.000474	+/-	0.000587	0.00772	+/-	0.00150
Vernon Elementary School	5/17/2011	0.000781	+/-	0.000634	0.00933	+/-	0.00155
Wilmington State Highway Garage	5/17/2011	0.000437	+/-	0.000541	0.00832	+/-	0.00143
Windham County Courthouse	5/17/2011	0.000495	+/-	0.000613	0.00792	+/-	0.00156
108 Cherry St. Burlington	5/24/2011	0.000363	+/-	0.000595	0.0090	+/-	0.00153
D & E Tree	5/24/2011	0.000405	+/-	0.000591	0.00831	+/-	0.00147
Dummerston State Garage	5/24/2011	0.000612	+/-	0.000629	0.00791	+/-	0.00146
Guilford Town Garage	5/24/2011	-0.00011	+/-	0.000539	0.00932	+/-	0.00161
Power Line River Crossing	5/24/2011	0.000399	+/-	0.000582	0.00861	+/-	0.00147
Renaud Brothers	5/24/2011	0.000469	+/-	0.000616	0.00765	+/-	0.00147
Vermont State Police-Brattleboro	5/24/2011	0.0000506	+/-	0.000526	0.00799	+/-	0.00146
Vernon Elementary School	5/24/2011	0.000101	+/-	0.000533	0.0141	+/-	0.0017
Wilmington State Highway Garage	5/24/2011	-0.000049	+/-	0.000487	0.00932	+/-	0.00147
Windham County Courthouse	5/24/2011	-0.00021	+/-	0.000489	0.00861	+/-	0.00152

Sample Location	Date of Sample	Total Alpha Radioactivity +/- error (pCi/m^3)			Total Beta Radioactivity +/- error (pCi/m^3)		
108 Cherry St. Burlington	6/7/2011	0.00114	+/-	0.00042	0.0151	+/-	0.0011
D & E Tree	6/7/2011	0.00102	+/-	0.00040	0.0144	+/-	0.0011
Dummerston State Garage	6/7/2011	0.00123	+/-	0.00043	0.0176	+/-	0.0012
Guilford Town Garage	6/7/2011	0.00127	+/-	0.00044	0.0172	+/-	0.0012
Power Line River Crossing	6/7/2011	0.00166	+/-	0.00048	0.0172	+/-	0.0012
Renaud Brothers	6/7/2011	0.00124	+/-	0.00043	0.0137	+/-	0.0011
Vermont State Police-Brattleboro	6/7/2011	0.000646	+/-	0.000347	0.0159	+/-	0.0011
Vernon Elementary School	6/7/2011	0.00137	+/-	0.00044	0.0170	+/-	0.0012
Wilmington State Highway Garage	6/7/2011	0.00173	+/-	0.00046	0.0178	+/-	0.0011
Windham County Courthouse	6/7/2011	0.00185	+/-	0.00051	0.020	+/-	0.0013
108 Cherry St. Burlington	6/21/2011	0.00134	+/-	0.00046	0.00951	+/-	0.00096

pCi/m^3 is picocurie per cubic meter of air volume
Data in italics were qualified due to sampling issues.

2011 Composite Air Filter Results: Fukushima-related (weekly collections)

	Date Range of Filters in Composite		Radioactive Element Detected by Gamma Spectroscopy
Quarter-2	3/24/2011	4/15/2011	beryllium-7, potassium-40, iodine-131, cesium-134, cesium-137
	4/19/2011	5/10/2011	beryllium-7, potassium-40, cesium-137
	5/10/2011	5/24/2011	beryllium-7
	5/24/2011	6/7/2011	berylium-7
Weekly samplings were composited. Qualitative analysis only done.			

Appendix B

2011 Tritium Water Data

Tritium results for all water samples tested by the Health Department in 2011 are provided in this appendix. Results are presented in order by sample location and by sampling date based on the following categories:

- Connecticut River samples
- On-site groundwater monitoring wells
- Off-site drinking water wells
- On-site drinking water wells

The Health Department's Lower Limit of Detection for tritium is 500 picocuries per liter (pCi/L).

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
3-3 Connecticut River Station	1/14/2011	< 500
	2/16/2011	< 500
	3/16/2011	< 500
	4/14/2011	< 500
	5/13/2011	< 500
	6/15/2011	< 500
	7/13/2011	< 500
	8/15/2011	< 500
	9/14/2011	< 500
	10/13/2011	< 500
	11/14/2011	< 500
	12/15/2011	< 500
3-4 Connecticut River Station	1/13/2011	< 500
	2/16/2011	< 500
	3/16/2011	< 500
	4/14/2011	< 500
	5/13/2011	< 500
	6/15/2011	< 500
	7/13/2011	< 500
	8/15/2011	< 500
	9/14/2011	< 500
	10/13/2011	< 500
	11/14/2011	< 500
	12/15/2011	< 500
3-8 Connecticut River Station	1/14/2011	< 500
	2/16/2011	< 500
	3/16/2011	< 500
	4/13/2011	< 500
	5/13/2011	< 500
	6/15/2011	< 500
	7/13/2011	< 500
	8/15/2011	< 500
	9/14/2011	< 500
	10/13/2011	< 500
	11/14/2011	< 500
	12/15/2011	< 500

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
Connecticut River Upstream	1/4/2011	< 500
	3/15/2011	< 500
	4/1/2011	< 500
	4/15/2011	< 500
	4/26/2011	< 500
	5/10/2011	< 500
	5/24/2011	< 500
	6/7/2011	< 500
	6/21/2011	< 500
	7/5/2011	< 500
	7/19/2011	< 500
	8/2/2011	< 500
	8/23/2011	< 500
	9/6/2011	< 500
	9/20/2011	< 500
	10/4/2011	< 500
	10/18/2011	< 500
	11/1/2011	< 500
	11/15/2011	< 500
	12/6/2011	< 500
	12/27/2011	< 500
Connecticut River Downstream	1/4/2011	< 500
	1/24/2011	< 500
	2/7/2011	< 500
	2/14/2011	< 500
	3/15/2011	< 500
	4/1/2011	< 500
	4/15/2011	< 500
	4/26/2011	< 500
	5/10/2011	< 500
	5/24/2011	< 500
	6/7/2011	< 500
	6/21/2011	< 500
	7/5/2011	< 500
	7/19/2011	< 500
	8/2/2011	< 500

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
Connecticut River Downstream	8/23/2011	< 500
	9/6/2011	< 500
	9/20/2011	< 500
	10/4/2011	< 500
	10/18/2011	< 500
	11/1/2011	< 500
	11/15/2011	< 500
	12/6/2011	< 500
	12/27/2011	< 500
Discharge Forebay	1/13/2011	< 500
	2/16/2011	< 500
	3/16/2011	< 500
	4/14/2011	< 500
	5/13/2011	< 500
	6/15/2011	< 500
	7/13/2011	< 500
	8/15/2011	< 500
	9/14/2011	< 500
	10/13/2011	< 500
	11/14/2011	< 500
	12/15/2011	< 500
Upstream of the VY River Discharge	1/4/2011	< 500
	2/7/2011	< 500
	2/14/2011	< 500
	2/22/2011	< 500
	2/28/2011	< 500
	3/7/2011	< 500
	3/14/2011	< 500
	3/21/2011	< 500
	3/28/2011	< 500
	4/4/2011	< 500
	4/11/2011	< 500
	4/18/2011	< 500
	4/25/2011	< 500
	5/2/2011	< 500
	5/9/2011	< 500

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
Upstream of the VY River Discharge	5/16/2011	< 500
	5/23/2011	< 500
	5/31/2011	< 500
	6/6/2011	< 500
	6/13/2011	< 500
	6/20/2011	< 500
	6/27/2011	< 500
	7/11/2011	< 500
	7/18/2011	611 +/- 139
	7/25/2011	534 +/- 194
	8/1/2011	< 500
	8/8/2011	565 +/- 198
	8/15/2011	< 500
(30 feet from river's edge, same location)	8/17/2011	< 500
	8/17/2011	< 500
	8/18/2011	< 500
	8/22/2011	< 500
	8/24/2011	< 500
	9/8/2011	< 500
	9/12/2011	< 500
	9/15/2011	< 500
	9/19/2011	< 500
	9/21/2011	< 500
	9/26/2011	< 500
	9/28/2011	< 500
	10/3/2011	< 500
	10/6/2011	< 500
	10/11/2011	< 500
	10/13/2011	< 500
	10/17/2011	< 500
	10/20/2011	< 500
	10/24/2011	< 500
	10/27/2011	< 500
	10/31/2011	< 500
	11/3/2011	1120 +/- 220
	11/10/2011	< 500
	11/14/2011	< 500
	11/17/2011	< 500

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
Upstream of the VY River Discharge	11/21/2011	< 500
	11/28/2011	< 500
	12/1/2011	< 500
	12/5/2011	< 500
	12/8/2011	< 500
	12/12/2011	< 500
	12/15/2011	< 500
	12/19/2011	< 500
	12/22/2011	< 500
	12/27/2011	< 500
	12/29/2011	< 500
GZ-01	1/20/2011	< 500
	1/24/2011	< 500
	1/31/2011	< 500
	2/7/2011	< 500
	2/14/2011	< 500
	2/22/2011	< 500
	2/28/2011	< 500
	3/7/2011	< 500
	3/14/2011	< 500
	3/21/2011	< 500
	3/28/2011	< 500
	4/4/2011	< 500
	4/11/2011	< 500
	4/18/2011	< 500
	4/25/2011	< 500
	5/2/2011	< 500
	5/9/2011	< 500
	5/16/2011	< 500
	5/23/2011	< 500
	5/31/2011	< 500
	6/6/2011	< 500
	8/1/2011	< 500
	10/3/2011	< 500
	12/5/2011	< 500
GZ-02	1/4/2011	< 500
	1/20/2011	< 500

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
GZ-02	1/24/2011	< 500
	1/31/2011	< 500
	2/7/2011	< 500
	2/14/2011	< 500
	2/22/2011	< 500
	2/28/2011	< 500
	3/7/2011	< 500
	3/14/2011	< 500
	3/21/2011	< 500
	3/28/2011	< 500
	4/4/2011	< 500
	4/11/2011	< 500
	4/18/2011	< 500
	4/25/2011	< 500
	5/2/2011	< 500
	5/9/2011	< 500
	5/16/2011	< 500
	5/23/2011	< 500
	5/31/2011	< 500
	6/6/2011	< 500
	8/1/2011	< 500
	10/3/2011	< 500
	12/5/2011	< 500
GZ-03	1/4/2011	153000 +/- 1000
	2/7/2011	108000 +/- 1000
	2/15/2011	105000 +/- 1000
	2/22/2011	98500 +/- 800
	2/28/2011	96400 +/- 800
	3/7/2011	79600 +/- 700
	3/14/2011	68000 +/- 700
	3/21/2011	80500 +/- 700
	3/28/2011	84100 +/- 800
	4/4/2011	80900 +/- 700
	4/11/2011	71200 +/- 700
	4/18/2011	75100 +/- 700
	4/25/2011	63600 +/- 700
	5/2/2011	63500 +/- 700

Sample Location	Date of Sample	Tritium Result (pCi/L)	+/- error
GZ-03	5/9/2011	75700	+/- 700
	5/16/2011	63500	+/- 700
	5/23/2011	71700	+/- 700
	5/31/2011	72100	+/- 700
	6/6/2011	57400	+/- 600
	7/18/2011	18000	+/- 400
	7/25/2011	16700	+/- 400
	8/1/2011	14200	+/- 400
	8/8/2011	9730	+/- 310
	8/15/2011	7630	+/- 300
	8/22/2011	5880	+/- 280
	9/1/2011	5170	+/- 270
	9/6/2011	4280	+/- 260
	9/12/2011	3400	+/- 240
	9/19/2011	1230	+/- 210
	9/26/2011	1540	+/- 220
	10/3/2011	1700	+/- 230
	10/11/2011	1150	+/- 210
	10/17/2011	1250	+/- 220
	10/24/2011	1660	+/- 220
	10/31/2011	1830	+/- 220
	11/14/2011	1730	+/- 220
	11/21/2011	1580	+/- 220
	11/28/2011	1260	+/- 210
	12/5/2011	1340	+/- 220
	12/12/2011	1030	+/- 210
	12/19/2011	985	+/- 199
	12/27/2011	827	+/- 207
GZ-04	1/4/2011	83600	+/- 800
	2/7/2011	75200	+/- 700
	2/14/2011	78800	+/- 700
	2/22/2011	81100	+/- 700
	2/28/2011	52600	+/- 600
	3/7/2011	17000	+/- 400
	3/14/2011	34200	+/- 500
	3/21/2011	47700	+/- 600
	3/28/2011	51300	+/- 600
	4/4/2011	35700	+/- 500
	4/11/2011	30800	+/- 500

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
GZ-04	4/18/2011	29500 +/- 500
	4/25/2011	25700 +/- 400
	5/2/2011	31600 +/- 500
	5/9/2011	43600 +/- 600
	5/16/2011	29100 +/- 500
	5/23/2011	25200 +/- 400
	5/31/2011	26100 +/- 500
	6/6/2011	18900 +/- 400
	8/1/2011	26800 +/- 500
	9/1/2011	25800 +/- 500
	10/3/2011	9860 +/- 320
	12/5/2011	5570 +/- 280
GZ-05	1/4/2011	< 500
	2/7/2011	< 500
	3/7/2011	< 500
	3/28/2011	< 500
	4/4/2011	< 500
	5/2/2011	< 500
	6/6/2011	< 500
	8/1/2011	< 500
	10/3/2011	< 500
	12/5/2011	< 500
GZ-06	1/4/2011	631 +/- 202
	1/20/2011	< 500
	1/24/2011	609 +/- 199
	1/31/2011	< 500
	2/7/2011	< 500
	2/14/2011	< 500
	2/22/2011	< 500
	2/28/2011	< 500
	3/7/2011	< 500
	3/14/2011	< 500
	3/21/2011	< 500
	3/28/2011	< 500
	4/4/2011	< 500
	4/11/2011	504 +/- 202
	4/18/2011	< 500
	4/25/2011	< 500
	5/2/2011	< 500

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
GZ-06	5/9/2011	< 500
	5/16/2011	< 500
	5/23/2011	< 500
	5/31/2011	< 500
	6/6/2011	< 500
	6/13/2011	< 500
	6/20/2011	< 500
	6/27/2011	< 500
	7/11/2011	< 500
	7/18/2011	< 500
	7/25/2011	578 +/- 195
	8/1/2011	590 +/- 203
	8/8/2011	< 500
	8/16/2011	< 500
	8/22/2011	< 500
	9/6/2011	549 +/- 146
	9/12/2011	< 500
	9/19/2011	557 +/- 198
	9/26/2011	< 500
	10/3/2011	549 +/- 199
	10/11/2011	< 500
	10/17/2011	711 +/- 198
	10/24/2011	535 +/- 207
	10/31/2011	< 500
	11/14/2011	< 500
	11/21/2011	576 +/- 144
	11/28/2011	< 500
	12/5/2011	723 +/- 210
	12/12/2011	564 +/- 208
	12/19/2011	< 500
	12/27/2011	722 +/- 199
GZ-07	1/4/2011	3600 +/- 240
	2/7/2011	2400 +/- 230
	2/14/2011	2480 +/- 230
	2/22/2011	1850 +/- 220
	2/28/2011	1850 +/- 220
	3/7/2011	1200 +/- 210
	3/14/2011	2300 +/- 230
	3/21/2011	2560 +/- 230
	3/28/2011	2300 +/- 220

Sample Location	Date of Sample	Tritium Result (pCi/L)	+/- error
GZ-07	4/4/2011	2300	230
	4/11/2011	2930	240
	4/18/2011	1780	220
	4/25/2011	1460	220
	5/2/2011	1090	210
	5/9/2011	927	212
	5/16/2011	1430	220
	5/23/2011	1200	210
	5/31/2011	1390	220
	6/6/2011	1820	220
	6/13/2011	2040	230
	6/20/2011	2030	230
	6/27/2011	3110	240
	7/11/2011	2760	230
	7/18/2011	2470	230
	7/25/2011	2310	220
	8/2/2011	2010	220
	8/8/2011	1540	210
	8/15/2011	836	212
	8/22/2011	853	212
	9/1/2011	1520	220
	9/6/2011	1550	220
	9/12/2011	1450	210
	9/19/2011	1720	220
	9/26/2011	1470	220
	10/4/2011	952	216
	10/11/2011	1290	210
	10/17/2011	914	211
	10/24/2011	834	212
	10/31/2011	561	207
	11/14/2011	1250	210
	11/21/2011	1140	150
	11/28/2011	573	208
	12/6/2011	< 500	
	12/12/2011	572	208
	12/27/2011	670	205
GZ-09	1/4/2011	< 500	
	2/7/2011	< 500	
	3/8/2011	< 500	

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
GZ-09	4/4/2011	< 500
	5/2/2011	< 500
	6/6/2011	< 500
	8/1/2011	< 500
	10/3/2011	< 500
	12/5/2011	< 500
GZ-10	1/4/2011	< 500
	2/8/2011	< 500
	2/15/2011	< 500
	2/22/2011	< 500
	2/28/2011	< 500
	3/7/2011	< 500
	3/14/2011	< 500
	3/21/2011	< 500
	3/28/2011	< 500
	4/4/2011	< 500
	4/11/2011	< 500
	4/18/2011	< 500
	4/25/2011	< 500
	5/2/2011	< 500
	5/9/2011	< 500
	5/16/2011	< 500
	5/23/2011	< 500
	5/31/2011	< 500
	6/6/2011	< 500
	8/1/2011	< 500
	9/1/2011	1760 +/- 220
	9/26/2011	744 +/- 202
	10/3/2011	591 +/- 199
	12/5/2011	530 +/- 207
GZ-11	1/4/2011	< 500
	2/7/2011	< 500
	3/7/2011	< 500
	4/4/2011	< 500
	5/2/2011	< 500
	6/6/2011	549 +/- 203
	8/2/2011	< 500
	10/3/2011	< 500
	12/6/2011	< 500

Sample Location	Date of Sample	Tritium Result (pCi/L)	+/- error
GZ-12D	1/4/2011	115000	+/- 1000
	2/7/2011	116000	+/- 1000
	2/14/2011	108000	+/- 1000
	2/22/2011	111000	+/- 1000
	2/28/2011	99400	+/- 800
	3/7/2011	97700	+/- 800
	3/14/2011	94900	+/- 800
	3/21/2011	91500	+/- 800
	3/28/2011	88500	+/- 800
	4/4/2011	84800	+/- 800
	4/11/2011	88700	+/- 800
	4/18/2011	86700	+/- 800
	4/25/2011	77400	+/- 700
	5/2/2011	87000	+/- 800
	5/9/2011	97400	+/- 800
	5/16/2011	26700	+/- 500
	5/23/2011	77200	+/- 700
	5/31/2011	88200	+/- 800
	6/6/2011	89200	+/- 800
	6/13/2011	54900	+/- 600
	6/20/2011	93700	+/- 800
	6/27/2011	75800	+/- 700
	7/11/2011	69000	+/- 700
	7/18/2011	68800	+/- 700
	7/25/2011	63800	+/- 700
	8/1/2011	64000	+/- 700
	8/8/2011	61800	+/- 700
	8/16/2011	63300	+/- 700
	8/22/2011	63500	+/- 700
	9/1/2011	59900	+/- 700
	9/6/2011	60300	+/- 700
	9/12/2011	56900	+/- 600
	9/19/2011	53400	+/- 600
	9/26/2011	56900	+/- 600
	10/3/2011	54100	+/- 600
	10/11/2011	54700	+/- 600
	10/17/2011	52700	+/- 600
	10/24/2011	52500	+/- 600

Sample Location	Date of Sample	Tritium Result (pCi/L)	+/- error
GZ-12D	11/14/2011	50900	600
	11/21/2011	47300	600
	11/28/2011	52500	600
	12/5/2011	48500	600
	12/12/2011	46500	600
	12/19/2011	47100	600
	12/27/2011	28800	500
GZ-12S	1/4/2011	3320	240
	2/7/2011	2770	230
	2/14/2011	2460	230
	2/22/2011	2450	230
	2/28/2011	3070	230
	3/7/2011	2650	230
	3/14/2011	2300	230
	3/21/2011	2710	230
	3/28/2011	1840	220
	4/4/2011	2370	230
	4/11/2011	2540	230
	4/18/2011	2200	220
	4/25/2011	2020	220
	5/2/2011	2350	230
	5/9/2011	2600	240
	5/16/2011	1490	220
	5/23/2011	2400	230
	5/31/2011	1150	210
	6/6/2011	1190	210
	8/1/2011	1380	210
	9/1/2011	2720	240
	10/3/2011	< 500	
	12/5/2011	795	211
GZ-13D	1/4/2011	802	204
	2/7/2011	834	202
	2/15/2011	773	204
	2/22/2011	1040	210
	2/28/2011	1020	200
	3/8/2011	875	207
	3/14/2011	820	203
	3/21/2011	844	203
	3/28/2011	915	204

Sample Location	Date of Sample	Tritium Result (pCi/L)	+/- error
GZ-13D	4/4/2011	826	+/- 201
	4/11/2011	765	+/- 206
	4/18/2011	925	+/- 205
	4/25/2011	826	+/- 205
	5/2/2011	832	+/- 210
	5/9/2011	1000	+/- 210
	5/16/2011	806	+/- 204
	5/23/2011	746	+/- 206
	5/31/2011	794	+/- 208
	6/6/2011	801	+/- 207
	8/2/2011	907	+/- 208
	9/2/2011	1100	+/- 210
	10/3/2011	991	+/- 217
	12/6/2011	959	+/- 213
GZ-13S	1/4/2011	< 500	
	2/7/2011	< 500	
	2/15/2011	< 500	
	2/22/2011	< 500	
	2/28/2011	< 500	
	3/8/2011	< 500	
	3/14/2011	< 500	
	3/21/2011	< 500	
	3/28/2011	< 500	
	4/4/2011	< 500	
	4/11/2011	< 500	
	4/18/2011	< 500	
	4/25/2011	< 500	
	5/2/2011	< 500	
	5/9/2011	< 500	
	5/16/2011	< 500	
	5/23/2011	< 500	
	5/31/2011	< 500	
	6/6/2011	< 500	
	8/2/2011	< 500	
	10/3/2011	< 500	
	12/6/2011	< 500	
GZ-14D	1/4/2011	< 500	
	2/7/2011	< 500	
	2/14/2011	< 500	

Sample Location	Date of Sample	Tritium Result (pCi/L)	+/- error
GZ-14D	2/28/2011	< 500	
	2/22/2011	< 500	
	3/7/2011	< 500	
	3/14/2011	< 500	
	3/21/2011	603	199
	3/28/2011	< 500	
	4/4/2011	530	197
	4/11/2011	683	198
	4/18/2011	783	203
	4/25/2011	943	207
	5/2/2011	860	209
	5/9/2011	1040	210
	5/16/2011	968	213
	5/23/2011	1240	210
	5/31/2011	1590	220
	6/6/2011	1560	220
	6/13/2011	1730	220
	6/20/2011	2070	220
	6/27/2011	2240	220
	7/11/2011	2680	230
	7/18/2011	2850	230
	7/25/2011	3120	240
	8/1/2011	3310	240
	8/8/2011	3050	240
	8/15/2011	3280	250
	8/22/2011	3540	250
	9/1/2011	4160	260
	9/6/2011	4390	260
	9/12/2011	4360	250
	9/19/2011	4600	250
	9/26/2011	5110	270
	10/3/2011	5660	280
	10/11/2011	5990	280
	10/17/2011	5720	280
	10/24/2011	6800	290
	10/31/2011	7120	290
	11/14/2011	8290	300
	11/21/2011	8450	300
	11/28/2011	8750	310
	12/5/2011	9520	320

Sample Location	Date of Sample	Tritium Result (pCi/L)	+/- error
GZ-14D	12/12/2011	9020	+/- 310
	12/19/2011	9830	+/- 310
	12/27/2011	10500	+/- 300
GZ-14S	1/5/2011	453000	+/- 2000
	2/7/2011	404000	+/- 2000
	2/15/2011	400000	+/- 2000
	3/7/2011	400000	+/- 2000
	3/14/2011	395000	+/- 2000
	3/21/2011	360000	+/- 2000
	3/28/2011	256000	+/- 1000
	4/4/2011	198000	+/- 1000
	4/11/2011	297000	+/- 1000
	4/18/2011	284000	+/- 1000
	4/25/2011	274000	+/- 1000
	5/2/2011	163000	+/- 1000
	5/9/2011	295000	+/- 1000
	5/16/2011	229000	+/- 1000
	5/23/2011	139000	+/- 1000
	5/31/2011	108000	+/- 1000
	6/6/2011	115000	+/- 1000
	6/13/2011	81200	+/- 700
	6/20/2011	109000	+/- 1000
	6/27/2011	82000	+/- 700
	7/11/2011	66100	+/- 700
	7/21/2011	114000	+/- 1000
	7/25/2011	83900	+/- 800
	8/1/2011	83900	+/- 800
	8/8/2011	92200	+/- 800
	8/15/2011	111000	+/- 1000
	8/22/2011	100000	+/- 1000
	9/1/2011	91300	+/- 800
	9/6/2011	85900	+/- 800
	9/12/2011	59000	+/- 600
	9/19/2011	56400	+/- 600
	9/26/2011	26700	+/- 500
	10/3/2011	48000	+/- 600
	10/11/2011	28100	+/- 500
	10/17/2011	23600	+/- 400
	10/24/2011	33900	+/- 500
	10/31/2011	27500	+/- 500

Sample Location	Date of Sample	Tritium Result (pCi/L)	+/- error
GZ-14S	11/14/2011	41900	+/- 600
	11/21/2011	42600	+/- 600
	11/28/2011	54500	+/- 600
	12/5/2011	120000	+/- 1000
	12/12/2011	31200	+/- 500
	12/19/2011	22400	+/- 400
	12/27/2011	36100	+/- 500
GZ-15	1/4/2011	138000	+/- 1000
	2/8/2011	110000	+/- 1000
	2/14/2011	124000	+/- 1000
	2/22/2011	105000	+/- 1000
	2/28/2011	96900	+/- 800
	3/7/2011	97800	+/- 800
	3/14/2011	92500	+/- 800
	3/21/2011	94200	+/- 800
	3/28/2011	105000	+/- 1000
	4/4/2011	98700	+/- 800
	4/11/2011	110000	+/- 1000
	4/18/2011	111000	+/- 1000
	4/25/2011	112000	+/- 1000
	5/2/2011	108000	+/- 1000
	5/9/2011	120000	+/- 1000
	5/16/2011	120000	+/- 1000
	5/23/2011	117000	+/- 1000
	5/31/2011	116000	+/- 1000
	6/6/2011	116000	+/- 1000
	7/18/2011	98900	+/- 800
	7/25/2011	104000	+/- 1000
	8/2/2011	94500	+/- 800
	8/8/2011	94900	+/- 800
	8/15/2011	91400	+/- 800
	8/24/2011	87800	+/- 800
	9/6/2011	84700	+/- 800
	9/12/2011	79000	+/- 700
	9/19/2011	81600	+/- 700
	9/26/2011	83600	+/- 800
	10/3/2011	82000	+/- 800
	10/11/2011	78600	+/- 700
	10/17/2011	77400	+/- 700

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
GZ-15	10/24/2011	77100 +/- 700
	10/31/2011	74200 +/- 700
	11/14/2011	75100 +/- 700
	12/5/2011	74200 +/- 700
	12/12/2011	78200 +/- 700
	12/19/2011	72800 +/- 700
	12/27/2011	75500 +/- 700
GZ-16	1/4/2011	< 500
	2/7/2011	< 500
	2/14/2011	< 500
	2/22/2011	< 500
	2/28/2011	< 500
	3/7/2011	< 500
	3/14/2011	< 500
	3/21/2011	< 500
	3/28/2011	< 500
	4/4/2011	< 500
	4/11/2011	< 500
	4/18/2011	< 500
	4/25/2011	< 500
	5/2/2011	< 500
	5/9/2011	< 500
	5/16/2011	< 500
	5/23/2011	< 500
	5/31/2011	< 500
	6/6/2011	< 500
	8/1/2011	< 500
	10/3/2011	< 500
	12/5/2011	< 500
GZ-17	1/4/2011	< 500
	2/8/2011	< 500
	3/7/2011	< 500
	4/4/2011	< 500
	5/2/2011	< 500
	6/6/2011	< 500
	8/1/2011	< 500
	10/3/2011	< 500
	12/5/2011	< 500

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
GZ-18D	1/4/2011	< 500
	2/7/2011	< 500
	2/15/2011	< 500
	2/22/2011	< 500
	2/28/2011	< 500
	3/8/2011	< 500
	3/14/2011	< 500
	3/21/2011	< 500
	3/28/2011	< 500
	4/4/2011	< 500
	4/11/2011	< 500
	4/18/2011	< 500
	4/25/2011	< 500
	5/2/2011	< 500
	5/9/2011	< 500
	5/16/2011	< 500
	5/23/2011	< 500
	5/31/2011	< 500
	6/6/2011	< 500
	8/2/2011	< 500
	10/3/2011	709 +/- 202
	12/6/2011	518 +/- 207
GZ-18S	1/4/2011	< 500
	2/7/2011	< 500
	2/14/2011	< 500
	2/22/2011	< 500
	2/28/2011	< 500
	3/7/2011	< 500
	3/14/2011	< 500
	3/21/2011	< 500
	3/28/2011	< 500
	4/4/2011	< 500
	4/11/2011	< 500
	4/18/2011	< 500
	4/25/2011	< 500
	5/2/2011	< 500
	5/9/2011	< 500
	5/16/2011	< 500
	5/23/2011	< 500

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
GZ-18S	5/31/2011	< 500
	6/6/2011	< 500
	8/2/2011	< 500
	10/3/2011	< 500
	12/6/2011	< 500
GZ-19D	2/8/2011	< 500
	5/2/2011	< 500
	8/2/2011	< 500
GZ-19S	2/7/2011	< 500
	5/2/2011	< 500
	8/1/2011	< 500
GZ-20	1/4/2011	711 +/- 202
	2/7/2011	976 +/- 208
	2/28/2011	944 +/- 203
	3/7/2011	916 +/- 208
	4/4/2011	634 +/- 198
	5/2/2011	1150 +/- 210
	6/7/2011	961 +/- 208
	8/2/2011	1970 +/- 220
	9/1/2011	1060 +/- 210
	10/4/2011	< 500
	12/6/2011	< 500
GZ-21	1/4/2011	8010 +/- 300
	2/22/2011	521 +/- 200
	3/8/2011	< 500
	3/14/2011	< 500
	3/21/2011	666 +/- 200
	3/28/2011	6910 +/- 280
	4/4/2011	13200 +/- 300
	4/11/2011	19900 +/- 400
	4/18/2011	21800 +/- 400
	4/25/2011	20900 +/- 400
	5/2/2011	18200 +/- 400
	5/9/2011	18900 +/- 400
	5/16/2011	16700 +/- 400
	5/23/2011	4550 +/- 260
	5/31/2011	13800 +/- 400
	6/6/2011	15800 +/- 400

Sample Location	Date of Sample	Tritium Result (pCi/L)	+/- error
GZ-21	6/13/2011	534	+/- 204
	6/20/2011	10500	+/- 300
	6/27/2011	2490	+/- 230
	7/11/2011	12500	+/- 300
	7/18/2011	13300	+/- 300
	7/25/2011	12600	+/- 300
	8/2/2011	15100	+/- 400
	8/8/2011	9910	+/- 320
	8/15/2011	9680	+/- 320
	8/22/2011	12300	+/- 300
	9/1/2011	10700	+/- 300
	9/6/2011	9230	+/- 310
	9/12/2011	6090	+/- 270
	9/19/2011	8640	+/- 300
	9/26/2011	6000	+/- 280
	10/4/2011	6090	+/- 280
	10/11/2011	7440	+/- 290
	10/17/2011	7050	+/- 290
	10/24/2011	8160	+/- 300
	10/31/2011	6530	+/- 280
	11/14/2011	6290	+/- 280
	11/21/2011	8270	+/- 300
	11/28/2011	6880	+/- 290
	12/6/2011	7940	+/- 300
	12/12/2011	7960	+/- 300
	12/19/2011	6810	+/- 280
	12/27/2011	9130	+/- 310
GZ-22D	1/4/2011	426000	+/- 2000
	2/7/2011	308000	+/- 1000
	2/14/2011	351000	+/- 2000
	3/7/2011	295000	+/- 1000
	3/14/2011	285000	+/- 1000
	3/21/2011	266000	+/- 1000
	3/28/2011	239000	+/- 1000
	4/4/2011	213000	+/- 1000
	4/11/2011	242000	+/- 1000
	4/18/2011	230000	+/- 1000

Sample Location	Date of Sample	Tritium Result (pCi/L)	+/- error
GZ-22D	4/25/2011	218000	1000
	5/2/2011	206000	1000
	5/9/2011	215000	1000
	5/16/2011	203000	1000
	5/23/2011	198000	1000
	5/31/2011	188000	1000
	6/6/2011	184000	1000
	6/13/2011	184000	1000
	6/20/2011	169000	1000
	6/27/2011	167000	1000
	7/11/2011	149000	1000
	7/18/2011	147000	1000
	7/25/2011	140000	1000
	8/1/2011	135000	1000
	8/8/2011	134000	1000
	8/15/2011	129000	1000
	8/22/2011	126000	1000
	9/1/2011	126000	1000
	9/6/2011	119000	1000
	9/12/2011	97700	800
	9/19/2011	104000	1000
	9/26/2011	111000	1000
	10/3/2011	109000	1000
	10/11/2011	101000	1000
	10/17/2011	98700	800
	10/24/2011	98800	800
	10/31/2011	95000	800
	11/14/2011	91300	800
	11/21/2011	91600	800
	11/28/2011	86700	800
	12/5/2011	85500	800
	12/12/2011	81000	800
	12/19/2011	72600	700
	12/27/2011	76600	700
GZ-23S	1/4/2011	< 500	
	1/20/2011	< 500	
	1/24/2011	738	201

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
GZ-23S	1/31/2011	< 500
	2/7/2011	< 500
	2/14/2011	594 +/- 198
	2/22/2011	< 500
	2/28/2011	558 +/- 197
	3/7/2011	< 500
	3/14/2011	676 +/- 201
	3/21/2011	< 500
	3/28/2011	< 500
	4/4/2011	549 +/- 197
	4/11/2011	< 500
	4/18/2011	752 +/- 203
	4/25/2011	< 500
	5/2/2011	< 500
	5/9/2011	< 500
	5/16/2011	< 500
	5/23/2011	< 500
	5/31/2011	< 500
	6/6/2011	< 500
	8/2/2011	< 500
	10/3/2011	< 500
	12/5/2011	< 500
GZ-24S	1/4/2011	1050 +/- 200
	1/20/2011	2850 +/- 230
	1/24/2011	3960 +/- 250
	2/7/2011	1100 +/- 210
	2/14/2011	1350 +/- 210
	2/22/2011	872 +/- 205
	2/28/2011	831 +/- 201
	3/7/2011	540 +/- 202
	3/14/2011	1090 +/- 210
	3/21/2011	556 +/- 199
	3/28/2011	< 500
	4/4/2011	< 500
	4/11/2011	532 +/- 195
	4/18/2011	< 500
	4/25/2011	< 500
	5/2/2011	< 500
	5/9/2011	< 500

Sample Location	Date of Sample	Tritium Result (pCi/L)	+/- error
GZ-24S	5/16/2011	< 500	
	5/23/2011	< 500	
	5/31/2011	578	+/- 204
	6/6/2011	< 500	
	6/13/2011	< 500	
	6/20/2011	< 500	
	6/27/2011	< 500	
	7/11/2011	< 500	
	7/18/2011	< 500	
	7/25/2011	< 500	
	8/1/2011	< 500	
	8/8/2011	< 500	
	8/16/2011	< 500	
	8/22/2011	< 500	
	9/6/2011	< 500	
	9/12/2011	< 500	
	9/19/2011	< 500	
	10/3/2011	< 500	
	10/11/2011	< 500	
	10/17/2011	< 500	
	10/24/2011	< 500	
	10/31/2011	< 500	
	11/14/2011	< 500	
	11/21/2011	< 500	
	11/28/2011	< 500	
	12/5/2011	< 500	
	12/12/2011	< 500	
	12/19/2011	< 500	
	12/27/2011	< 500	
GZ-25S	1/4/2011	< 500	
	2/7/2011	< 500	
	2/14/2011	< 500	
	2/22/2011	< 500	
	2/28/2011	< 500	
	3/7/2011	< 500	
	3/14/2011	< 500	
	3/21/2011	< 500	
	3/28/2011	< 500	

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
GZ-25S	4/4/2011	< 500
	4/11/2011	< 500
	4/18/2011	< 500
	4/25/2011	< 500
	5/2/2011	< 500
	5/9/2011	< 500
	5/16/2011	< 500
	5/23/2011	< 500
	5/31/2011	< 500
	6/6/2011	< 500
	8/1/2011	< 500
	10/3/2011	< 500
	12/5/2011	< 500
GZ-26S	1/4/2011	< 500
	2/7/2011	< 500
	2/14/2011	< 500
	2/22/2011	< 500
	2/28/2011	< 500
	3/7/2011	< 500
	3/14/2011	< 500
	3/21/2011	< 500
	3/28/2011	< 500
	4/4/2011	< 500
	4/11/2011	< 500
	4/18/2011	< 500
	4/25/2011	< 500
	5/2/2011	< 500
	5/9/2011	< 500
	5/16/2011	< 500
	5/23/2011	< 500
	5/31/2011	< 500
	6/6/2011	< 500
	8/1/2011	< 500
	10/3/2011	< 500
	12/5/2011	< 500
GZ-27S	1/4/2011	< 500
	2/7/2011	< 500
	2/14/2011	< 500
	2/22/2011	< 500

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
GZ-27S	2/28/2011	< 500
	3/7/2011	< 500
	3/14/2011	< 500
	3/21/2011	< 500
	3/28/2011	< 500
	4/4/2011	< 500
	4/11/2011	< 500
	4/18/2011	< 500
	4/25/2011	< 500
	5/2/2011	< 500
	5/9/2011	< 500
	5/16/2011	< 500
	5/23/2011	< 500
	5/31/2011	< 500
	6/6/2011	< 500
	8/1/2011	< 500
	10/3/2011	< 500
	12/5/2011	< 500
WVN0201	2/10/2011	< 500
	5/5/2011	< 500
	8/3/2011	< 500
	11/9/2011	< 500
WVN0202	2/10/2011	< 500
	5/5/2011	< 500
	8/3/2011	< 500
	11/9/2011	< 500
WVN0203	2/10/2011	< 500
	5/5/2011	< 500
	8/3/2011	< 500
	11/9/2011	< 500
WVN0204	2/10/2011	< 500
	5/5/2011	< 500
	8/3/2011	< 500
	11/9/2011	< 500
Blodgett Farm	1/4/2011	< 500
	1/24/2011	< 500
	2/7/2011	< 500
	2/14/2011	< 500
	3/15/2011	< 500

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
Blodgett Farm	4/1/2011	< 500
	4/15/2011	< 500
	4/26/2011	< 500
	5/10/2011	< 500
	5/24/2011	< 500
	6/7/2011	< 500
	6/21/2011	< 500
	7/5/2011	< 500
	7/19/2011	< 500
	8/2/2011	< 500
	8/23/2011	< 500
	9/6/2011	< 500
	9/20/2011	< 500
	10/4/2011	< 500
	10/18/2011	< 500
	11/1/2011	< 500
	11/15/2011	< 500
	12/6/2011	< 500
	12/27/2011	< 500
Brattleboro Fire Dept, West Station	1/4/2011	< 500
	1/24/2011	< 500
	2/7/2011	< 500
	2/14/2011	< 500
	3/15/2011	< 500
	4/1/2011	< 500
	4/15/2011	< 500
	4/26/2011	< 500
	5/24/2011	< 500
	6/7/2011	< 500
	6/21/2011	< 500
	7/5/2011	< 500
	7/19/2011	< 500
	8/2/2011	< 500
	8/23/2011	< 500
	9/6/2011	< 500
	9/20/2011	< 500
	10/4/2011	< 500
	10/18/2011	< 500
	11/1/2011	< 500

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
Brattleboro Fire Dept, West Station	11/15/2011	< 500
	12/6/2011	< 500
	12/27/2011	< 500
Miller Farm	1/4/2011	< 500
	1/24/2011	< 500
	2/7/2011	< 500
	2/14/2011	< 500
	3/15/2011	< 500
	4/1/2011	< 500
	4/26/2011	< 500
	5/10/2011	< 500
	5/24/2011	< 500
	6/7/2011	< 500
	6/21/2011	< 500
	7/5/2011	< 500
	7/19/2011	< 500
	8/2/2011	< 500
	8/23/2011	< 500
	9/6/2011	< 500
	9/20/2011	< 500
	10/4/2011	< 500
	10/18/2011	< 500
	11/1/2011	< 500
	11/15/2011	< 500
	12/6/2011	< 500
	12/27/2011	< 500
Residence - 1	1/24/2011	< 500
	2/7/2011	< 500
	2/14/2011	< 500
	3/15/2011	< 500
	4/1/2011	< 500
	4/15/2011	< 500
	4/26/2011	< 500
	5/10/2011	< 500
	6/7/2011	< 500
	6/21/2011	< 500
	7/5/2011	< 500
	7/19/2011	< 500
	8/2/2011	< 500

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
Residence - 1	8/23/2011	< 500
	9/6/2011	< 500
	9/20/2011	< 500
	10/4/2011	< 500
	10/18/2011	< 500
	11/1/2011	< 500
	12/6/2011	< 500
Residence - 2	1/4/2011	< 500
	1/24/2011	< 500
	3/15/2011	< 500
	4/15/2011	< 500
	4/26/2011	< 500
	5/10/2011	< 500
Residence - 3	1/4/2011	< 500
	1/24/2011	< 500
	2/7/2011	< 500
	2/14/2011	< 500
	3/15/2011	< 500
	4/1/2011	< 500
	4/15/2011	< 500
	4/26/2011	< 500
	5/24/2011	< 500
	6/7/2011	< 500
	6/21/2011	< 500
	7/5/2011	< 500
	7/19/2011	< 500
	8/2/2011	< 500
	8/23/2011	< 500
	9/6/2011	< 500
	9/20/2011	< 500
	10/4/2011	< 500
	10/18/2011	< 500
Vernon Elementary School	1/4/2011	< 500
	1/24/2011	< 500
	2/7/2011	< 500
	2/14/2011	< 500
	3/15/2011	< 500
	4/1/2011	< 500

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
Vernon Elementary School	4/15/2011	< 500
	4/26/2011	< 500
	5/10/2011	< 500
	5/24/2011	< 500
	6/7/2011	< 500
	6/21/2011	< 500
	7/5/2011	< 500
	7/19/2011	< 500
	8/2/2011	< 500
	8/23/2011	< 500
	9/6/2011	< 500
	9/20/2011	< 500
	10/4/2011	< 500
	10/18/2011	< 500
	11/1/2011	< 500
	11/15/2011	< 500
	12/6/2011	< 500
Vernon Green Nursing Home	1/4/2011	< 500
	1/24/2011	< 500
	2/7/2011	< 500
	2/14/2011	< 500
	3/15/2011	< 500
	4/1/2011	< 500
	4/26/2011	< 500
	5/10/2011	< 500
	5/24/2011	< 500
	6/7/2011	< 500
	6/21/2011	< 500
	7/5/2011	< 500
	7/19/2011	< 500
	8/2/2011	< 500
	8/23/2011	< 500
	9/6/2011	< 500
	9/20/2011	< 500
	10/4/2011	< 500
	10/18/2011	< 500
	11/1/2011	< 500
	11/15/2011	< 500
	12/6/2011	< 500
	12/27/2011	< 500

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
White House	1/5/2011	< 500
	2/8/2011	< 500
	2/16/2011	< 500
	2/24/2011	< 500
	3/1/2011	< 500
	3/7/2011	< 500
	3/15/2011	< 500
	3/22/2011	< 500
	3/29/2011	< 500
	4/7/2011	< 500
	4/11/2011	< 500
	4/18/2011	< 500
	4/26/2011	< 500
	5/3/2011	< 500
	5/10/2011	< 500
	5/18/2011	< 500
	5/24/2011	< 500
	6/7/2011	< 500
	6/14/2011	< 500
	6/21/2011	< 500
	6/28/2011	< 500
	7/12/2011	< 500
	7/21/2011	< 500
	7/26/2011	< 500
	8/3/2011	< 500
	8/9/2011	< 500
	8/16/2011	< 500
	8/23/2011	< 500
	9/6/2011	< 500
	9/12/2011	< 500
	9/20/2011	< 500
	9/27/2011	< 500
	10/3/2011	< 500
	10/13/2011	< 500
	10/17/2011	< 500
	10/25/2011	< 500
	11/1/2011	< 500
	11/15/2011	< 500
	11/22/2011	< 500
	11/29/2011	< 500

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
White House	12/6/2011	< 500
	12/20/2011	< 500
Main Well	1/6/2011	< 500
	2/8/2011	< 500
	2/16/2011	< 500
	2/24/2011	< 500
	2/28/2011	< 500
	3/14/2011	< 500
	3/22/2011	< 500
	3/28/2011	< 500
	4/4/2011	< 500
	4/11/2011	< 500
	4/18/2011	< 500
	4/26/2011	< 500
	5/2/2011	< 500
	5/11/2011	< 500
	5/18/2011	< 500
	5/24/2011	< 500
	6/6/2011	< 500
	6/14/2011	< 500
	6/21/2011	< 500
	6/27/2011	< 500
	7/11/2011	< 500
	7/21/2011	< 500
	7/25/2011	< 500
	8/4/2011	< 500
	8/10/2011	< 500
	8/16/2011	< 500
	8/22/2011	< 500
	9/7/2011	< 500
	9/13/2011	< 500
	9/20/2011	< 500
	9/26/2011	< 500
	10/4/2011	< 500
	10/12/2011	< 500
	10/17/2011	< 500
	10/24/2011	< 500
	11/1/2011	< 500
	11/16/2011	< 500

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
Main Well	11/22/2011	< 500
	12/1/2011	< 500
	12/7/2011	< 500
	12/15/2011	< 500
	12/21/2011	< 500
PSB Well	1/17/2011	< 500
	2/8/2011	< 500
	2/16/2011	< 500
	2/24/2011	< 500
	3/1/2011	< 500
	3/7/2011	< 500
	3/15/2011	< 500
	3/22/2011	< 500
	3/29/2011	< 500
	4/7/2011	< 500
	4/11/2011	< 500
	4/18/2011	< 500
	4/26/2011	< 500
	5/3/2011	< 500
	5/10/2011	< 500
	5/18/2011	< 500
	5/24/2011	< 500
	6/7/2011	< 500
	6/14/2011	< 500
	6/21/2011	< 500
	6/28/2011	< 500
	7/12/2011	< 500
	7/21/2011	< 500
	7/26/2011	< 500
	8/4/2011	< 500
	8/9/2011	< 500
	8/16/2011	< 500
	8/23/2011	< 500
	9/6/2011	< 500
	9/12/2011	< 500
	9/20/2011	< 500
	9/27/2011	< 500
	10/3/2011	< 500
	10/13/2011	< 500
	10/17/2011	< 500

Sample Location	Date of Sample	Tritium Result +/- error (pCi/L)
PSB Well	10/25/2011	< 500
	11/1/2011	< 500
	11/15/2011	< 500
	11/22/2011	< 500
	11/29/2011	< 500
	12/6/2011	< 500
	12/20/2011	< 500
Southwest Well	6/21/2011	< 500
	6/28/2011	< 500
	7/12/2011	< 500
	7/19/2011	< 500
	7/25/2011	< 500
	8/4/2011	< 500
	9/28/2011	< 500
	12/14/2011	< 500
pCi/L = picocuries per liter		

Appendix C

2011 Gamma Spectroscopy Water Data

Gamma spectroscopy data for all water samples tested by the Health Department in 2011 are provided in this appendix. Results are presented in order by sample location and by sampling date based on the following categories:

- Connecticut River samples
- On-site groundwater monitoring wells
- Off-site drinking water wells
- On-site drinking water wells

Natural means that gamma-emitting materials detected are not related to nuclear power stations or above-grounds weapons testing.

< LLD means less than the Laboratory's Lower Limit if Detection.

Sample Location	Date of Sample	Gamma Spectroscopy Result
3-3 Connecticut River Station	1/14/2011	<LLD
	2/16/2011	<LLD
	3/16/2011	<LLD
	4/14/2011	<LLD
	5/13/2011	<LLD
	6/15/2011	<LLD
	7/13/2011	<LLD
	8/15/2011	<LLD
	9/14/2011	<LLD
	10/13/2011	<LLD
	11/14/2011	<LLD
	12/15/2011	<LLD
3-4 Connecticut River Station	1/13/2011	<LLD
	2/16/2011	<LLD
	3/16/2011	<LLD
	4/14/2011	<LLD
	5/13/2011	<LLD
	6/15/2011	<LLD
	7/13/2011	<LLD
	8/15/2011	<LLD
	9/14/2011	<LLD
	10/13/2011	<LLD
	11/14/2011	<LLD
	12/15/2011	<LLD
3-8 Connecticut River Station	1/14/2011	<LLD
	2/16/2011	<LLD
	3/16/2011	<LLD
	4/13/2011	<LLD
	5/13/2011	<LLD
	6/15/2011	<LLD
	7/13/2011	<LLD
	8/15/2011	<LLD
	9/14/2011	<LLD
	10/13/2011	<LLD
	11/14/2011	<LLD
	12/15/2011	<LLD
Upstream of the VY River Discharge	1/4/2011	<LLD
	2/7/2011	<LLD
	2/14/2011	<LLD

Sample Location	Date of Sample	Gamma Spectroscopy Result
Upstream of the VY River Discharge	2/28/2011	<LLD
	3/14/2011	<LLD
	3/28/2011	<LLD
	4/25/2011	<LLD
	5/23/2011	<LLD
	6/6/2011	<LLD
	6/20/2011	<LLD
	7/11/2011	<LLD
	7/18/2011	<LLD
	7/25/2011	<LLD
	8/8/2011	<LLD
	8/15/2011	<LLD
	8/17/2011	<LLD
(30 feet from river's edge, same location)	8/17/2011	<LLD
	8/18/2011	Natural
	8/22/2011	<LLD
	8/24/2011	<LLD
	9/8/2011	<LLD
	9/12/2011	<LLD
	9/15/2011	<LLD
	9/19/2011	<LLD
	9/21/2011	<LLD
	9/26/2011	<LLD
	9/28/2011	<LLD
	10/3/2011	<LLD
	10/6/2011	<LLD
	10/11/2011	<LLD
	10/13/2011	<LLD
	10/17/2011	<LLD
	10/20/2011	<LLD
	10/24/2011	<LLD
	10/27/2011	Natural
	10/31/2011	<LLD
	11/3/2011	<LLD
	11/10/2011	<LLD
	11/14/2011	<LLD
	11/17/2011	<LLD
	11/21/2011	<LLD
	11/28/2011	<LLD
	12/1/2011	<LLD

Sample Location	Date of Sample	Gamma Spectroscopy Result
Upstream of the VY River Discharge	12/5/2011	<LLD
	12/8/2011	<LLD
	12/12/2011	<LLD
	12/15/2011	<LLD
	12/19/2011	<LLD
	12/22/2011	<LLD
	12/27/2011	<LLD
	12/29/2011	<LLD
Connecticut River Downstream	1/4/2011	Natural
	1/24/2011	<LLD
	2/7/2011	<LLD
	2/14/2011	<LLD
	3/15/2011	<LLD
	4/1/2011	<LLD
	4/15/2011	<LLD
	4/26/2011	<LLD
	5/10/2011	<LLD
	5/24/2011	<LLD
	6/7/2011	<LLD
	6/21/2011	<LLD
	7/5/2011	<LLD
	7/19/2011	<LLD
	8/2/2011	<LLD
	8/23/2011	<LLD
	9/6/2011	<LLD
	9/20/2011	Natural
	10/4/2011	<LLD
	10/18/2011	<LLD
	11/1/2011	<LLD
	11/15/2011	<LLD
	12/6/2011	Natural
	12/27/2011	<LLD
Connecticut River Upstream	1/4/2011	Natural
	3/15/2011	<LLD
	4/1/2011	<LLD
	4/15/2011	<LLD
	4/26/2011	<LLD
	5/10/2011	<LLD
	5/24/2011	<LLD
	6/7/2011	<LLD

Sample Location	Date of Sample	Gamma Spectroscopy Result
Connecticut River Upstream	6/21/2011	<LLD
	7/5/2011	<LLD
	7/19/2011	<LLD
	8/2/2011	<LLD
	8/23/2011	<LLD
	9/6/2011	Natural
	9/20/2011	<LLD
	10/4/2011	<LLD
	10/18/2011	<LLD
	11/1/2011	<LLD
	11/15/2011	<LLD
	12/6/2011	<LLD
	12/27/2011	<LLD
Discharge Forebay	1/13/2011	<LLD
	2/16/2011	<LLD
	3/16/2011	<LLD
	4/14/2011	<LLD
	5/13/2011	<LLD
	6/15/2011	<LLD
	7/13/2011	<LLD
	8/15/2011	<LLD
	9/14/2011	<LLD
	10/13/2011	<LLD
	11/14/2011	Natural
	12/15/2011	<LLD
GZ-01	1/20/2011	<LLD
	1/24/2011	<LLD
	1/31/2011	<LLD
	2/7/2011	<LLD
	2/14/2011	<LLD
	2/28/2011	<LLD
	3/14/2011	<LLD
	3/28/2011	<LLD
	4/25/2011	<LLD
	5/23/2011	<LLD
	5/31/2011	<LLD
	6/6/2011	<LLD
	8/1/2011	<LLD
	10/3/2011	<LLD
	12/5/2011	<LLD

Sample Location	Date of Sample	Gamma Spectroscopy Result
GZ-02	1/4/2011	<LLD
	1/20/2011	<LLD
	1/24/2011	<LLD
	1/31/2011	<LLD
	2/7/2011	Natural
	2/14/2011	<LLD
	2/28/2011	<LLD
	3/14/2011	<LLD
	3/28/2011	<LLD
	4/25/2011	<LLD
	5/23/2011	<LLD
	6/6/2011	<LLD
	8/1/2011	<LLD
	10/3/2011	<LLD
	12/5/2011	<LLD
GZ-03	1/4/2011	<LLD
	2/7/2011	<LLD
	2/15/2011	<LLD
	2/28/2011	<LLD
	3/14/2011	<LLD
	4/25/2011	<LLD
	5/23/2011	<LLD
	6/6/2011	<LLD
	7/18/2011	<LLD
	7/25/2011	<LLD
	8/1/2011	<LLD
	8/8/2011	<LLD
	8/15/2011	<LLD
	8/22/2011	<LLD
	9/1/2011	<LLD
	9/6/2011	<LLD
	9/12/2011	<LLD
	9/19/2011	<LLD
	9/26/2011	<LLD
	10/3/2011	<LLD
	10/11/2011	<LLD
	10/17/2011	<LLD
	10/24/2011	<LLD
	10/31/2011	<LLD
	11/14/2011	<LLD

Sample Location	Date of Sample	Gamma Spectroscopy Result
GZ-03	11/21/2011	<LLD
	11/28/2011	<LLD
	12/5/2011	<LLD
	12/12/2011	<LLD
	12/19/2011	<LLD
	12/27/2011	<LLD
GZ-04	1/4/2011	<LLD
	2/7/2011	<LLD
	2/14/2011	<LLD
	2/28/2011	<LLD
	3/14/2011	<LLD
	4/25/2011	<LLD
	5/23/2011	<LLD
	6/6/2011	<LLD
	8/1/2011	<LLD
	9/1/2011	<LLD
	10/3/2011	<LLD
	12/5/2011	<LLD
GZ-05	1/4/2011	<LLD
	2/7/2011	<LLD
	3/28/2011	<LLD
	5/2/2011	<LLD
	6/6/2011	<LLD
	8/1/2011	<LLD
	10/3/2011	<LLD
	12/5/2011	<LLD
GZ-06	1/4/2011	<LLD
	1/20/2011	Natural
	1/24/2011	Natural
	1/31/2011	<LLD
	2/7/2011	<LLD
	2/14/2011	<LLD
	2/28/2011	<LLD
	3/14/2011	<LLD
	3/28/2011	<LLD
	4/25/2011	<LLD
	5/23/2011	<LLD
	6/6/2011	<LLD
	6/20/2011	<LLD
	7/11/2011	<LLD

Sample Location	Date of Sample	Gamma Spectroscopy Result
GZ-06	7/18/2011	<LLD
	8/1/2011	<LLD
	8/8/2011	<LLD
	8/16/2011	<LLD
	8/22/2011	<LLD
	9/6/2011	<LLD
	9/12/2011	<LLD
	9/19/2011	<LLD
	9/26/2011	<LLD
	10/3/2011	<LLD
	10/11/2011	<LLD
	10/17/2011	<LLD
	10/24/2011	<LLD
	10/31/2011	<LLD
	11/14/2011	<LLD
	11/21/2011	<LLD
	11/28/2011	<LLD
	12/5/2011	<LLD
	12/12/2011	<LLD
	12/19/2011	<LLD
	12/27/2011	<LLD
GZ-07	1/4/2011	<LLD
	2/7/2011	<LLD
	2/14/2011	<LLD
	2/22/2011	<LLD
	2/28/2011	<LLD
	3/14/2011	<LLD
	3/21/2011	<LLD
	4/25/2011	<LLD
	5/23/2011	<LLD
	6/6/2011	<LLD
	6/20/2011	<LLD
	7/18/2011	<LLD
	7/25/2011	<LLD
	8/2/2011	<LLD
	8/8/2011	<LLD
	8/15/2011	<LLD
	8/22/2011	<LLD
	9/1/2011	<LLD
	9/6/2011	<LLD

Sample Location	Date of Sample	Gamma Spectroscopy Result
GZ-07	9/12/2011	<LLD
	9/19/2011	<LLD
	9/26/2011	<LLD
	10/4/2011	<LLD
	10/11/2011	<LLD
	10/17/2011	<LLD
	10/24/2011	<LLD
	10/31/2011	<LLD
	11/14/2011	<LLD
	11/21/2011	<LLD
	11/28/2011	<LLD
	12/6/2011	<LLD
	12/12/2011	<LLD
	12/27/2011	<LLD
GZ-09	1/4/2011	<LLD
	2/7/2011	<LLD
	5/2/2011	<LLD
	6/6/2011	<LLD
	8/1/2011	<LLD
	10/3/2011	<LLD
	12/5/2011	<LLD
GZ-10	1/4/2011	<LLD
	2/8/2011	<LLD
	2/15/2011	<LLD
	2/28/2011	<LLD
	3/14/2011	<LLD
	3/28/2011	<LLD
	4/25/2011	<LLD
	5/23/2011	<LLD
	6/6/2011	<LLD
	8/1/2011	<LLD
	9/1/2011	<LLD
	9/26/2011	<LLD
	10/3/2011	<LLD
	12/5/2011	<LLD
GZ-11	1/4/2011	<LLD
	2/7/2011	<LLD
	5/2/2011	Natural
	6/6/2011	<LLD
	8/2/2011	<LLD

Sample Location	Date of Sample	Gamma Spectroscopy Result
GZ-11	10/3/2011	<LLD
	12/6/2011	<LLD
GZ-12D	1/4/2011	<LLD
	2/7/2011	Natural
	2/14/2011	<LLD
	2/28/2011	<LLD
	3/14/2011	Natural
	4/25/2011	<LLD
	5/23/2011	<LLD
	6/6/2011	<LLD
	6/20/2011	<LLD
	7/18/2011	<LLD
	7/25/2011	<LLD
	8/1/2011	<LLD
	8/8/2011	<LLD
	8/16/2011	<LLD
	8/22/2011	<LLD
	9/1/2011	<LLD
	9/6/2011	<LLD
	9/12/2011	<LLD
	9/19/2011	<LLD
	9/26/2011	<LLD
	10/3/2011	<LLD
	10/11/2011	<LLD
	10/17/2011	<LLD
	10/24/2011	<LLD
	11/14/2011	<LLD
	11/21/2011	<LLD
	11/28/2011	<LLD
	12/5/2011	<LLD
	12/12/2011	<LLD
	12/19/2011	<LLD
	12/27/2011	<LLD
GZ-12S	1/4/2011	<LLD
	2/7/2011	<LLD
	2/14/2011	<LLD
	2/22/2011	<LLD
	2/28/2011	<LLD
	3/14/2011	<LLD
	3/28/2011	<LLD

Sample Location	Date of Sample	Gamma Spectroscopy Result
GZ-12S	4/25/2011	<LLD
	5/23/2011	<LLD
	6/6/2011	<LLD
	8/1/2011	<LLD
	9/1/2011	<LLD
	10/3/2011	<LLD
	12/5/2011	<LLD
GZ-13D	1/4/2011	<LLD
	2/7/2011	<LLD
	2/15/2011	<LLD
	2/22/2011	<LLD
	2/28/2011	<LLD
	3/14/2011	<LLD
	4/25/2011	<LLD
	5/23/2011	<LLD
	6/6/2011	<LLD
	8/2/2011	<LLD
	9/2/2011	<LLD
	10/3/2011	<LLD
	12/6/2011	<LLD
GZ-13S	1/4/2011	<LLD
	2/7/2011	<LLD
	2/15/2011	<LLD
	2/28/2011	<LLD
	3/14/2011	<LLD
	3/28/2011	<LLD
	4/25/2011	<LLD
	5/23/2011	<LLD
	6/6/2011	<LLD
	8/2/2011	<LLD
	10/3/2011	<LLD
	12/6/2011	<LLD
GZ-14D	1/4/2011	<LLD
	2/7/2011	<LLD
	2/14/2011	<LLD
	2/28/2011	<LLD
	3/14/2011	<LLD
	3/28/2011	<LLD
	4/25/2011	<LLD
	5/23/2011	<LLD

Sample Location	Date of Sample	Gamma Spectroscopy Result
GZ-14D	6/6/2011	<LLD
	6/20/2011	<LLD
	7/18/2011	<LLD
	7/25/2011	<LLD
	8/1/2011	Natural
	8/8/2011	<LLD
	8/15/2011	<LLD
	8/22/2011	<LLD
	9/1/2011	<LLD
	9/6/2011	<LLD
	9/12/2011	<LLD
	9/19/2011	<LLD
	9/26/2011	<LLD
	10/3/2011	<LLD
	10/11/2011	<LLD
	10/17/2011	<LLD
	10/24/2011	<LLD
	10/31/2011	<LLD
	11/14/2011	<LLD
	11/21/2011	<LLD
	11/28/2011	<LLD
	12/5/2011	<LLD
	12/12/2011	<LLD
	12/19/2011	<LLD
	12/27/2011	<LLD
GZ-14S	1/5/2011	<LLD
	2/7/2011	<LLD
	2/15/2011	<LLD
	3/14/2011	<LLD
	4/25/2011	<LLD
	5/23/2011	<LLD
	6/6/2011	<LLD
	6/20/2011	<LLD
	7/21/2011	<LLD
	7/25/2011	<LLD
	8/1/2011	<LLD
	8/8/2011	<LLD
	8/15/2011	<LLD
	8/22/2011	<LLD
	9/1/2011	<LLD

Sample Location	Date of Sample	Gamma Spectroscopy Result
GZ-14S	9/6/2011	<LLD
	9/12/2011	<LLD
	9/19/2011	<LLD
	9/26/2011	<LLD
	10/3/2011	<LLD
	10/11/2011	<LLD
	10/17/2011	<LLD
	10/24/2011	<LLD
	10/31/2011	<LLD
	11/14/2011	<LLD
	11/21/2011	<LLD
	11/28/2011	<LLD
	12/5/2011	<LLD
	12/12/2011	<LLD
	12/19/2011	<LLD
	12/27/2011	<LLD
GZ-15	1/4/2011	<LLD
	2/8/2011	<LLD
	2/14/2011	<LLD
	2/28/2011	<LLD
	3/14/2011	<LLD
	4/25/2011	<LLD
	5/23/2011	<LLD
	6/6/2011	<LLD
	7/18/2011	<LLD
	7/25/2011	<LLD
	8/2/2011	<LLD
	8/8/2011	<LLD
	8/15/2011	<LLD
	8/24/2011	<LLD
	9/6/2011	<LLD
	9/12/2011	<LLD
	9/19/2011	<LLD
	9/26/2011	<LLD
	10/3/2011	<LLD
	10/11/2011	<LLD
	10/17/2011	<LLD
	10/24/2011	<LLD
	10/31/2011	<LLD
	11/14/2011	<LLD

Sample Location	Date of Sample	Gamma Spectroscopy Result
GZ-15	12/5/2011	<LLD
	12/12/2011	<LLD
	12/19/2011	<LLD
	12/27/2011	<LLD
GZ-16	1/4/2011	<LLD
	2/7/2011	<LLD
	2/14/2011	<LLD
	2/28/2011	<LLD
	3/14/2011	<LLD
	3/28/2011	<LLD
	4/25/2011	<LLD
	5/23/2011	<LLD
	6/6/2011	<LLD
	8/1/2011	<LLD
	10/3/2011	<LLD
	12/5/2011	<LLD
GZ-17	1/4/2011	<LLD
	2/8/2011	<LLD
	5/2/2011	<LLD
	6/6/2011	<LLD
	8/1/2011	<LLD
	10/3/2011	<LLD
	12/5/2011	<LLD
GZ-18D	1/4/2011	<LLD
	2/7/2011	<LLD
	2/15/2011	<LLD
	2/28/2011	<LLD
	3/14/2011	<LLD
	3/28/2011	<LLD
	4/25/2011	<LLD
	5/23/2011	<LLD
	6/6/2011	<LLD
	8/2/2011	<LLD
	10/3/2011	<LLD
	12/6/2011	<LLD
GZ-18S	1/4/2011	<LLD
	2/7/2011	<LLD
	2/14/2011	<LLD
	2/28/2011	<LLD
	3/14/2011	<LLD

Sample Location	Date of Sample	Gamma Spectroscopy Result
GZ-18S	3/28/2011	<LLD
	4/25/2011	<LLD
	5/23/2011	<LLD
	6/6/2011	<LLD
	8/2/2011	<LLD
	10/3/2011	<LLD
	12/6/2011	<LLD
GZ-19D	2/8/2011	<LLD
	5/2/2011	<LLD
	8/2/2011	Natural
GZ-19S	2/7/2011	<LLD
	5/2/2011	<LLD
	8/1/2011	<LLD
GZ-20	1/4/2011	<LLD
	2/7/2011	<LLD
	2/28/2011	<LLD
	5/2/2011	<LLD
	6/7/2011	<LLD
	8/2/2011	<LLD
	9/1/2011	<LLD
	10/4/2011	<LLD
	12/6/2011	<LLD
GZ-21	1/4/2011	<LLD
	2/22/2011	<LLD
	3/8/2011	<LLD
	3/14/2011	<LLD
	3/28/2011	<LLD
	4/25/2011	<LLD
	5/23/2011	<LLD
	6/6/2011	<LLD
	6/20/2011	<LLD
	7/18/2011	<LLD
	7/25/2011	<LLD
	8/2/2011	<LLD
	8/8/2011	<LLD
	8/15/2011	<LLD
	8/22/2011	<LLD
	9/1/2011	<LLD
	9/6/2011	<LLD
	9/12/2011	<LLD

Sample Location	Date of Sample	Gamma Spectroscopy Result
GZ-21	9/19/2011	<LLD
	9/26/2011	<LLD
	10/4/2011	<LLD
	10/11/2011	<LLD
	10/17/2011	<LLD
	10/24/2011	<LLD
	10/31/2011	<LLD
	11/14/2011	<LLD
	11/21/2011	<LLD
	11/28/2011	<LLD
	12/6/2011	<LLD
	12/12/2011	<LLD
	12/19/2011	<LLD
	12/27/2011	<LLD
GZ-22D	1/4/2011	<LLD
	2/7/2011	Natural
	2/14/2011	<LLD
	3/14/2011	<LLD
	4/25/2011	<LLD
	5/23/2011	<LLD
	6/6/2011	<LLD
	6/20/2011	<LLD
	7/18/2011	<LLD
	7/25/2011	<LLD
	8/1/2011	<LLD
	8/8/2011	<LLD
	8/15/2011	<LLD
	8/22/2011	<LLD
	9/1/2011	<LLD
	9/6/2011	<LLD
	9/12/2011	<LLD
	9/19/2011	<LLD
	9/26/2011	<LLD
	10/3/2011	<LLD
	10/11/2011	<LLD
	10/17/2011	<LLD
	10/24/2011	<LLD
	10/31/2011	<LLD
	11/14/2011	<LLD
	11/21/2011	<LLD

Sample Location	Date of Sample	Gamma Spectroscopy Result
GZ-22D	11/28/2011	<LLD
	12/5/2011	<LLD
	12/12/2011	<LLD
	12/19/2011	<LLD
	12/27/2011	<LLD
GZ-23S	1/4/2011	Natural
	1/20/2011	Natural
	1/24/2011	<LLD
	1/31/2011	<LLD
	2/7/2011	Natural
	2/14/2011	<LLD
	2/22/2011	<LLD
	2/28/2011	Natural
	3/14/2011	<LLD
	3/28/2011	<LLD
	4/25/2011	<LLD
	5/23/2011	<LLD
	6/6/2011	<LLD
	8/2/2011	<LLD
	10/3/2011	<LLD
	12/5/2011	<LLD
GZ-24S	1/4/2011	<LLD
	1/20/2011	Natural
	1/24/2011	<LLD
	2/7/2011	Natural
	2/14/2011	<LLD
	2/22/2011	<LLD
	2/28/2011	<LLD
	3/14/2011	<LLD
	3/28/2011	<LLD
	4/25/2011	<LLD
	5/23/2011	<LLD
	6/6/2011	<LLD
	6/20/2011	<LLD
	7/11/2011	<LLD
	7/18/2011	<LLD
	8/1/2011	<LLD
	8/8/2011	<LLD
	8/16/2011	<LLD
	8/22/2011	<LLD

Sample Location	Date of Sample	Gamma Spectroscopy Result
GZ-24S	9/6/2011	<LLD
	9/12/2011	<LLD
	9/19/2011	<LLD
	10/3/2011	<LLD
	10/11/2011	<LLD
	10/17/2011	<LLD
	10/24/2011	<LLD
	10/31/2011	<LLD
	11/14/2011	<LLD
	11/21/2011	<LLD
	11/28/2011	<LLD
	12/5/2011	<LLD
	12/12/2011	<LLD
	12/19/2011	<LLD
	12/27/2011	<LLD
GZ-25S	1/4/2011	Natural
	2/7/2011	<LLD
	2/14/2011	<LLD
	2/28/2011	<LLD
	3/14/2011	<LLD
	3/28/2011	<LLD
	4/25/2011	<LLD
	5/23/2011	<LLD
	6/6/2011	<LLD
	8/1/2011	<LLD
	10/3/2011	<LLD
	12/5/2011	<LLD
GZ-26S	1/4/2011	<LLD
	2/7/2011	<LLD
	2/14/2011	<LLD
	2/28/2011	<LLD
	3/14/2011	<LLD
	3/28/2011	<LLD
	4/25/2011	<LLD
	5/23/2011	<LLD
	6/6/2011	<LLD
	8/1/2011	<LLD
	10/3/2011	<LLD
	12/5/2011	<LLD
GZ-27S	1/4/2011	<LLD

Sample Location	Date of Sample	Gamma Spectroscopy Result
GZ-27S	2/7/2011	<LLD
	2/14/2011	<LLD
	2/28/2011	<LLD
	3/14/2011	<LLD
	3/28/2011	<LLD
	4/25/2011	<LLD
	5/23/2011	<LLD
	6/6/2011	Natural
	8/1/2011	<LLD
	10/3/2011	Natural
	12/5/2011	<LLD
WVN0201	2/10/2011	<LLD
	5/5/2011	<LLD
	8/3/2011	<LLD
	11/9/2011	<LLD
WVN0202	2/10/2011	<LLD
	5/5/2011	<LLD
	8/3/2011	<LLD
	11/9/2011	<LLD
WVN0203	2/10/2011	<LLD
	5/5/2011	<LLD
	8/3/2011	<LLD
	11/9/2011	<LLD
WVN0204	2/10/2011	<LLD
	5/5/2011	<LLD
	8/3/2011	Natural
	11/9/2011	<LLD
Blodgett Farm	1/4/2011	Natural
	1/24/2011	Natural
	2/7/2011	Natural
	2/14/2011	Natural
	3/15/2011	Natural
	4/1/2011	Natural
	4/15/2011	Natural
	4/26/2011	<LLD
	5/10/2011	Natural
	5/24/2011	Natural
	6/7/2011	Natural
	6/21/2011	Natural
	7/5/2011	Natural

Sample Location	Date of Sample	Gamma Spectroscopy Result
Blodgett Farm	7/19/2011	Natural
	8/2/2011	Natural
	8/23/2011	<LLD
	9/6/2011	Natural
	9/20/2011	Natural
	10/4/2011	Natural
	10/18/2011	<LLD
	11/1/2011	Natural
	11/15/2011	<LLD
	12/6/2011	Natural
	12/27/2011	Natural
Brattleboro Fire Dept., West Station	1/4/2011	Natural
	1/24/2011	<LLD
	2/7/2011	<LLD
	2/14/2011	<LLD
	3/15/2011	<LLD
	4/1/2011	<LLD
	4/15/2011	<LLD
	4/26/2011	<LLD
	5/24/2011	<LLD
	6/7/2011	<LLD
	6/21/2011	<LLD
	7/5/2011	<LLD
	7/19/2011	<LLD
	8/2/2011	<LLD
	8/23/2011	<LLD
	9/6/2011	<LLD
	9/20/2011	<LLD
	10/4/2011	<LLD
	10/18/2011	<LLD
	11/1/2011	<LLD
	11/15/2011	<LLD
	12/6/2011	<LLD
	12/27/2011	<LLD
Miller Farm	1/4/2011	Natural
	1/24/2011	<LLD
	2/7/2011	<LLD
	2/14/2011	<LLD
	3/15/2011	Natural
	4/1/2011	<LLD

Sample Location	Date of Sample	Gamma Spectroscopy Result
Miller Farm	4/26/2011	<LLD
	5/10/2011	Natural
	5/24/2011	<LLD
	6/7/2011	Natural
	6/21/2011	<LLD
	7/5/2011	Natural
	7/19/2011	<LLD
	8/2/2011	Natural
	8/23/2011	<LLD
	9/6/2011	<LLD
	9/20/2011	Natural
	10/4/2011	Natural
	10/18/2011	<LLD
	11/1/2011	<LLD
	11/15/2011	<LLD
	12/6/2011	Natural
	12/27/2011	Natural
Residence - 1	1/24/2011	<LLD
	2/7/2011	Natural
	2/14/2011	<LLD
	3/15/2011	Natural
	4/1/2011	<LLD
	4/15/2011	<LLD
	4/26/2011	<LLD
	5/10/2011	Natural
	6/7/2011	Natural
	6/21/2011	<LLD
	7/5/2011	<LLD
	7/19/2011	<LLD
	8/2/2011	Natural
	8/23/2011	<LLD
	9/6/2011	<LLD
	9/20/2011	Natural
	10/4/2011	<LLD
	10/18/2011	<LLD
	11/1/2011	<LLD
	12/6/2011	Natural
Residence - 2	1/4/2011	Natural
	1/24/2011	<LLD
	3/15/2011	<LLD

Sample Location	Date of Sample	Gamma Spectroscopy Result
Residence - 2	4/15/2011	<LLD
	4/26/2011	<LLD
	5/10/2011	<LLD
Residence - 3	1/4/2011	Natural
	1/24/2011	<LLD
	2/7/2011	Natural
	2/14/2011	<LLD
	3/15/2011	Natural
	4/1/2011	<LLD
	4/15/2011	<LLD
	4/26/2011	<LLD
	5/24/2011	Natural
	6/7/2011	<LLD
	6/21/2011	<LLD
	7/5/2011	Natural
	7/19/2011	Natural
	8/2/2011	Natural
	8/23/2011	<LLD
	9/6/2011	<LLD
	9/20/2011	Natural
	10/4/2011	<LLD
	10/18/2011	<LLD
Vernon Elementary School	1/4/2011	Natural
	1/24/2011	<LLD
	2/7/2011	<LLD
	2/14/2011	Natural
	3/15/2011	Natural
	4/1/2011	Natural
	4/15/2011	<LLD
	4/26/2011	<LLD
	5/10/2011	Natural
	5/24/2011	Natural
	6/7/2011	Natural
	6/21/2011	<LLD
	7/5/2011	Natural
	7/19/2011	<LLD
	8/2/2011	<LLD
	8/23/2011	<LLD
	9/6/2011	<LLD
	9/20/2011	Natural

Sample Location	Date of Sample	Gamma Spectroscopy Result
Vernon Elementary School	10/4/2011	Natural
	10/18/2011	<LLD
	11/1/2011	<LLD
	11/15/2011	<LLD
	12/6/2011	Natural
Vernon Green Nursing Home	1/4/2011	Natural
	1/24/2011	<LLD
	2/7/2011	Natural
	2/14/2011	<LLD
	3/15/2011	Natural
	4/1/2011	<LLD
	4/26/2011	<LLD
	5/10/2011	Natural
	5/24/2011	Natural
	6/7/2011	Natural
	6/21/2011	<LLD
	7/5/2011	Natural
	7/19/2011	Natural
	8/2/2011	Natural
	8/23/2011	<LLD
	9/6/2011	Natural
	9/20/2011	Natural
	10/4/2011	<LLD
	10/18/2011	<LLD
	11/1/2011	<LLD
	11/15/2011	<LLD
	12/6/2011	Natural
	12/27/2011	Natural
White House	1/5/2011	<LLD
	2/8/2011	<LLD
	2/16/2011	<LLD
	3/1/2011	<LLD
	3/15/2011	<LLD
	3/29/2011	<LLD
	4/26/2011	<LLD
	5/24/2011	<LLD
	6/7/2011	<LLD
	6/21/2011	<LLD
	7/12/2011	<LLD
	7/21/2011	<LLD

Sample Location	Date of Sample	Gamma Spectroscopy Result
White House	8/3/2011	<LLD
	8/9/2011	<LLD
	8/16/2011	<LLD
	8/23/2011	<LLD
	9/6/2011	<LLD
	9/12/2011	<LLD
	9/20/2011	<LLD
	9/27/2011	<LLD
	10/3/2011	<LLD
	10/13/2011	<LLD
	10/17/2011	<LLD
	10/25/2011	<LLD
	11/1/2011	<LLD
	11/15/2011	<LLD
	11/22/2011	<LLD
	11/29/2011	<LLD
	12/6/2011	<LLD
	12/20/2011	<LLD
Main Well	1/6/2011	<LLD
	2/8/2011	Natural
	2/16/2011	<LLD
	2/28/2011	<LLD
	3/14/2011	<LLD
	3/28/2011	<LLD
	4/26/2011	<LLD
	5/24/2011	Natural
	6/6/2011	<LLD
	6/21/2011	<LLD
	7/11/2011	<LLD
	7/21/2011	<LLD
	8/4/2011	<LLD
	8/10/2011	<LLD
	8/16/2011	<LLD
	8/22/2011	<LLD
	9/7/2011	<LLD
	9/13/2011	<LLD
	9/20/2011	<LLD
	9/26/2011	<LLD
	10/4/2011	<LLD
	10/12/2011	<LLD

Sample Location	Date of Sample	Gamma Spectroscopy Result
Main Well	10/17/2011	<LLD
	10/24/2011	<LLD
	11/1/2011	<LLD
	11/16/2011	<LLD
	11/22/2011	<LLD
	12/1/2011	<LLD
	12/7/2011	<LLD
	12/15/2011	<LLD
	12/21/2011	<LLD
PSB Well	1/17/2011	<LLD
	2/8/2011	Natural
	2/16/2011	<LLD
	3/1/2011	<LLD
	3/15/2011	<LLD
	3/29/2011	<LLD
	4/26/2011	<LLD
	5/24/2011	Natural
	6/7/2011	<LLD
	6/21/2011	<LLD
	7/12/2011	<LLD
	7/21/2011	<LLD
	8/4/2011	<LLD
	8/9/2011	<LLD
	8/16/2011	<LLD
	8/23/2011	<LLD
	9/6/2011	<LLD
	9/12/2011	<LLD
	9/20/2011	<LLD
	9/27/2011	<LLD
	10/3/2011	<LLD
	10/13/2011	<LLD
	10/17/2011	<LLD
	10/25/2011	<LLD
	11/1/2011	<LLD
	11/15/2011	<LLD
	11/22/2011	<LLD
	11/29/2011	<LLD
	12/6/2011	<LLD
	12/20/2011	<LLD
Southwest Well	6/21/2011	<LLD

Sample Location	Date of Sample	Gamma Spectroscopy Result
Southwest Well	7/12/2011	<LLD
	7/19/2011	<LLD
	8/4/2011	<LLD
	9/28/2011	<LLD
	12/14/2011	<LLD

Appendix D

2011 Hard-to-Detect Water Results

Hard-to-detect metal results for all water samples tested by the Health Department in 2011 are provided in this appendix. Results are presented in alphabetical order by sample location and by sampling date based on the following categories:

- Connecticut River samples
- On-site groundwater monitoring wells
- Off-site drinking water wells
- On-site drinking water wells

Lower limit of detections (LLDs) for water samples:

Iron-55: 50 pCi/L

Nickel-63: 5.0 pCi/L

Strontium-90[1]: 2.0 pCi/L

[1] Strontium-89 lower limit of detection varied due to shorter half-life.

Sample Location	Sample Date	Hard-to Detect Results	Sample Date	Hard-to Detect Results
3-3 Connecticut River Station	3/16/2011	< LLD	8/15/2011	< LLD
	6/15/2011	< LLD	11/14/2011	< LLD
3-4 Connecticut River Station	3/16/2011	< LLD	8/15/2011	< LLD
	6/15/2011	< LLD	11/14/2011	< LLD
3-8 Connecticut River Station	3/16/2011	< LLD	8/15/2011	< LLD
	6/15/2011	< LLD	11/14/2011	< LLD
Connecticut River Downstream	3/15/2011	< LLD	9/1/2011	< LLD
	7/5/2011	< LLD	11/7/2011	< LLD
Connecticut River Upstream	3/15/2011	< LLD	8/2/2011	< LLD
	6/7/2011	< LLD	11/1/2011	< LLD
Discharge Forebay	3/16/2011	< LLD	8/15/2011	< LLD
	6/15/2011	< LLD	11/14/2011	< LLD
Upstream of the River Discharge	3/28/2011	< LLD	11/3/2011	< LLD
	7/5/2011	< LLD	11/8/2011	< LLD
	8/1/2011	< LLD		
GZ-01	3/28/2011	< LLD	9/1/2011	< LLD
	7/5/2011	< LLD	11/7/2011	< LLD
GZ-02	3/28/2011	< LLD	9/1/2011	< LLD
	7/5/2011	< LLD	11/7/2011	< LLD
GZ-03	3/14/2011	< LLD	9/1/2011	< LLD
	7/5/2011	< LLD	11/7/2011	< LLD
GZ-04	3/14/2011	< LLD	9/1/2011	< LLD
	7/5/2011	< LLD	11/7/2011	< LLD
GZ-05	3/28/2011	< LLD	9/1/2011	< LLD
	7/5/2011	< LLD	11/7/2011	< LLD
GZ-06	3/28/2011	< LLD	9/1/2011	< LLD
	7/5/2011	< LLD	11/7/2011	< LLD

Sample Location	Sample Date	Hard-to Detect Results	Sample Date	Hard-to Detect Results
GZ-07	3/14/2011	< LLD	9/1/2011	< LLD
	7/5/2011	< LLD	11/8/2011	< LLD
GZ-09	3/8/2011	< LLD	9/1/2011	< LLD
	7/5/2011	< LLD	11/7/2011	< LLD
GZ-10	3/28/2011	< LLD	9/1/2011	< LLD
	7/5/2011	< LLD	11/8/2011	< LLD
GZ-11	3/7/2011	< LLD	9/1/2011	< LLD
	7/5/2011	< LLD	11/8/2011	< LLD
GZ-12D	3/14/2011	< LLD	9/1/2011	< LLD
	7/5/2011	< LLD	11/7/2011	< LLD
GZ-12S	3/28/2011	< LLD	9/1/2011	< LLD
	7/5/2011	< LLD	11/7/2011	< LLD
GZ-13D	3/14/2011	< LLD	9/2/2011	< LLD
	7/5/2011	< LLD	11/8/2011	< LLD
GZ-13S	3/28/2011	< LLD	9/2/2011	< LLD
	7/5/2011	< LLD	11/8/2011	< LLD
GZ-14D	3/28/2011	< LLD	9/1/2011	< LLD
	7/5/2011	< LLD	11/7/2011	< LLD
GZ-14S	3/14/2011	< LLD	9/1/2011	< LLD
	7/5/2011	< LLD	11/7/2011	< LLD
GZ-15	3/14/2011	< LLD	8/2/2011	< LLD
	7/5/2011	< LLD	11/7/2011	< LLD
GZ-16	3/28/2011	< LLD	9/1/2011	< LLD
	7/5/2011	< LLD	11/7/2011	< LLD
GZ-17	3/7/2011	< LLD	9/1/2011	< LLD
	7/5/2011	< LLD	11/7/2011	< LLD
GZ-18D	3/28/2011	< LLD	9/2/2011	< LLD
	7/5/2011	< LLD	11/8/2011	< LLD

Sample Location	Sample Date	Hard-to Detect Results	Sample Date	Hard-to Detect Results
GZ-18S	3/28/2011	< LLD	9/2/2011	< LLD
	7/5/2011	< LLD	11/8/2011	< LLD
GZ-19D	2/8/2011	< LLD	9/1/2011	< LLD
	5/2/2011	< LLD	11/7/2011	< LLD
GZ-19S	2/7/2011	< LLD	9/1/2011	< LLD
	5/2/2011	< LLD	11/7/2011	< LLD
GZ-20	2/28/2011	< LLD	9/1/2011	< LLD
	7/5/2011	< LLD	11/8/2011	< LLD
GZ-21	3/14/2011	< LLD	9/1/2011	< LLD
	7/5/2011	< LLD	11/8/2011	< LLD
GZ-22D	3/14/2011	< LLD	9/1/2011	< LLD
	7/5/2011	< LLD	11/7/2011	< LLD
GZ-23S	3/28/2011	< LLD	9/1/2011	< LLD
	7/5/2011	< LLD	11/7/2011	< LLD
GZ-24S	3/28/2011	< LLD	9/1/2011	< LLD
	7/5/2011	< LLD	11/7/2011	< LLD
GZ-25S	3/28/2011	< LLD	9/1/2011	< LLD
	7/5/2011	< LLD	11/7/2011	< LLD
GZ-26S	3/28/2011	< LLD	9/1/2011	< LLD
	7/5/2011	< LLD	11/7/2011	< LLD
GZ-27S	3/28/2011	< LLD	9/1/2011	< LLD
	7/5/2011	< LLD	11/7/2011	< LLD
WVN0201	2/10/2011	< LLD	8/3/2011	< LLD
	5/5/2011	< LLD	11/9/2011	< LLD
WVN0202	2/10/2011	< LLD	8/3/2011	< LLD
	5/5/2011	< LLD	11/9/2011	< LLD
WVN0203	2/10/2011	< LLD	8/3/2011	< LLD
	5/5/2011	< LLD	11/9/2011	< LLD

Sample Location	Sample Date	Hard-to Detect Results	Sample Date	Hard-to Detect Results
WVN0204	2/10/2011	< LLD	8/3/2011	< LLD
	5/5/2011	< LLD	11/9/2011	< LLD
Blodgett Farm	3/15/2011	< LLD	8/2/2011	< LLD
	6/7/2011	< LLD	11/15/2011	< LLD
Brattleboro Fire Department, West Station	3/15/2011	< LLD	8/2/2011	< LLD
	6/7/2011	< LLD	11/1/2011	< LLD
Miller Farm	3/15/2011	< LLD	8/2/2011	< LLD
	6/7/2011	< LLD	11/1/2011	< LLD
Residence-1	3/15/2011	< LLD	8/2/2011	< LLD
	6/7/2011	< LLD	11/1/2011	< LLD
Residence-2	3/15/2011	< LLD		
Residence-3	3/15/2011	< LLD	8/2/2011	< LLD
	6/7/2011	< LLD		
Vernon Elementary School	3/15/2011	< LLD	8/2/2011	< LLD
	6/7/2011	< LLD	11/1/2011	< LLD
Vernon Green Nursing Home	3/15/2011	< LLD	8/2/2011	< LLD
	6/7/2011	< LLD	11/15/2011	< LLD
Main well	3/14/2011	< LLD	8/4/2011	< LLD
	7/5/2011	< LLD	11/8/2011	< LLD
PSB Well	3/15/2011	< LLD	8/4/2011	< LLD
	7/5/2011	< LLD	11/9/2011	< LLD
Southwest Well	7/5/2011	< LLD	11/8/2011	< LLD
	8/31/2011	< LLD		
White House	3/15/2011	< LLD	11/9/2011	< LLD
	7/5/2011	< LLD		

Appendix E

2011 Advanced Off Gas (AOG) Soil Hard-to-Detect Metal Data

The 2010 confirmed release of tritium in groundwater at Vermont Yankee marked an unintentional underground release of radioactive material. Soil testing confirmed that other materials contaminated the environment near the leak. Soil samples were collected at various depths around the Advanced Off Gas pipe tunnel excavation area (Figure 13). Nuclear power plant-related radioactive elements, manganese-64, cobalt-60, zinc-65 and cesium-137, were measured in the soil. The amounts measured were greater than expected from above-ground weapons testing or nuclear fallout from global incidents like Chernobyl.

Soil samples were collected in February, March and May of 2010. A total of 40 samples were tested by gamma spectroscopy and those results reported in the 2010 Surveillance report. February and March samples were taken from the AOG area. The May samples were taken from soil that had been excavated from the area. Results from the hard-to-detect tests were pending last year at publication. They are reported here.

Figure 13. Advanced Off-Gas (AOG) Leak Area: Approximate Sample Sites

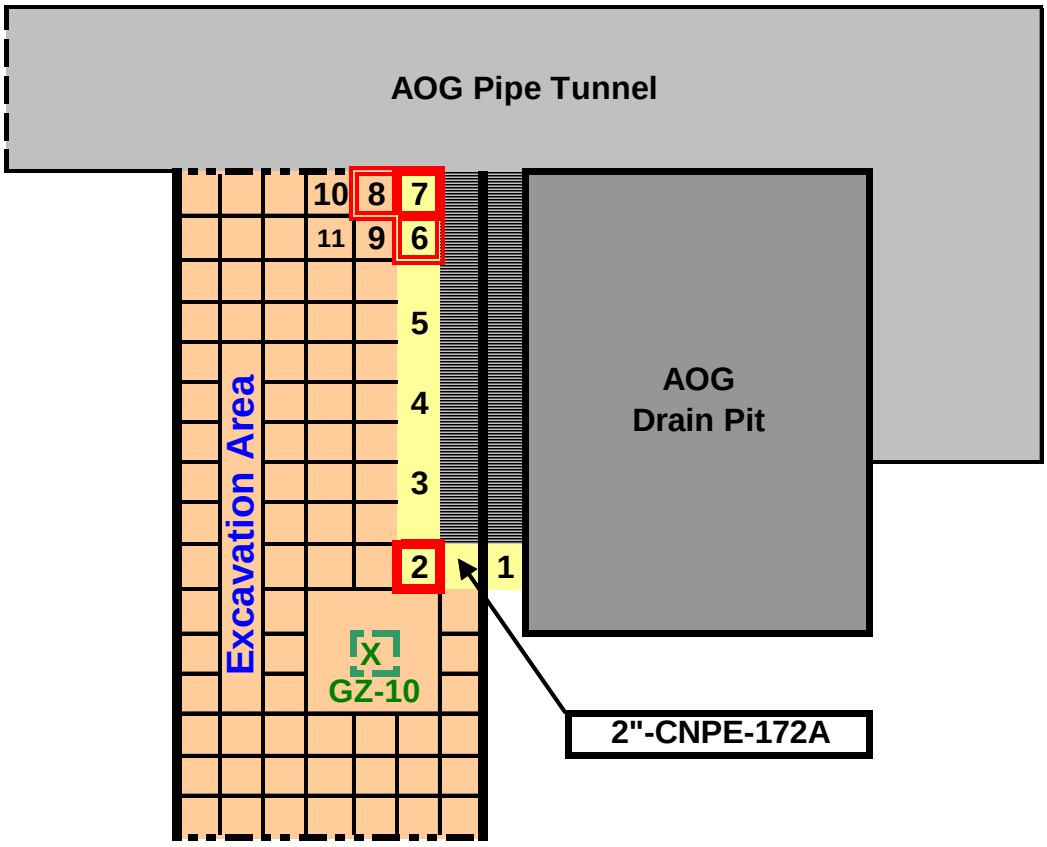


Table 23. February 2010 Soil Collected from Advanced Off Gas (AOG) Excavation Area Hard-to-Detect Data

AOG Site Number	Sample Location Depth	Results (pCi/kg) Iron-55	Nickel-63	Strontium-90
1 (*approx*)	surface of excavation	< LLD	< LLD	< LLD
	2 feet below surface of excavation	< LLD	< LLD	7,480 +/- 1,508
	4 feet below surface of excavation	< LLD	< LLD	< LLD
	6 feet below surface of excavation	< LLD	< LLD	< LLD
2 (*approx*)	surface of excavation	< LLD	< LLD	< LLD
	2 feet below surface of excavation	< LLD	< LLD	< LLD
	4 feet below surface of excavation	< LLD	< LLD	< LLD
	6 feet below surface of excavation	< LLD	< LLD	< LLD
7 (*approx*)	surface of excavation	< LLD	< LLD	< LLD
	2 feet below surface of excavation	< LLD	< LLD	< LLD
	4 feet below surface of excavation	< LLD	< LLD	< LLD
	6 feet below surface of excavation	< LLD	< LLD	< LLD
SW Corner of area	4 feet below surface of excavation	< LLD	< LLD	< LLD
	6 feet below surface of excavation	< LLD	< LLD	< LLD
NW corner of area	4 feet below surface of excavation	< LLD	< LLD	< LLD
	6 feet below surface of excavation	< LLD	< LLD	< LLD
< LLD means less than the Laboratory's Lower Limit of Detection				
Site numbers are approximate to location in Figure 13.				

Table 24. March 2010 Soil Collected from Advanced Off Gas (AOG) Excavation Area Hard-to-Detect Data

AOG Site Number	Sample Location Depth	Results (pCi/kg) Iron-55	Nickel-63	Strontium-90
1	surface of excavation	< LLD	< LLD	7,200 +/- 1,550
	2 feet below surface of excavation	< LLD	< LLD	< LLD
2	surface of excavation	< LLD	< LLD	2,730 +/- 795
	2 feet below surface of excavation	< LLD	< LLD	< LLD
3	surface of excavation	< LLD	< LLD	< LLD
	2 feet below surface of excavation	< LLD	< LLD	< LLD
4	surface of excavation	< LLD	< LLD	< LLD
	2 feet below surface of excavation	< LLD	< LLD	< LLD
5	surface of excavation	< LLD	< LLD	< LLD
	2 feet below surface of excavation	< LLD	< LLD	< LLD
6	surface of excavation	< LLD	< LLD	< LLD
	2 feet below surface of excavation	< LLD	< LLD	< LLD
7	surface of excavation	< LLD	< LLD	< LLD
	2 feet below surface of excavation	< LLD	< LLD	< LLD
8	surface of excavation	< LLD	< LLD	< LLD
	2 feet below surface of excavation	< LLD	< LLD	< LLD
9	surface of excavation	< LLD	< LLD	< LLD
	2 feet below surface of excavation	< LLD	< LLD	< LLD
10	surface of excavation	< LLD	< LLD	< LLD
	2 feet below surface of excavation	< LLD	< LLD	< LLD
11	surface of excavation	< LLD	< LLD	< LLD
	2 feet below surface of excavation	< LLD	< LLD	< LLD

< LLD means less than the Laboratory's Lower Limit of Detection

Site numbers are approximate to location in Figure 13.

Table 25. May 2010 Soil Collected from Advanced Off Gas (AOG) Excavation Area Hard-to-Detect Data

Sample Location	Results (pCi/kg)		
AOG Area	Iron-55	Nickel-63	Strontium-90
North End of AOG	< LLD	< LLD	< LLD
South End of AOG	< LLD	< LLD	< LLD

< LLD means less than the Laboratory's Lower Limit of Detection