

Tritium Investigation Report 2011

The following information was presented on the Health Department website to inform the public about an investigation into radioactive contamination from the Vermont Yankee Nuclear Power Plant in 2011.

To view maps and diagrams related to this investigation, see our Investigation Graphics document.

DECEMBER:**December 21, 2011****Tritium Detected Again in Connecticut River Water**

The Vermont Department of Health Laboratory analysis of a water sample from the Connecticut River has again detected tritium. This sample was taken from the river on November 3 and had a tritium concentration of 1,120 picocuries per liter (pCi/L). No other radionuclides were detected.

The Connecticut River samples were pumped from a hose below the surface of the water next to the shoreline where the plume of tritium-contaminated groundwater is moving into the river. River water samples obtained on July 18, July 25, and August 8, 2011 from the same location were also positive for tritium. Tritium concentrations in those samples were 534 pCi/L, 611 pCi/L, and 565 pCi/L respectively. To date, no other radionuclides that could have originated from Vermont Yankee have been detected in river water.

The Health Department immediately sent the water sample to its contract laboratory to be analyzed for hard-to-detect radioactive materials including strontium-90. Confirmatory gamma spectroscopy and analysis for tritium will also be done.

The Health Department contacted Vermont Yankee to find out if their split of the river water sample had been analyzed. Vermont Yankee informed the Health Department on Tuesday, December 20 that its sample was also positive for tritium at a concentration of 1,230 pCi/L.

There is no risk to public health. These low concentrations of tritium at the river's edge are immediately diluted by the greater volume of river water to the point that they cannot be measured.

To date, no tritium has been found at the six other locations in the river that are routinely sampled. No radioactive materials that could have originated from Vermont Yankee have been found in active drinking water wells on or off the plant property. One exception is the COB well, a drinking water well located at Vermont Yankee that had not been used since February 2010, which tested positive for tritium in October 2010. The Departments of Health and Public Safety and the Agency of Natural Resources have requested that the COB well be routinely tested. Vermont Yankee has not agreed to do this.

This Connecticut River water sample is one of many samples obtained by the Health Department in its ongoing surveillance of the environment for impacts of the radioactive system leaks identified in early 2010. The sample is also part of a broader environmental surveillance program that uses hundreds of air, water, vegetation, milk, soil, river sediment and other samples to determine if Vermont Yankee releases contribute to increases in the public's exposure to radiation.

DEPARTMENT OF HEALTH**December 14, 2011****Connecticut River Fish Test Results 2010 and 2011**

As part of ongoing environmental surveillance around Vermont Yankee, the Health Department tests and reports on fish from two locations in the Connecticut River (9 miles upstream of the plant, and at a location outside the Vermont Yankee discharge).

Fish are tested either as a whole fish, or split into edible and inedible portions. The Health Department tests the fish for hard-to-detects and gamma-emitting materials. Fish types tested were yellow perch, pumpkinseed, bluegill and large and small mouth bass.

Results for 2010 and 2011 were similar to what has previously been reported by the Health Department. Fish had measurable amounts of potassium-40, a naturally-occurring radionuclide, and strontium-90, and cesium-137, both human-made radionuclides. Cesium-137 levels were consistent with above-ground weapons testing and global nuclear incidents. Only one sample, collected in June 2010 and reported in August of this year, has had a detection of strontium-90 in the edible portion.

NOVEMBER:**November 30, 2011****Advanced Off-Gas (AOG) Excavation Filled**

On October 19, 2011, the Health Department learned that Vermont Yankee planned to fill the excavation near the AOG building and tunnel. On November 8, the radiological health chief inspected the site with the state nuclear engineer, the Vermont Yankee state liaison engineer and the AOG repair project manager. Repairs appeared to be appropriate to prevent the recurrence of previous failures. Vermont Yankee filled the excavation with compacted sand below, and to about one foot above, the new AOG drain line. Concrete fill was used for the rest of the roughly 2,000 cubic foot excavation. Now filled, the tunnel can only be inspected using a boroscope with a small camera inserted through a three-inch diameter hole cut through the tunnel wall. This inspection port is accessible from inside the AOG building.

The excavation work started in February 2010, when the source of the first of two leaks of water from plant systems was positively identified. Leaking water contaminated the soil near the AOG building and tunnel with radioisotopes consistent with a leak of nuclear reactor water, and caused a plume of tritium-contaminated groundwater that is still moving to the Connecticut River.

The excavation is approximately 16 feet long, 16 feet deep and eight feet wide. Within it, access to the interior of the AOG tunnel, the AOG drain line pipe and the penetration of the AOG drain line into the exterior wall of the AOG pit was available. During the last refueling and maintenance outage that ended November 2, 2011, workers cut, removed and replaced the original AOG drain line. This drain line was found to leak during start-up following the 2010 refueling outage in May 2010. They also replaced the unmortared concrete blocks that served as the AOG tunnel wall with a steel-reinforced 22-inch thick concrete wall. Failures in the AOG tunnel itself allowed radioactively contaminated condensate water to leak into the environment from leaking plant components within the tunnel. The leaking plant components in the AOG tunnel were removed and replaced in April 2010.

Tritium was first detected in a groundwater monitoring well on Vermont Yankee property near the Connecticut River in November 2009. This discovery launched an investigation that has been closely monitored by the Health Department and reported here.

DEPARTMENT OF HEALTH
Silt Disposal Investigation

On September 15, 2011, the Health Department was alerted by an officer of the Agency of Natural Resources Office of Environmental Enforcement about materials being trucked from Vermont Yankee for disposal at a Vernon gravel pit. At the officer's request, the Health Department took samples of the material that was being removed from the site and determined its source. According to Vermont Yankee officials interviewed at the time, this was sediment that had been dredged from the Connecticut River, under a permit from the U.S. Army Corps of Engineers. Dredging is performed periodically in the river near the intake structure to maintain proper flow of water from the river into the intake canal. River water in the intake canal is used in the plant condenser to cool steam in the main turbine for return to the reactor as feedwater. The sediment was pumped from the river by a boat-mounted pump to a sediment storage area temporarily constructed on a parking lot outside the plant-protected area and outside any radiologically-controlled area.

At the Vernon disposal site, radiation levels were measured with a hand-held radiation survey meter and found to be at normal background, between 5 and 15 microrentgen per hour. Representative samples were taken from the piles of sediment at the site, and delivered to the Health Department Laboratory for radiochemical analysis. The radiochemical analysis by gamma spectrometry identified the naturally occurring radioactive materials beryllium-7 and potassium-40 along with cesium-137. The cesium-137 concentrations, between 22 and 98 picocuries per kilogram (pCi/kg) are well within the background levels of cesium-137. Background levels of cesium-137 and other radioactive materials from nuclear weapons testing, nuclear reactor accidents and other human sources are well understood in most parts of our environment, including sediment. They are documented in our annual environmental surveillance reports.

The sediment concentrations, seen in the table below, are very low and do not represent a real risk for human health effects. Each sediment sample was collected on 09/15/2011:

Sample ID	Beryllium-7 (pCi/kg)	Potassium-40 (pCi/kg)	Cesium-137 (pCi/kg)
Sample 1	< LLD	16,500 +/- 3,100	65.9 +/- 24.6
Sample 2	< LLD	14,100 +/- 2,600	40.8 +/- 19.8
Sample 3	< LLD	12,200 +/- 2,300	22.4 +/- 15.9
Sample 4	< LLD	15,300 +/- 2,800	70.6 +/- 20.5
Sample 5	244 +/- 166	18,200 +/- 3,400	97.3 +/- 26.5
< LLD means less than the Laboratory's Lower Limit of Detection			

The Health Department reported the radiochemical analysis results to the Agency of Natural Resources. Our conclusion is that the Connecticut River sediments dredged up near the Vermont Yankee intake structure, stored at the Vermont Yankee parking lot, and disposed of before and after September 15, 2011, did not contain radioactive materials likely to be from Vermont Yankee nuclear operations.

Groundwater Monitoring Well Results

The test results for tritium that follow are as reported by Vermont Yankee through November 12, 2011. The Health Department publishes its own sample results, which generally have confirmed the Vermont Yankee results. Vermont Yankee has been reporting sample results to the Health Department since February 1, 2011. Most wells are sampled weekly or monthly. Split samples from each are sent to the Health Department lab.

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As of this date, 11 out of a total of 31 groundwater monitoring wells are testing positive for tritium. Six monitoring wells had tritium results that were lower as compared to last month, while five had higher results as compared to last month. Generally, the trends in tritium concentration are downward.

Eighteen months ago, the highest well readings for tritium were approximately 1,000,000 picocuries per liter (pCi/L). These wells were near the AOG tunnel and AOG building. At the end of 2010, the highest levels were near 500,000 pCi/L, from wells about halfway between plant buildings and the river. Now the highest tritium levels are about 90,000 pCi/L from wells near the river. Two of the three wells with the highest tritium concentrations are the extraction wells GZ-14S and GZ-22D, which are used to pump contaminated groundwater to a large truck container called a frac tank. The contents of the frac tank are disposed of through a license radioactive waste contractor. The third well with a high concentration is GZ-15. It was used as an extraction well in the past, but has had increasing tritium concentrations after no longer being used for groundwater clean-up. To date, only tritium has been detected, and only in on-site groundwater and two samples of river water. Gamma spectroscopy and special analyses for hard-to-detect radionuclides have not identified any other nuclear power plant-related radioactive materials in groundwater, drinking water, or river water. All results are in pCi/L. The term <LLD means less than the lower limit of detection.

GZ-1:	<LLD on 11/7/11
GZ-2:	<LLD on 11/7/11
GZ-3:	1,478 on 11/7/11, up from 1,274 on 9/26/11
GZ-4:	2,955 on 11/7/11, down from 18,400 on 9/1/11
GZ-5:	<LLD on 10/3/11
GZ-6:	<LLD on 11/7/11
GZ-7:	1,397 on 11/8/11, up from 1,155 on 9/26/11
GZ-8:	No sample; dry well
GZ-9:	<LLD on 11/7/11
GZ-10:	<LLD on 11/8/11
GZ-11:	<LLD on 11/8/11
GZ-12S:	<LLD on 11/7/11, down from 1,160 on 9/1/11
GZ-12D:	53,040 on 11/8/11, up from 49,490 on 9/26/11
GZ-13S:	<LLD on 11/8/11
GZ-13D:	873 on 10/3/11, down from 978 on 9/2/11
GZ-14S:	56,070 on 11/7/11, up from 23,325 on 9/26/11
GZ-14D:	6,320 on 11/7/11, up from 4,495 on 9/26/11
GZ-15:	69,655 on 11/7/11, down from 78,240 on 9/26/11
GZ-16:	<LLD on 11/7/11
GZ-17:	<LLD on 11/7/11
GZ-18S:	<LLD on 11/8/11
GZ-18D:	<LLD on 11/8/11
GZ-19S:	<LLD on 11/7/11
GZ-19D:	<LLD on 11/7/11
GZ-20:	774 on 10/4/11, down from 778 on 9/1/11
GZ-21:	4,615 on 11/8/11, down from 7,642 on 9/26/11

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GZ-22D:	88,288 on 11/7/11, down from 103,321 on 9/26/11
GZ-23S:	<LLD on 10/3/11
GZ-24S:	<LLD on 10/31/11
GZ-25S:	<LLD on 10/3/11
GZ-26S:	<LLD on 10/3/11
GZ-27S:	<LLD on 10/3/11

OCTOBER:
October 7, 2011
Vermont Yankee Suspends Part of its Investigation of Groundwater Contamination

State and federal officials were informed by Vermont Yankee on September 22 that it had concluded its investigation into the cause of tritium contamination of groundwater near monitoring well GZ-24S. Plant officials determined their investigation verified the cause of the contamination as the Advanced Off-Gas (AOG) Building sump drain line.

The investigation started about nine months ago, when samples of groundwater from GZ-24S were found to contain tritium. GZ-24S is located near the Radioactive Waste Building, which is approximately 350 feet north of the plume of contaminated groundwater created by leaks at the Advanced Off-Gas (AOG) Building. The AOG Building leaks were confirmed in January 2010. The leaks discovered near the Radioactive Waste Building were confirmed about a year later, in January 2011.

Groundwater tests performed over the course of several weeks in January and February 2011, found the highest level of tritium in groundwater in this area to be about 9,000 picocuries per liter (pCi/L). For comparison, the leaks from the AOG Building had a peak concentration greater than 1.5 million pCi/L.

The investigation focused on six sections of underground piping. According to Vermont Yankee, five sections of piping were tested and found not to leak:

- the stack sump discharge drain line
- the first and second stage AOG delay pipe drain lines
- the steam packing exhaust drain line
- the standby gas treatment drain line.

The sixth section of buried piping is the AOG sump drain line, which runs from the sump in the AOG Building to the Radioactive Waste Building. This section could not be tested. Instead, it was cut and capped to prevent any further use, and groundwater along its path was monitored for tritium contamination. After months of monitoring without new contamination being detected, Vermont Yankee concluded that this section of piping was the source of the leak detected in January 2011.

Third Party Lab Confirms Tritium in River Water Slightly Above Lower Limit of Detection

The contract laboratory used by the Department of Health for special analyses of samples for hard-to-detect radionuclides was asked to analyze a sample of Connecticut River water taken on August 1, 2011. Results from the contract laboratory found levels of tritium at slightly above the lower limit of detection. The analysis serves

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as independent confirmation of the Health Department Laboratory’s positive test results for tritium in river water samples from July 18 and July 25, 2011.

Our contract laboratory used analytical methods identical to those used by Vermont Yankee and its contract laboratory. These levels of tritium are not indicative of what is in the river as a whole, just for what was sampled in the location where tritium in the groundwater first seeps from the soils of the shoreline into the river.

Department of Health Groundwater Monitoring Continues

The Department of Health continues to independently analyze groundwater, drinking water and river water at and around Vermont Yankee. This includes our annual routine environmental monitoring of waters, soil, sediments, and the air and the food supply that has been going on for the past forty years, as well as our current investigation into the tritium contamination. The Department will publish the results of monitoring both here on its website and in its annual Vermont Yankee Environmental Surveillance Reports.

In the list of reported results below, three of the 32 groundwater monitoring wells existed before 2010, and were sampled as part of the annual monitoring program. The remaining wells were drilled to find the AOG leaks and to detect any new leaks like the one that developed near the Radioactive Waste Building in 2010.

Groundwater Extraction

Vermont Yankee continues pumping out groundwater from wells GZ-14S and GZ-22D. Vermont Yankee reports that about 335,700 gallons of tritium-contaminated groundwater have been removed since extraction began in early 2010. This includes about 28,400 gallons since extraction was re-started on December 30, 2010. Extracted groundwater is stored in an on-site ‘frac’ tank that can be easily transported by a tractor-trailer rig.

Groundwater Monitoring Well Results

The test results for tritium that follow are as reported by Vermont Yankee through September 29, 2011. Vermont Yankee has been reporting sample results to the Health Department every day they obtain them since February 1, 2011. Most wells are sampled weekly or monthly. Split samples from each are sent to the Health Department lab.

As of this date, 12 out of a total of 31 groundwater monitoring wells are testing positive for tritium. Nine monitoring wells had tritium results that were lower as compared to last month, while four had higher results as compared to last month. Generally, the trends in tritium concentration are downward.

Eighteen months ago, the highest well readings for tritium were approximately 1,000,000 picocuries per liter (pCi/L). These wells were near the AOG tunnel and AOG building. At the end of 2010, the highest levels were near 500,000 pCi/L, from wells about halfway between plant buildings and the river. Now the highest tritium levels are about 100,000 pCi/L from wells near the river.

To date, only tritium has been detected, and only in on-site groundwater and two samples of river water. Gamma spectroscopy and special analyses for hard-to-detect radionuclides have not identified any other nuclear power plant-related radioactive materials in groundwater, drinking water, or river water.

All results are in pCi/L. The term <LLD means less than the lower limit of detection.

GZ-1:	<LLD on 9/1/11
GZ-2:	<LLD on 9/1/11
GZ-3:	1,274 on 9/26/11, down from 4,140 on 9/6/11
GZ-4:	18,400 on 9/1/11, down from 19,100 on 8/1/11

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GZ-5:	<LLD on 9/1/11
GZ-6:	<LLD on 9/26/11
GZ-7:	1,155 on 9/26/11, down from 1,530 on 9/6/11
GZ-8:	No sample; dry well
GZ-9:	<LLD on 9/1/11
GZ-10:	<LLD on 9/26/11, down from 2,080 on 9/1/11
GZ-11:	<LLD on 9/1/11
GZ-12S:	1,160 on 9/1/11, down from 1,840 on 8/1/11
GZ-12D:	49,490 on 9/26/11, down from 62,000 on 9/6/11
GZ-13S:	<LLD on 9/2/11
GZ-13D:	978 on 9/2/11, up from <LLD on 8/2/11
GZ-14S:	23,325 on 9/26/11, down from 73,400 on 9/6/11
GZ-14D:	4,495 on 9/26/11, up from 3,960 on 9/6/11
GZ-15:	78,240 on 9/26/11, up from 69,000 on 9/6/11
GZ-16:	<LLD on 9/1/11
GZ-17:	<LLD on 9/1/11
GZ-18S:	<LLD on 9/2/11
GZ-18D:	<LLD on 9/2/11
GZ-19S:	<LLD on 9/1/11
GZ-19D:	<LLD on 9/1/11
GZ-20:	778 on 9/1/11, up from <LLD on 6/7/11
GZ-21:	7,642 on 9/26/11, down from 11,900 on 9/6/11
GZ-22D:	103,321 on 9/26/11, down from 110,000 on 9/6/11
GZ-23S:	<LLD on 9/1/11
GZ-24S:	<LLD on 9/19/11
GZ-25S:	<LLD on 9/1/11
GZ-26S:	<LLD on 9/1/11
GZ-27S:	<LLD on 9/1/11

SEPTEMBER:
September 22, 2011
Groundwater Extraction

Vermont Yankee continues pumping out groundwater from wells GZ-14S and GZ-22D in an effort to reduce the amount of tritium-contaminated groundwater remaining in the environment. Vermont Yankee reports that about 335,500 gallons of tritium-contaminated groundwater has been removed since extraction began in early 2010. This includes about 28,200 gallons since extraction was re-started on December 30, 2010. Extracted groundwater is stored in an on-site ‘frac’ tank that can be easily transported by a tractor-trailer rig.

Groundwater Monitoring Well Results

The test results for tritium that follow are as reported by Vermont Yankee through September 15, 2011. The Department of Health publishes its own sample results here on the website, which generally have confirmed the

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Vermont Yankee results. Vermont Yankee has been reporting sample results to the Health Department every day they obtain them since February 1, 2011. Most wells are sampled weekly or monthly, with split samples from each well sent to the Health Department lab.

As of this date, 13 out of a total of 31 groundwater monitoring wells are testing positive for tritium. Seven monitoring wells had tritium results that were lower as compared to last month, while six had higher results as compared to last month. Generally, the trends in tritium concentration are downward.

For example, the highest well readings for tritium were approximately 1,000,000 picocuries per liter (pCi/L) a year ago. These wells are near the AOG tunnel and AOG building. At the end of 2010, the highest levels were near 500,000 pCi/L, from wells about halfway between plant buildings and the river. Now the highest tritium levels are about 110,000 pCi/L from wells near the river. Two exceptions to the downward trend are elevated results of September 6 and September 1, 2011 from GZ-7 and GZ-10. These wells have been at or less than the lower limit of detection (LLD) since the spring of 2010. Entergy believes the higher readings are due to the flooding that occurred with Tropical Storm Irene as it impacted Vermont on August 28.

To date, only tritium has been detected, and only in on-site groundwater and two samples of river water.

Gamma spectroscopy and special analyses for hard-to-detect radionuclides have not identified any other nuclear power plant-related radioactive materials in groundwater, drinking water, or river water.

All results are in pCi/L. The term <LLD means less than the lower limit of detection.

GZ-1:	<LLD on 9/1/11
GZ-2:	<LLD on 9/1/11
GZ-3:	4,140 on 9/6/11, down from 13,000 on 8/1/11
GZ-4:	18,400 on 9/1/11, down from 19,100 on 8/1/11
GZ-5:	<LLD on 9/1/11
GZ-6:	<LLD on 9/1/11
GZ-7:	1,530 on 9/6/11, up from <LLD on 8/2/11
GZ-8:	No sample; dry well
GZ-9:	<LLD on 9/1/11
GZ-10:	2,080 on 9/1/11, up from <LLD on 8/1/11
GZ-11:	<LLD on 9/1/11
GZ-12S:	1,160 on 9/1/11, down from 1,840 on 8/1/11
GZ-12D:	62,000 on 9/6/11, down from 67,800 on 8/1/11
GZ-13S:	<LLD on 9/2/11
GZ-13D:	978 on 9/2/11, up from <LLD on 8/2/11
GZ-14S:	73,400 on 9/6/11, up from 68,600 on 8/1/11
GZ-14D:	3,960 on 9/6/11, up from 2,380 on 8/1/11
GZ-15:	69,000 on 9/6/11, down from 88,744 on 7/25/11
GZ-16:	<LLD on 9/1/11
GZ-17:	<LLD on 9/1/11
GZ-18S:	<LLD on 9/2/11
GZ-18D:	<LLD on 9/2/11
GZ-19S:	<LLD on 9/1/11
GZ-19D:	<LLD on 9/1/11

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GZ-20:	778 on 9/1/11, up from <LLD on 6/7/11
GZ-21:	11,900 on 9/6/11, down from 14,700 on 8/2/11
GZ-22D:	110,000 on 9/6/11, down from 124,268 on 7/25/11
GZ-23S:	<LLD on 9/1/11
GZ-24S:	<LLD on 9/6/11
GZ-25S:	<LLD on 9/1/11
GZ-26S:	<LLD on 9/1/11
GZ-27S:	<LLD on 9/1/11

AUGUST:
August 9, 2011
Groundwater Extraction

Vermont Yankee continues pumping out groundwater from wells GZ-14S and GZ-22D in an effort to reduce the amount of tritium-contaminated groundwater remaining in the environment. Since extraction began in early 2010, Vermont Yankee reports that 334,700 gallons of tritium-contaminated groundwater has been removed. This includes 27,500 gallons since extraction was re-started on December 30 2010 after a brief stop. Extracted groundwater is stored in an on-site 'frac' tank. Some of the extracted water in the frac tank is being re-used by the plant after the water is cleaned to specific standards. A frac tank is a 20,000 to 25,000 gallon container that can be easily transported by a tractor-trailer rig. Frac tanks are used to collect liquids in many situations, but they are especially suited for environmental remediation.

Groundwater Monitoring Well Results

The results that follow are as reported by Vermont Yankee for tritium through August 4, 2011. Vermont Yankee has been reporting sample results to the Health Department every day they obtain them since February 1, 2011. Most wells are sampled weekly or monthly, with split samples from each well sent to the Health Department lab.

To date, nine out of a total of 31 groundwater monitoring wells are testing positive for tritium. Generally, the trends are downward. For example, the highest wells were near 1,000,000 picocuries per liter (pCi/L) for tritium a year ago. These were wells near the AOG tunnel and AOG building. At the end of 2010, the highest levels were near 500,000 pCi/L from wells about halfway between plant buildings and the river. Now the highest tritium levels are about 125,000 pCi/L from wells near the river.

Gamma spectroscopy and special analyses for hard-to-detect radionuclides have not identified any other nuclear power plant-related radioactive materials in groundwater, drinking water or river water.

All results are in pCi/L. The term <LLD means less than the lower limit of detection.

GZ-1:	<LLD on 8/1/11
GZ-2:	<LLD on 8/1/11
GZ-3:	13,000 on 8/1/11, down from 83,600 on 6/6/11
GZ-4:	19,100 on 8/1/11, down from 19,400 on 6/6/11

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GZ-5:	<LLD on 8/1/11
GZ-6:	<LLD on 8/1/11
GZ-7:	<LLD on 8/2/11
GZ-8:	No sample; dry well
GZ-9:	<LLD on 8/1/11
GZ-10:	<LLD on 8/1/11
GZ-11:	<LLD on 8/2/11
GZ-12S:	1,840 on 8/1/11, up from <LLD on 6/6/11
GZ-12D:	67,800 on 8/1/11, down from 101,000 on 6/27/11
GZ-13S:	<LLD on 8/2/11
GZ-13D:	<LLD on 8/2/11
GZ-14S:	68,600 on 8/1/11, down from 85,700 on 6/27/11
GZ-14D:	2,380 on 8/1/11, up from 2,100 on 6/27/11
GZ-15:	88,744 on 7/25/11, down from 101,000 on 6/6/11
GZ-16:	<LLD on 8/1/11
GZ-17:	<LLD on 8/1/11
GZ-18S:	<LLD on 8/2/11
GZ-18D:	<LLD on 8/2/11
GZ-19S:	<LLD on 8/1/11
GZ-19D:	<LLD on 8/2/11
GZ-20:	<LLD on 6/7/11
GZ-21:	14,700 on 8/2/11, up from 2,310 on 6/27/11
GZ-22D:	124,268 on 7/25/11, down from 152,275 on 6/27/11

August 2, 2011
More Fish Samples Analyzed

As a part of the Health Department’s comprehensive environmental surveillance around Vermont Yankee, we routinely collect fish from the Connecticut River for analysis. The Health Department Laboratory analyzes fish and other environmental samples such as air, water, milk, soil, vegetation and sediment for most radionuclides, including tritium and many gamma-emitting radioactive materials. The Health Department has also contracted with a commercial laboratory to conduct what are called “hard to detect” analyses for the radionuclides strontium-90, iron-55 and nickel-63. Only a small number of laboratories in the U.S. are qualified to perform hard to detect analyses.

Results from Hard to Detect Analyses

On January 10, 2011, the Health Department reported the results of hard to detect analyses of four samples of fish taken in February, April and May 2010. These fish were analyzed by the Wadsworth Center Laboratory operated by the New York State Department of Environmental Conservation.

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On July 26, 2011, we received results from our own contract laboratory for nine additional samples of fish samples taken since June 2010. No iron-55 or nickel-63 was detected in these samples. Similar to earlier results from the Wadsworth Laboratory, strontium-90 (Sr-90) was detected in most of the nine new samples. Results of all 13 samples analyzed to date are presented below. The fish are analyzed for hard to detect radionuclides in their edible portions (the flesh) and in their inedible portions (bones, head, scales and guts), and results are presented separately.

One finding of Sr-90 just above the lower limit of detection in one fish sample is notable because it is the first time Sr-90 has been detected in the edible portion of any of our fish samples. While the scientific literature includes evidence that edible portions of fish can retain Sr-90, this finding in the Connecticut River requires more sample data so we can better understand what it means. For this purpose, the Department of Health has asked that additional samples of fish obtained on June 9, 2010 be analyzed by our contract lab. There are additional samples from other dates pending analysis at the contract lab, and more samples are being shipped from Vermont Yankee. The Health Department is also working to obtain additional fish for testing much farther upstream in the Connecticut River.

Where the Fish were Caught

Results are also presented by two catch locations. The first is called "Near VY Discharge". These fish were caught in the Vernon Pond where the plant discharges water both from its discharge canal and from the contaminated groundwater on site. The second location is called "Upstream of VY". These fish were caught near the Route 9 bridge north of Brattleboro and about nine miles upstream of Vermont Yankee. Fish caught near the Vermont Yankee discharge are most likely to be exposed to Vermont Yankee-related radioactivity, while fish caught upstream of the plant are most likely not to have been exposed to these radioactive materials. However, fish may move around and nine miles upstream may not be enough distance to keep a particular fish from swimming down to the Vermont Yankee discharge area.

How the Fish were Caught and Analyzed

Fish are caught by a method called electro-fishing. An electric charge is introduced into the river water and stunned fish float to the surface. Environmental technicians collect the largest fish, which are most likely to have taken up radioactivity from the water over time. The collection of fish is then split, with half sent to Vermont Yankee's contract laboratory and half to the Health Department's Laboratory. Some of the Health Department's split are shipped directly to the Health Department's contract laboratory for hard to detect analysis. Individual fish are not cut in half and split between the two destinations. Instead, whole fish of similar species and size are sent to each destination.

Analytical results

Inedible Portion Analytical Results (bones, head, scales, guts)

Four of 13 inedible portion samples were measured and found to have no strontium-90 (Sr-90) above the lower limit of detection (LLD). Nine of 13 inedible samples of fish contained Sr-90, ranging from 28 picocuries per kilogram (pCi/kg) to 255 pCi/kg. The range of Sr-90 results in inedible portions of fish is within the range of background for Sr-90 found in fish studies. A New York State Department of Environmental Conservation (NYSDEC) study published in 2009¹ reported that Sr-90 in inedible portions of fish obtained in 2007 from the Catskill Region of the Hudson River in New York averaged 120 to 360 pCi/kg, depending on the species of fish. This segment of the Hudson River is between 65 and 83 miles upstream of the Indian Point Nuclear Power Plant.

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Another study conducted in 1971 by NYSDEC and cited in the NYSDEC 2009 report measured background Sr-90 concentrations in Lake Ontario from 89 to 3,516 pCi/kg, again depending on the species of fish.

Edible Portion Results (flesh)

Twelve of 13 edible portions of fish had strontium-90 (Sr-90) results that were less than the lower limit of detection (LLD), while one of 13 sample sets had an edible portion result of 58 (\pm 35) pCi/kg Sr-90. This value is close to the lower limit of detection of 47 pCi/kg. The fish in this sample were caught on June 9, 2010 about nine miles upstream of Vermont Yankee. This fish sample also had the highest Sr-90 concentration in inedible portions (255 pCi/kg). The other eight positive samples of inedible portions of fish had Sr-90 concentrations between 28 and 101 pCi/kg. The 2009 NYSDEC study of fish obtained in the Catskill Region of the Hudson River in New York in 2007 had no Sr-90 above the lower limit of detection in fish, but had one result for blue crab at 8 pCi/kg. The 1971 NYSDEC study of Lake Ontario fish species resulted in edible portions measuring less than the lower limit of detection up to 62 pCi/kg.

Health Department Samples as Compared to Background

Portion Analyzed for Sr-90	VDH 2010 Analytical Result	NY DEC 2007 Background ¹	NY DEC 1971 Background ¹
Inedible	< LLD – 255 pCi/kg	< LLD – 360 pCi/kg	89 – 3,516 pCi/kg
Edible	< LLD – 58 pCi/kg	< LLD – 8 pCi/kg	< LLD – 62 pCi/kg

¹*Measurement of Strontium-90 (90Sr) and Other Radionuclides in Edible Tissues and Bone/Carapace of Fish and Blue Crabs from the Lower Hudson River, New York.*

New York State Department of Environmental Conservation, Division of Fish, Wildlife and Marine Resources, Albany, NY, November 2009.

Strontium-90 in Fish

The single positive result for Sr-90 in edible portions of fish from the Connecticut River north of Brattleboro within the range of background Sr-90 in edible portions of fish reported in a 1971 study, but is higher than the range in a 2009 NYSDEC study of fish collected in 2007. We have asked our contract laboratory to analyze another two fish also collected on June 9, 2010 to help verify this measurement. We are also making arrangements to obtain fish samples from locations on the Connecticut River further upstream of Vermont Yankee. Additional analysis will improve the confidence in our overall assessment.

Sr-90 is found throughout our environment and in our diet. All humans have Sr-90 within their bodies. Given that Sr-90 is detected in fish collected from various locations, as well as many other media in the environment, we cannot associate low levels of Sr-90 in fish in the Connecticut River with Vermont Yankee-related radioactive materials without other supporting evidence. Other supporting evidence would include measuring Sr-90 in groundwater samples as well as measuring other nuclear power plant-related radionuclides in both fish and groundwater samples. To date, the Health Department Laboratory has not measured other nuclear power plant-related radionuclides in fish or groundwater samples.

Results of Hard-to-detect Analyses on Fish Collected in 2010-2011 from Connecticut River (Brattleboro/Vernon, VT)									
Date Sample Collected	Location Sampled	Edible (flesh)				Inedible (bones, head, scales, guts)			
		Iron-55 (pCi/kg)	Nickel-63 (pCi/kg)	Strontium-89 (pCi/kg)	Strontium-90 (pCi/kg)	Iron-55 (pCi/kg)	Nickel-63 (pCi/kg)	Strontium-89 (pCi/kg)	Strontium-90 (pCi/kg)
February 2010	Near VY Discharge	N/A	N/A	N/A	< LLD	N/A	N/A	N/A	47 +/- 16
	Upstream of VY	N/A	N/A	N/A	< LLD	N/A	N/A	N/A	30 +/- 17
Apr/May 2010	Near VY Discharge	N/A	N/A	N/A	< LLD	N/A	N/A	N/A	50 +/- 18
	Upstream of VY	N/A	N/A	N/A	< LLD	N/A	N/A	N/A	77 +/- 16
June 2010	Near VY Discharge	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	84 +/- 34
	Near VY Discharge	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD
	Upstream of VY	< LLD	< LLD	< LLD	58 +/- 35	< LLD	< LLD	< LLD	255 +/- 48
August 2010	Near VY Discharge	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD
	Upstream of VY	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	28 +/- 19
October 2010	Near VY Discharge	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD
	Upstream of VY	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	101 +/- 31
April 2011	Near VY Discharge	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD
	Upstream of VY	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	85 +/- 29

<LLD = less than lower limit of detection
N/A = samples were not analyzed for Iron-55, Nickel-63, Strontium-89

Strontium-90 in the Environment

Like many radionuclides, Sr-90 is found in many places in the environment. These background levels of radioactivity are from naturally occurring radioactive materials like carbon-14, potassium-40 and uranium-238, as well as purely human-made radionuclides like cobalt-60, strontium-90 and cesium-137. Some natural radionuclides were formed when the universe and the earth took shape billions of years ago. New natural radionuclides are also constantly building up as a result of cosmic radiation interactions with the earth. The human-made radionuclides come from the fairly constant release of very low quantities from medical and industrial users of radioactive materials, and from infrequent releases such as above-ground nuclear weapons testing in the 1950s, and the nuclear reactor accidents at Chernobyl in 1986 and Fukushima in 2011. One document the Health Department is using to interpret strontium-90 results is a publication by the Agency for Toxic Substances and Disease Registry, a part of U.S. Department of Health and Human Services, [Toxicological Profile for Strontium](#). This publication shows strontium-90 is a fairly constant part of the U.S. diet, with concentrations decreasing since above ground nuclear weapons tests were banned in 1963. The report also describes how Sr-90 gets into our bodies, from fruit juices, produce, milk and the overall human diet.

JULY:

July 1, 2011

Conceptual Site Model

Vermont Yankee officials have made available the conceptual site model in a report entitled Hydrogeologic

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Investigation of Tritium in Groundwater. The report is dated May 2011 and was prepared by Vermont Yankee's hydrogeological contractor. It has been shared with geologists and health physicists in Vermont, Massachusetts and New Hampshire. These are the states that share responsibility for emergency preparedness and environmental surveillance for the plant. The 501-page report details this small portion of the Connecticut River watershed and the forces exerted on groundwater, both above and within the bedrock. The report contains many tables, graphs, charts, maps, schematics, models, illustrations and reports from contractors, boring and well logs, test results and calculations that had not previously been available to state experts. For the most part, the general assessment of state health and natural resources experts described on this website remains unchanged. What has changed is that these assessments are better substantiated with additional evidence.

States Observe NRC Groundwater Inspection

The same state hydrogeological and radiological health experts who reviewed the conceptual site model accompanied NRC officials for their inspection of the Vermont Yankee groundwater protection program on June 14 and 15. Detailed findings can only be released after the official inspection report is issued by the NRC. This report is expected sometime in late July or early August. The state geologists and health physicists toured the entire site, focusing on physical elements of the groundwater monitoring program, groundwater extraction and sources of the Advanced Off Gas (AOG) building leakage site. They were then provided detailed presentations and discussed key aspects of the conceptual site model. In addition to the NRC lead inspector who is a health physicist, federal officials included a hydrogeologist from the NRC's Washington DC research division, and a hydrogeologist from the U.S. Geological Survey.

Southwest Well Sampling

In response to a joint request by the Vermont Departments of Health and Environmental Conservation, Vermont Yankee is now providing separate samples from the Southwest Well. This well is just south and west of the turbine building and about 350 feet from the AOG tunnel, where the current groundwater contamination was introduced. Water from the Southwest Well and the West Well are combined to supply the main drinking water supply for workers at the Vermont Yankee site. Previously, the main drinking water supply was sampled, and it was impossible to determine if the water was coming from the West Well or the Southwest Well. With these new samples, the Departments of Health and Environmental Conservation can better assess any impacts on this well near the plume of tritium contamination and sources of additional contamination. The Southwest Well is drilled 500 feet deep into the bedrock.

Groundwater Extraction

Vermont Yankee continues extraction of groundwater from wells GZ-14S and GZ-22D in an effort to reduce the amount of tritium-contaminated groundwater remaining in the environment. Since extraction began in early 2010, 333,800 gallons of tritium-contaminated groundwater has been removed. This includes 26,500 gallons since extraction was restarted on December 30 2010 after a brief hiatus. Extracted groundwater is being stored in an on-site frac tank. Some of the extracted water in the frac tank is being reused by the plant after the water is cleansed to specific standards. A frac tank is a 20,000 to 25,000 gallon container that can be easily transported by a tractor trailer rig. Frac tanks are used for collection of liquids in many situations, but they are particularly suited to environmental remediation activities.

Groundwater Monitoring Well Results

The results that follow are as reported by Vermont Yankee for tritium through June 29, 2011. The Department of

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Health publishes its own sample results <http://healthvermont.gov/enviro/rad/yankee/laboratory_testing.aspx> here on the website, which generally confirm the Vermont Yankee results. Vermont Yankee has been reporting sample results to the Health Department every day they obtain them since February 1. As of this report, eight out of a total of 31 groundwater monitoring wells are testing positive for tritium. Generally, the trends are downward. For example, the highest wells were near 1,000,000 picocuries per liter (pCi/L) for tritium a year ago. These were wells near the AOG tunnel and AOG building. At the end of 2010, the highest levels were near 500,000 pCi/L and these were for samples from wells about halfway between plant buildings and the river. Now, the highest tritium levels are about 150,000 pCi/L, and these are measured in samples from wells near the river. For this report, three wells had an increased tritium concentration and seven had a decreased tritium concentration compared to our last update. To date, gamma spectroscopy and special analyses for hard-to-detect radionuclides have not identified any other nuclear power plant-related radioactive materials in groundwater, drinking water or river water. All results are in pCi/L. The term <LLD means less than the lower limit of detection.

GZ-1:	<LLD on 6/6/11
GZ-2:	<LLD on 5/6/11
GZ-3:	83,600 on 6/6/11, up from 48,400 on 5/16/11
GZ-4:	19,400 on 6/6/11, down from 21,900 on 5/16/11
GZ-5:	<LLD on 6/6/11
GZ-6:	<LLD on 6/27/11
GZ-7:	<LLD on 6/27/11
GZ-8:	No sample; dry well
GZ-9:	<LLD on 6/6/11
GZ-10:	<LLD on 6/6/11
GZ-11:	<LLD on 6/6/11
GZ-12S:	<LLD on 6/6/11
GZ-12D:	101,000 on 6/27, up from 75,476 on 6/20/11
GZ-13S:	<LLD on 6/6/11
GZ-13D:	<LLD on 6/6/11, down from 958 on 5/23/11
GZ-14S:	85,700 on 6/27/11, down from 95,256 on 6/20/11
GZ-14D:	2,100 on 6/27/11, up from 1,163 on 6/20/11
GZ-15:	101,000 on 6/6/11, down from 110,453 on 5/23/11
GZ-16:	<LLD on 6/6/11
GZ-17:	<LLD on 6/6/11
GZ-18S:	<LLD on 6/6/11
GZ-18D:	<LLD on 6/6/11
GZ-19S:	<LLD on 5/2/11
GZ-19D:	<LLD on 5/2/11
GZ-20:	<LLD on 6/7/11
GZ-21:	2,310 on 6/27/11, down from 7,017 on 6/20/11
GZ-22D:	152,275 on 6/27/11, down from 188,500 on 5/16/11
GZ-23S:	<LLD on 6/6/11

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GZ-24S:	<LLD on 6/27/11
GZ-25S:	<LLD on 6/6/11
GZ-26S:	<LLD on 6/6/11
GZ-27S:	<LLD on 6/6/11

JUNE:**June 1, 2011****Conceptual Site Model Shared with State Experts**

Vermont Yankee officials have made available its conceptual site model in a report entitled *Hydrogeologic Investigation of Tritium in Groundwater*. The report is dated May 2011 and was prepared by Vermont Yankee's hydrogeological contractor. It has been shared with geologists and health physicists in Vermont, Massachusetts and New Hampshire. These are the three states that share responsibility for emergency preparedness and environmental surveillance for the plant. This report was provided to the states in preparation for observing the NRC inspection of the groundwater protection program, now scheduled for June 14 and 15.

The conceptual site model details how groundwater flows at the site from higher elevations north, west and south, passing Vermont Yankee structures on its way to the lower elevation of the Connecticut River. It also shows how elevation changes in the river and in water sources deeper within the bedrock relate to elevations of tritium-contaminated groundwater. These forces are instrumental in protecting drinking water from the contaminated groundwater, both on site at Vermont Yankee and beyond its boundaries. With this report, state experts can now independently assess the level of protection. The report will also be important to future decisions about whether the Construction Office Building (COB) well should be sampled again and, if so, how and when it should be sampled.

Groundwater Extraction

According to Vermont Yankee, as of May 19, 2011 approximately 332,000 gallons of tritium-contaminated groundwater have been pumped out of the ground, with approximately 25,000 gallons removed since extraction resumed on December 30, 2010. Extraction is performed at wells GZ-22D and GZ-14S. Concentrations at both wells are about half what they were before extraction restarted in December.

Groundwater Monitoring Well Results

The results that follow are as reported by Vermont Yankee for tritium through May 19, 2011. The Department of Health publishes its own sample results, which generally confirm the Vermont Yankee results. Vermont Yankee has been reporting sample results every day to the Health Department since February 1. As of this report, eight out of a total of 31 groundwater monitoring wells are testing positive for tritium. Generally, the trends are stable or downward. For this report, four wells had an increased tritium concentration and four had a decreased tritium concentration compared to the last sample date. The largest change was with GZ-14S. This is an extraction well and the previous sample was unusually much lower than previous samples. Extraction may have been the cause of the previously reported low concentration. To date, gamma spectroscopy and special analyses for hard-to-detect radionuclides have not identified any other nuclear power plant-related radioactive materials in groundwater, drinking water or river water. All results are in pCi/L. The term <LLD means less than the lower limit of detection.

GZ-1:	<LLD on 5/16/11
GZ-2:	<LLD on 5/16/11
GZ-3:	48,400 on 5/16/11, down from 71,500 on 5/2/11
GZ-4:	21,900 on 5/16/11, up from 18,800 on 5/2/11
GZ-5:	<LLD on 5/2/11
GZ-6:	<LLD on 5/16/11
GZ-7:	<LLD on 5/16/11
GZ-8:	No sample; dry well
GZ-9:	<LLD on 5/2/11
GZ-10:	<LLD on 5/16/11
GZ-11:	<LLD on 5/2/11
GZ-12S:	<LLD on 5/16/11
GZ-12D:	24,600 on 5/16/11, down from 84,800 on 5/2/11
GZ-13S:	<LLD on 5/16/11
GZ-13D:	794 on 5/16/11, down from 917 on 5/2/11
GZ-14S:	212,5800 on 5/16/11, up from 100,000 on 5/2/11
GZ-14D:	<LLD on 5/16/11
GZ-15:	109,200 on 5/16/11, up from 98,700 on 5/2/11
GZ-16:	<LLD on 5/16/11
GZ-17:	<LLD on 5/2/11
GZ-18S	<LLD on 5/16/11
GZ-18D	<LLD on 5/2/11
GZ-19S	<LLD on 5/2/11
GZ-19D	<LLD on 5/2/11
GZ-20:	<LLD on 4/4/11
GZ-21:	26,700 on 5/16/11, up from 18,600 on 5/2/11
GZ-22D:	188,500 on 5/16/11, down from 203,000 on 5/2/11
GZ-23S:	<LLD on 5/2/11
GZ-24S:	<LLD on 5/16/11
GZ-25S:	<LLD on 5/16/11
GZ-26S:	<LLD on 5/16/11
GZ-27S:	<LLD on 5/2/11

MAY:

May 9, 2011

NRC to Share Conceptual Site Model with State Experts

The US Nuclear Regulatory Commission (NRC) has agreed to share copies of the conceptual site model prepared by Vermont Yankee's hydrogeological contractor with geologists and health physicists in Vermont,

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Massachusetts and New Hampshire. These are the three states that share responsibility for emergency preparedness and environmental surveillance for the plant. This report was provided to the NRC late last week by Entergy Vermont Yankee officials. State experts have requested the data contained in the report to make an independent assessment of drinking water protection at the site.

The conceptual site model details how groundwater flows at the site from higher elevations north, west and south, passing Vermont Yankee structures on its way to the lower elevation of the Connecticut River. It also shows how elevation changes in the river and in water sources deeper within the bedrock relate to elevations of tritium-contaminated groundwater. These forces are instrumental in protecting drinking water from the contaminated groundwater, both on site at Vermont Yankee and beyond its boundaries.

The NRC will provide the report in sufficient time for experts to read it and prepare for the NRC groundwater protection inspection now scheduled for June. The NRC has invited these same experts to participate in the two-day inspection. The inspection had been scheduled for April and then May, but delays in getting the conceptual site model report finalized and delivered to the NRC have pushed the inspection to no earlier than the week of June 13. The report will require weeks to review due to its scope and complexity.

Sampling the COB Well

Vermont officials from the Departments of Health, Public Service and Environmental Conservation will use their findings from the conceptual site model and from the groundwater protection site inspection in June to independently determine whether Vermont Yankee should again try to sample the Construction Office Building (COB) well. This former drinking water well is situated near the centerline of the plume of tritium-contaminated groundwater that was confirmed in January 2010. The well was removed from service by Vermont Yankee in late February 2010. State officials have sought samples from the well to assess whether bedrock sources of water had become contaminated with tritium. Vermont Yankee sampled the well in September 2010 during what is called packer testing. Packer testing isolates specific fractures in the bedrock that provide water to the well. One of the fractures tested had a tritium concentration of 1,040 picocuries per liter (pCi/L), and Vermont Yankee officials decided to suspend any further testing or sampling of the well.

In response to requests from the State Of Vermont, Vermont Yankee again tried to sample the COB well in February 2011. They were unable to obtain a sample. Vermont Yankee officials and their hydrogeological contractor met with the commissioners of health, public service and environmental conservation in April 2011 to explain why. They described how the sample pump put so much pressure on the well that there was a risk of pulling contaminated groundwater above the bedrock into the well. They also described a method that could be employed to sample the well without high risk of contaminating it. This method would require up to 16 weeks to purge the well and obtain a representative sample. State officials determined it best to obtain the conceptual site model and analyze hydrogeological data independently during the NRC groundwater inspection to determine if the well could be sampled safely by other means.

Groundwater Extraction

According to Vermont Yankee, as of May 5, 2011 approximately 330,000 gallons of tritium-contaminated groundwater have been pumped out of the ground, with approximately 22,000 gallons removed since extraction resumed on December 30, 2010. Extraction is performed at wells GZ-22D and GZ-14S. Concentrations at both wells are about half what they were before extraction restarted in December.

Groundwater Monitoring Well Results

The results that follow are as reported by Vermont Yankee for tritium through May 5, 2011. The Department of Health publishes its own sample results here on the website, which generally confirm the Vermont Yankee results. Vermont Yankee has been reporting sample results every day to the Health Department since February 1. As of this report, nine out of a total of 31 groundwater monitoring wells are testing positive for tritium. Generally, the trends are stable or downward. For this report, two wells had an increased tritium concentration and seven had a decreased tritium concentration compared to the last sample date. To date, gamma spectroscopy and special analyses for hard-to-detect radionuclides have not identified any other nuclear power plant-related radioactive materials in groundwater, drinking water or river water. All results are in pCi/L. The term <LLD means less than the lower limit of detection.

GZ-1:	<LLD on 5/2/11
GZ-2:	<LLD on 5/2/11
GZ-3:	71,500 on 5/2/11, down from 77,800 on 4/18/11
GZ-4:	18,800 on 5/2/11, down from 21,400 on 4/18/11
GZ-5:	<LLD on 5/2/11
GZ-6:	<LLD on 5/3/11
GZ-7:	<LLD, down from 2,040 on 4/18/11
GZ-8:	No sample; dry well
GZ-9:	<LLD on 5/2/11
GZ-10:	<LLD on 5/2/11
GZ-11:	<LLD on 5/2/11
GZ-12S:	<LLD on 5/2/11
GZ-12D:	84,800 on 5/2/11, down from 102,000 on 4/18/11
GZ-13S:	<LLD on 5/2/11
GZ-13D:	917 on 5/2/11, up from <LLD on 4/18/11
GZ-14S:	100,000 on 5/2/11, down from 293,000 on 4/18/11
GZ-14D:	<LLD on 5/2/11
GZ-15:	98,700 on 5/2/11, down from 111,000 on 4/18/11
GZ-16:	<LLD on 5/2/11
GZ-17:	<LLD on 5/2/11
GZ-18S:	<LLD on 5/2/11
GZ-18D:	<LLD on 5/2/11
GZ-19S:	<LLD on 5/2/11
GZ-19D:	<LLD on 5/2/11
GZ-20:	<LLD on 4/4/11
GZ-21:	18,600 on 5/2/11, up from 12,300 on 4/18/11
GZ-22D:	203,000 on 5/2/11, down from 228,000 on 4/18/11
GZ-23S:	<LLD on 5/2/11
GZ-24S:	<LLD on 5/4/11

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GZ-25S:	<LLD on 5/2/11
GZ-26S:	<LLD on 5/2/11
GZ-27S:	<LLD on 5/2/11

May 2, 2011**COB Well Sampling**

State officials and technical experts met with Vermont Yankee and its hydrogeological contractor on April 27 to discuss sampling of the Construction Office Building (COB) well. This former drinking water well was taken out of service at the end of February 2010. The commissioners of Health, Environmental Conservation, and Public Service have repeatedly requested samples to verify that this well remains free of contamination.

State officials believe sampling is important because this well is deep in the bedrock and situated near the middle of the plume of tritium-contaminated groundwater, where it is most at risk of being contaminated from the groundwater above the bedrock. Vermont Yankee attempted to sample the well in September 2010 during a procedure called packer testing, but stopped when tritium was found in the well. They tried again in February 2011, but stopped when pumping appeared likely to draw water down from the tritium-contaminated groundwater above the bedrock.

At the meeting, Vermont Yankee's hydrogeological contractor summarized its conceptual site model. This model maps how the groundwater flows from higher elevations north, west and south, passing Vermont Yankee structures on its way to the Connecticut River. The model shows elevations of each of the shallow and deep wells above the bedrock, and many of the drinking water wells on and off site. The model also shows how groundwater flow reacts to seasonal changes in river elevation. While these seasonal changes can be seen in all wells, the elevations of drinking water sources and wells outside Vermont Yankee are always higher than the elevations of contaminated groundwater wells at Vermont Yankee. Because water does not naturally travel uphill, this indicates that contaminated groundwater will not affect drinking water supplies or wells west of Vermont Yankee. The contractor also described packer testing of the COB well to show how the testing itself might have caused the tritium contamination first reported in January 2010.

Vermont Yankee officials have concluded that sampling the COB well cannot be done without risking contamination. They also do not believe that further sampling will reveal any significant new information to contradict its conceptual site model, which demonstrates how drinking water sources are protected from groundwater contamination. State officials requested the actual data for independent analysis by its own experts. All parties decided a final decision on sampling the COB well would wait until the State had reviewed the conceptual site model and geophysical testing data, and after reviewing data during the NRC inspection.

NRC Groundwater Inspection Postponed to May 10 - 11

The Nuclear Regulatory Commission (NRC) has invited geologists and health physicists from Vermont, New Hampshire and Massachusetts to join them at the next inspection of Vermont Yankee's groundwater protection program. This inspection was first scheduled for April 15, but has been postponed until May to allow adequate time for reviewing Vermont Yankee's conceptual site model (described above).

Groundwater Contamination near Radioactive Waste Building

The source of tritium contamination near the radioactive waste building has not been positively identified, but Vermont Yankee officials are concluding by process of elimination that the source was likely the AOG sump drain

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line. This piping runs from the sump in the Advanced Off-Gas (AOG) building to the radioactive waste building. Five other buried pipes that carry radioactive materials were tested multiple times and found not to leak. Modifications were made to other plant components to prevent leakage. Vermont Yankee will remove the AOG sump drain line and the sump pump from service, drain its contents, and cap the ends of the piping. The drain line was to be tested first for leakage, but Vermont Yankee found testing could not be accomplished. Contamination near the radioactive waste building was first identified in early January 2011, with samples from groundwater monitoring well GZ-24S. Contamination never exceeded about 9,000 picocuries per liter (pCi/L), and has been measured most weeks at just above the lower limit of detection, about 500 pCi/L.

Groundwater Extraction

According to Vermont Yankee, as of April 21, 2011 approximately 328,800 gallons of tritium-contaminated groundwater have been pumped out of the ground, with approximately 21,000 gallons removed since extraction resumed on December 30, 2010. Extraction is performed at wells GZ-22D and GZ-14S. Concentrations at both wells are about half what they were before extraction restarted in December.

Groundwater Monitoring Well Results

The results that follow are as reported by Vermont Yankee for tritium through April 14, 2011. Vermont Yankee has been reporting sample results every day to the Health Department since February 1.

As of this report, eight out of a total of 31 groundwater monitoring wells are testing positive for tritium.

Generally, the trends are stable or downward. For this report, five wells had an increased tritium concentration and three had a decreased tritium concentration compared to the last sample date.

To date, gamma spectroscopy and special analyses for hard-to-detect radionuclides have not identified any other nuclear power plant-related radioactive materials in groundwater, drinking water or river water.

All results are in pCi/L. The term <LLD means less than the lower limit of detection.

GZ-1:	<LLD on 4/18/11
GZ-2:	<LLD on 4/18/11
GZ-3:	77,800 on 4/18/11, up from 65,600 on 4/11/11
GZ-4:	21,400 on 4/18/11, up from 20,200 on 4/11/11
GZ-5:	<LLD on 4/4/11
GZ-6:	<LLD on 4/19/11
GZ-7:	2,040 on 4/18/11, down from 2,940 on 4/11/11
GZ-8:	No sample; dry well
GZ-9:	<LLD on 4/4/11
GZ-10:	<LLD on 4/18/11
GZ-11:	<LLD on 4/18/11
GZ-12S:	<LLD on 4/18/11, down from 2,240 on 4/11/11
GZ-12D:	102,000 on 4/18/11, up from 86,300 on 4/11/11
GZ-13S:	<LLD on 4/18/11
GZ-13D:	<LLD on 4/18/11, down from 1,070 on 4/11/11
GZ-14S:	293,000 on 4/18/11, up from 220,000 4/11/11
GZ-14D:	<LLD on 4/18/11

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GZ-15:	111,000 on 4/18/11, up from 107,000 on 4/11/11
GZ-16:	<LLD on 4/18/11
GZ-17:	<LLD on 4/4/11
GZ-18S	<LLD on 4/18/11
GZ-18D	<LLD on 4/18/11
GZ-19S	<LLD on 2/7/11 (on a quarterly sampling interval)
GZ-19D	<LLD on 2/7/11 (on a quarterly sampling interval)
GZ-20:	<LLD on 4/4/11
GZ-21:	12,300 on 4/18/11, down from 14,300 on 4/11/11
GZ-22D:	228,000 on 4/18/11, down from 233,000 on 4/11/11
GZ-23S:	<LLD on 4/18/11
GZ-24S:	<LLD on 4/19/11
GZ-25S:	<LLD on 4/18/11
GZ-26S:	<LLD on 4/18/11
GZ-27S:	<LLD on 4/18/11

APRIL:
April 20, 2011
Hydrogeological Conceptual Site Model

Vermont Yankee provided an in-depth assessment of the conceptual site model created by its hydrogeological contractors to a group of state government experts, including the Agency of Natural Resources state geologist and hydrogeologist, Rep. Bob Krebs of the House Fish, Wildlife & Water Resources Committee and the Health Department’s state radiological health chief, at a meeting on April 15. This model uses topographic data, original construction documents, and detailed analysis of well drilling data and site bedrock borings to depict the characteristics of the watershed in Vernon, and groundwater elevations and flows at the Vermont Yankee site. The model also presents the interface of bedrock and water within the bedrock with soils and groundwater above the bedrock.

State officials requested this meeting to enable state experts to make an independent assessment as to whether the Construction Office Building (COB) well should be sampled further. The COB well is a 360-foot deep well that provided drinking water to Vermont Yankee workers on site. The COB well was shut down in February 2010 when groundwater in the area was contaminated with tritium. Since then, state officials have requested that the well be routinely to help verify that drinking water was not getting contaminated even at this most vulnerable location. A meeting with the commissioners of health, environmental conservation and public service and the Vermont Yankee site vice president is scheduled for April 27, when final decisions about sampling the COB well may be made. The conceptual site model shared and other information will be critical to these decisions. Tritium concentrations are increasing at groundwater monitoring wells GZ-15 and GZ-21. The hydrogeological contractor considered these increases likely due to the transition from winter to spring, and the composition of soils in the vicinity of these wells. The Health Department noted the wells are supposed to monitor nearby plant systems for new leakage and, until contamination clears from the soils there, new leaks are impossible to identify with the well results alone. GZ-15 was previously used for extraction, and groundwater tritium

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concentrations at both GZ-15 and GZ-21 were lowest during extraction, and have been increasing since extraction at GZ-15 ceased.

NRC Groundwater Inspection on May 10-11

The Nuclear Regulatory Commission (NRC) has invited geologists and health physicists from Vermont, New Hampshire and Massachusetts to join them at the next inspection of Vermont Yankee's groundwater protection program, scheduled for May 10 and 11. The final conceptual site model will be analyzed by NRC geologists and health physicists as a major part of the inspection.

Groundwater Contamination near Radioactive Waste Building

The source of tritium contamination near the Radioactive Waste Building has still not been positively identified according to Vermont Yankee officials. This contamination was identified in January 2011, with samples from groundwater monitoring well GZ-24S. Contamination never exceeded about 9,000 picocuries per liter (pCi/L), and has been measured most weeks at just above the lower limit of detection, about 500 pCi/L.

Five piping runs have so far been ruled out as sources of low concentrations of tritium near groundwater monitoring well GZ-24S, which is located near the Radioactive Waste Building. These are the stack sump discharge drain line, the first stage Advanced Off-Gas (AOG) delay pipe drain line, the second stage AOG delay pipe drain line, the steam packing exhaust drain line, and the standby gas treatment drain line. Vermont Yankee will conduct gaseous tracer testing in May on a sixth piping run of interest, the AOG sump drain line. This piping runs from the sump in the AOG building to the radioactive waste building.

Groundwater Extraction

According to Vermont Yankee, as of March 17 approximately 326,800 gallons of tritium-contaminated groundwater have been pumped out of the ground, with approximately 19,500 gallons removed since extraction resumed on December 30, 2010. Extraction is performed at wells GZ-22D and GZ-14S. Concentrations at both wells are about half what they were before extraction restarted in December.

Groundwater Monitoring Well Results

The results that follow are as reported by Vermont Yankee for tritium through April 14, 2011. Vermont Yankee has been reporting sample results every day to the Health Department since February 1.

As of this report, 10 out of a total of 31 groundwater monitoring wells are testing positive for tritium. Generally, the trends are stable or downward. The only exceptions are GZ-15 and GZ-21 as described above. The reason for this is unclear. For this report, five wells had an increased tritium concentration and five had a decreased tritium concentration compared to the last sample date.

To date, gamma spectroscopy and special analyses for hard-to-detect radionuclides have not identified any other nuclear power plant-related radioactive materials in groundwater, drinking water or river water.

All results are in pCi/L. The term <LLD means less than the lower limit of detection.

MARCH:**March 22, 2011**

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Groundwater contamination near the radioactive waste building

The source of contamination near the radwaste building has not yet been identified according to Vermont Yankee officials. Four piping runs have so far been ruled out as sources of low concentrations of tritium near groundwater monitoring well GZ-24S near the radioactive waste building: the stack sump discharge drain line, the second stage Advanced Off-gas (AOG) delay pipe drain line, the first stage AOG delay pipe drain line and the steam packing exhaust drain line. Vermont Yankee will conduct gaseous tracer testing in April to further confirm the lines do not leak. The standby gas treatment drain line may be tested as early as March 24. If this line is not found to be leaking, the AOG Building sump drain line will be tested. This piping runs from the sump in the AOG building to the radioactive waste building.

Vermont Yankee asked to explain why the COB well is not being sampled Commissioners of the Departments of Health, Environmental Conservation and Public Service have sent a formal letter of request to Vermont Yankee site vice president to fully describe why the Construction Office Building (COB) well is no longer being sampled. State officials have been asking for samples from this well for many months in order to better understand the potential risk of contamination to drinking water supplies deep in the bedrock. The COB well is 360 foot deep into bedrock and sited near the center of the current plume of tritium-contaminated groundwater above the bedrock. The letter also requested a description of plans to renew safe sampling of the well. An answer to the request is expected by March 28.

Vermont Yankee stopped sampling the COB well in February 2010, conducted special testing in September 2010, and stopped testing in October 2010 when tritium was detected in one of numerous bedrock fractures that feed the well. The letter from the State was sent after attempts to sample again in late February 2011 were halted.

Groundwater Extraction

According to Vermont Yankee, as of March 17 approximately 328,800 gallons of tritium-contaminated groundwater have been pumped out of the ground, with approximately 16,500 since extraction resumed on December 30, 2010. Extraction is performed at wells GZ-22D and GZ-14S.

Groundwater Monitoring Well Results

The results that follow are as reported by Vermont Yankee for tritium through March 17, 2011. Vermont Yankee has been reporting sample results every day to the Health Department since February 1.

As of this report, 11 out of a total of 31 groundwater monitoring wells are testing positive for tritium. Generally, the trends are stable or downward. This includes a downward trend at GZ-24S, which had been at a high of over 9,000 picocuries per liter (pCi/L) on January 20 and is now about 1,500 pCi/L. The reason for this is unclear. For this report, four wells had an increased tritium concentration compared to the last sample date. To date, gamma spectroscopy and special analyses for hard-to-detect radionuclides have not identified any other nuclear power plant-related radioactive materials in groundwater, drinking water or river water.

GZ-1:	<LLD on 3/14/11
GZ-2:	<LLD on 3/14/11
GZ-3:	96,900 on 3/14/11, down from 108,000 on 2/22/11
GZ-4:	47,200 on 3/14/11, down from 94,800 on 2/22/11
GZ-5:	<LLD on 3/16/11
GZ-6:	<LLD on 3/16/11

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GZ-7:	2,540 on 3/14/11, up from 2,280 on 2/22/11
GZ-8:	No sample; dry well
GZ-9:	<LLD on 3/8/11
GZ-10:	<LLD on 3/14/11
GZ-11:	<LLD on 3/14/11
GZ-12S:	< LLD on 3/14/11, down from 2,670 on 2/22/11
GZ-12D:	80,900 on 3/14/11, down from 113,000 on 2/22/11
GZ-13S:	<LLD on 3/14/11
GZ-13D:	909 on 3/14/11, up from 823 on 2/22/11
GZ-14S:	413,000 on 3/14/11, down from 426,000 on 2/17/11
GZ-14D:	<LLD on 3/14/11
GZ-15:	93,300 on 3/14/11, down from 100,000 on 2/22/11
GZ-16:	<LLD on 3/14/11
GZ-17:	<LLD on 2/8/11
GZ-18S	<LLD on 3/14/11
GZ-18D	<LLD on 3/14/11
GZ-19S	<LLD on 2/7/11
GZ-19D	<LLD on 2/7/11
GZ-20:	<LLD on 2/22/11
GZ-21:	<LLD on 3/14/11
GZ-22D:	283,000 on 3/14/11, down from 344,000 on 2/22/11
GZ-23S:	1,300 on 3/14/11, up from 722 on 2/22/11
GZ-24S:	1,520 on 3/16/11, up from 677 on 2/23/11
GZ-25S:	<LLD on 3/14/11
GZ-26S:	<LLD on 3/14/11
GZ-27S:	<LLD on 3/14/11

FEBRUARY:
February 28, 2011
Vermont State Nuclear Advisory Panel (VSNAP)

On February 22, VSNAP met for the first time since March 2009, convened at Vernon Elementary School by new Public Service Commissioner Elizabeth Miller. VSNAP is charged with overseeing current and future uses of nuclear power in the state. Most of the meeting focused on the groundwater contamination investigation at Vermont Yankee. The Health Department presented a review of the 2010 Advanced Off-Gas (AOG) building leak, remediation efforts, long-term environmental monitoring, as well as the more recent tritium contamination tracked at groundwater monitoring well GZ-24S. This was followed by reports from Vermont Yankee officials. The meeting also included presentations on VY docket 7440 for a Certificate of Public Good to continue operating after March 2012, and VY docket 7600 to shut down the plant. A consultant to the Public Service Department gave an update on the comprehensive reliability audit, and a consultant from Fairewinds Associates highlighted reliability issues that were identified in the most recent Public Oversight Panel's report to the Joint Fiscal Committee. The New England Coalition presented concerns about buried electrical cables that may

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become submerged in water and degrade. A public comment period followed. About 80 to 100 people attended.

Groundwater contamination near the radwaste building

So far, no source of contamination near the radwaste building has been identified. Vermont Yankee officials have ruled out the stack sump discharge drain line and the second stage AOG delay pipe drain line as sources of low concentrations of tritium near groundwater monitoring well GZ-24S. This well is located near the radwaste building.

Three additional piping runs, sumps and tanks near the radwaste building are still under investigation. The first stage AOG delay pipe drain line is scheduled for testing this week, and the steam packing exhaust drain line is being tested now, but results so far are inconclusive. Changes in the test procedure are being implemented. The standby gas treatment drain line may be tested as early as March 7.

One other explanation is “washout” or “rainout.” This happens when radioactivity in the air is washed out of the air by precipitation. Vermont Yankee is testing snow to see if this is occurring. Vermont Yankee has routinely tested the storm drains, where rain and snow melt end up, for radioactivity including tritium. Tests of the storm drains have been negative for tritium since January 2010. The Health Department has always monitored these storm drain results.

Sampling to start again at former COB drinking water well

On February 26, Vermont Yankee officials reported a delay in preparations for sampling water once again from the Construction Office Building (COB) well. A new internal casing for a new pump had been installed and the first new sample was expected to be obtained on February 25. Vermont Yankee says the problems they are encountering in sampling again are likely due to a full year of inactivity at this well, allowing silt to accumulate in bedrock fractures that feed the well. They expect to have the well ready to sample again on or about March 2. The COB well is a former drinking water well. It's about 360 feet deep, and is located in the plume of tritium contaminated groundwater that was created by leaks at the AOG Building. It was taken out of service as a well for drinking water in February 2010. For the past year, the Departments of Health and Environmental Conservation have requested that sampling of this well continue.

The well was subjected to “down-hole geophysical testing” in the spring of 2010, and “packer testing” in the fall of 2010. Both tests were designed to assess the bedrock and water-yielding fractures in the bedrock through which the well was bored. During packer testing in October 2010, water from a low yielding fracture at 200 to 220 feet in depth tested positive for tritium. Subsequently, Vermont Yankee pulled all of its equipment out of the well and stopped testing and sampling it.

Radiochemical analytical results will be shared with the Department of Health, and the Department plans to analyze a split sample from the well.

Groundwater Extraction

According to Vermont Yankee, as of February 10 approximately 325,000 gallons of tritium-contaminated groundwater has been pumped out of the ground, with approximately 13,200 of that total extracted since the restart of that process on December 30, 2010. The two currently operating extraction wells, GZ-22D and GZ-14S, each yield about 0.25 gallons per minute. This is much less than previous groundwater extraction wells. The

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lower extraction rate is at least partially due to the lower permeability of soils in the area. Groundwater does not move as fast in the soils near GZ-22D and GZ-14S.

Groundwater Monitoring Well Results

The results that follow are as reported by Vermont Yankee for tritium through February 25, 2011. Vermont Yankee has been reporting sample results every day to the Health Department since February 1.

As of this report, 11 out of a total of 31 groundwater monitoring wells are testing positive for tritium. With the exception of wells GZ-14S and GZ-22D, the trends are stable or downward. This includes a downward trend at GZ-24S, which had been at a high of over 9,000 picocuries per liter (pCi/L) on January 20 and is now just barely over the lower limit of detection of approximately 500 pCi/L. The reason for this is unclear. For this week, three wells had an increased tritium concentration compared to the last sample date.

To date, gamma spectroscopy and special analyses for hard-to-detect radionuclides have not identified any other nuclear power plant-related radioactive materials in groundwater, drinking water or river water.

GZ-1:	<LLD on 2/22/11
GZ-2:	<LLD on 2/22/11
GZ-3:	108,000 on 2/22/11, down from 112,000 on 2/7/11
GZ-4:	94,800 on 2/22/11, up from 70,000 on 1/31/11
GZ-5:	<LLD on 2/7/11
GZ-6:	<LLD on 2/23/11
GZ-7:	2,280 on 2/22/11, down from 3,610 on 2/7/11
GZ-8:	No sample; dry well
GZ-9:	<LLD on 2/7/11
GZ-10:	<LLD on 2/22/11
GZ-11:	<LLD on 2/7/11
GZ-12S:	2,670 on 2/22, down from 3,250 on 2/7/11
GZ-12D:	113,000 on 2/22/11, down from 125,000 on 2/7/11
GZ-13S:	<LLD on 2/22/11
GZ-13D:	823 on 2/22/11, down from 955 on 2/7/11
GZ-14S:	426,000 on 2/17, up from 255,865 on 2/10/11
GZ-14D:	<LLD on 2/22/11
GZ-15:	100,000 on 2/22/11, down from 108,000 on 2/8/11
GZ-16:	<LLD on 2/22/11
GZ-17:	<LLD on 2/8/11
GZ-18S:	<LLD on 2/22/11
GZ-18D:	<LLD on 2/22/11
GZ-19S:	<LLD on 2/7/11
GZ-19D:	<LLD on 2/7/11
GZ-20:	<LLD on 2/22/11
GZ-21:	<LLD on 2/22, down from 8,650 on 2/7/11

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GZ-22D:	344,000 on 2/22/11, up from 308,000 on 2/7/11
GZ-23S:	722 on 2/22/11, up from <LLD on 2/7/11
GZ-24S:	677 on 2/23/11, down from 2,159 on 2/13/11
GZ-25S:	<LLD on 2/22/11
GZ-26S:	<LLD on 2/22/11
GZ-27S:	<LLD on 2/22/11

February 14, 2011
Hydrogeological Briefing Held on Feb. 10

Geologists and health physicists from Vermont, New Hampshire and Massachusetts attended a hydrogeological briefing at Vermont Yankee on Feb. 10. Although Vermont Yankee’s hydrogeological contractor did not attend as had been expected, plant officials provided some important new information.

The recent tritium groundwater contamination detected north of the Advanced Off-Gas (AOG) plume at monitoring wells GZ-24S and GZ-6 was a key area of interest. Vermont Yankee presented graphical representations of the underground piping runs in these areas.

The Health Department and the other participants requested copies of these documents, as well as a copy of the Site Conceptual Model Report when it is completed by Vermont Yankee’s contractor. This is expected to be March 15. Without that report, it is impossible for states to independently assess protection of drinking water.

Detailed information provided by Vermont Yankee at the briefing tend to show this new source of contamination as smaller, and of less radiological significance, than the AOG leak that was confirmed in January 2010. However, the following assumptions that were presented have yet to be confirmed:

- The calculated volume of the longest of the five pipes in the area of GZ-24S is about 130 gallons. The total volume of water these five pipes could hold is less than 1,000 gallons. Depending on how long the pipe(s) have been leaking, the total volume of water that could have leaked into the ground would be low compared to leak(s) confirmed in January 2010 at the AOG Building, which may have been in excess of 75,000 gallons.
- All of these five piping runs are drain lines for systems that normally carry gases. This means that much less liquid travels through them. It also means that the concentration of other radioactive materials like cesium-137, cobalt-60 and strontium-90 should be significantly lower when compared to liquid processing lines. The condensate in the AOG piping that leaked into the ground contained relatively high concentrations of these and other radioactive materials.
- The soils around GZ-24S only allow groundwater movement at a rate of about 20 to 30 feet per year. The soils very near the AOG leak allowed groundwater to move about 300 to 350 feet per year.
- The leak rate of the piping near GZ-24S may be as low as three to four milliliters per minute. This is less than two gallons per day. The leak at the AOG Building was estimated to be as much as 100 gallons per day.

These five piping runs near GZ-24S are partly buried under the Radioactive Waste Compactor Building, and this may make excavation complicated. According to Vermont Yankee, preliminary planning for excavation is underway. Two of the five pipes have been tested once and ruled out as sources, but will be tested again. The

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re-test, a hydrostatic pressure test like the first test, will be for a longer duration. Two more lines will be tested in the coming week. The fifth will take longer to be tested as it is a safety-related piping run, which requires greater planning.

Vermont Yankee also committed to continued groundwater extraction (see below), and a return to sampling the Construction Office Building (COB) well. The Departments of Health and Environmental Conservation have formally requested a return to sampling this well as it serves as a sentinel well on deep sources of water in the bedrock. This former drinking water well was taken out of service in February 2010 and not sampled again until late September and early October 2010. After a sample from one of numerous fractures in the bedrock in the COB well was found to be contaminated with about 1,000 picocuries per liter (pCi/L), Vermont Yankee ceased all sampling from the well. At the briefing, Vermont Yankee again stated they are planning to resume sampling of the COB well this month.

NRC to Host State/Federal Scientific Review of Site Conceptual Model Report

Also on Feb. 10, the Nuclear Regulatory Commission (NRC) advocated that each state should get a copy of the Site Conceptual Model report for their public health and environmental experts to review. NRC plans to host hydrogeologists and health physicists from each state and the NRC in a review, allowing the group to jointly evaluate the report. The review would likely be conducted in mid-April.

Groundwater Extraction

According to Vermont Yankee, as of Feb. 10 approximately 318,500 gallons of tritium-contaminated groundwater has been pumped out of the ground, with approximately 11,200 of that total extracted since the restart of that process on December 30, 2010. The two locations where extraction is occurring, GZ-22D and GZ-14S, each yield about 0.25 gallons per minute. This is much less than previous groundwater extraction wells. The lower extraction rate is at least partially due to the lower permeability of soils in the area. Groundwater does not move as fast in the soils near GZ-22D and GZ-14S.

Groundwater Monitoring Well Results

The results that follow are as reported by Vermont Yankee for tritium through February 14, 2011. Vermont Yankee has been reporting sample results every day to the Health Department since February 1, 2011.

As of this report, 11 of the 31 groundwater monitoring wells are testing positive for tritium. With the exception of wells GZ-23S, GZ-6 and GZ-24S, the trend over the past several months has been that tritium concentrations in groundwater near plant structures, systems and components are decreasing. Trends for wells GZ-14 and GZ-22D, the two extraction sites, are trending downward as expected. Trends for GZ-23S, GZ-6 and GZ-24S, as described above, have remained relatively stable over the past two weeks. For this week, 6 wells had an increased tritium concentration compared to the last sample date.

To date, gamma spectroscopy and special analyses for hard-to-detect radionuclides have not identified any other nuclear power plant-related radioactive materials in groundwater, drinking water or river water.

GZ-1:	<LLD on 2/7/11
GZ-2:	<LLD on 2/7/11
GZ-3:	112,000 on 2/7/11, up from 108,000 on 1/31/11

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GZ-4:	70,000 on 1/31/11, down from 78,555 on 1/24/11
GZ-5:	<LLD on 2/7/11
GZ-6:	<LLD on 2/13/11
GZ-7:	3,610 on 2/7/11, up from 3,117 on 1/31/11
GZ-8:	No sample; dry well
GZ-9:	<LLD on 2/7/11
GZ-10:	<LLD on 2/8/11
GZ-11:	<LLD on 2/7/11
GZ-12S:	3,250 on 2/7/11, up from 1,877 on 1/31/11
GZ-12D:	125,000 on 2/7/11, up from 114,962 on 1/31/11
GZ-13S:	<LLD on 2/1/11
GZ-13D:	955 on 2/7/11, up from 880 on 1/31/11
GZ-14S:	255,865 on 2/10/11, down from 334,136 on 1/31/11
GZ-14D:	<LLD on 2/8/11
GZ-15:	108,000 on 2/8/11, down from 144,700 on 1/26/11
GZ-16:	<LLD on 2/4/11
GZ-17:	<LLD on 2/7/11
GZ-18S:	<LLD on 2/7/11
GZ-18D:	<LLD on 2/7/11
GZ-19S:	<LLD on 2/7/11
GZ-19D:	<LLD on 2/7/11
GZ-20:	<LLD on 2/7/11
GZ-21:	8,650 on 2/7/11, up from 6,853 on 1/31/11
GZ-22D:	308,000 on 2/7/11, down from 354,906 on 1/31/11
GZ-23S:	<LLD on 2/7/11
GZ-24S:	2,159 on 2/13/11, down from 4,857 on 2/3/11
GZ-25S:	<LLD on 2/7/11
GZ-26S:	<LLD on 2/7/11
GZ-27S:	<LLD on 2/7/11

February 7, 2011
Groundwater Monitoring Well GZ-23S Tests Positive for Tritium

The Vermont Department of Health received laboratory data late last week from Entergy Vermont Yankee that indicates samples from groundwater monitoring well GZ-23S tested positive for low levels of tritium. Vermont Yankee's lower limit of detection (LLD) for tritium is in the range of 670 to 700 picocuries per liter (pCi/L). The test results for the samples collected from GZ-23S during the week of January 24 were 714 and 721 pCi/L.

In the past month, three groundwater monitoring wells that previously tested negative for tritium have now been shown to be contaminated. All three wells – GZ-23S, GZ-6 and GZ-24S – are north of the underground plume of tritium-contaminated groundwater that the Health Department has been monitoring for the past 13 months. GZ-23S is much closer to the plume, as it is currently defined, compared to GZ-6 and GZ-24S. GZ-23S is

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approximately on a line between GZ-12 and GZ-13, two sites that have both yielded samples positive for tritium over the last several months.

These newest results could be evidence that the original plume is broadening from north to south along the river, or that there are other sources responsible for tritium contamination. Vermont Yankee is investigating nearby plant structures, systems and components to determine the source.

The only sample from GZ-23S that the Health Department Laboratory has received and analyzed so far was taken on December 6 – tritium was not detected in that sample.

Groundwater Source Investigation

In a teleconference on February 3, Vermont Yankee noted that it had completed pressure testing of two piping runs suspected as possible sources of new leaks. These are two of five piping runs that are high on the list of possible sources near GZ-24S. In fact, the well was sited at this location to monitor these particular piping runs. Pressure testing indicated that these two piping runs do not appear to be leaking. Preparations are underway to pressure test the other three piping runs.

All of these five piping runs are drain lines for systems that normally carry gases. This means that less liquid travels through them. It also means that the concentration of other radioactive materials like cobalt-60, cesium-137 and strontium-90 (Co-60, Cs-137 and Sr-90) should be lower as compared to liquid processing lines. Vermont Yankee officials noted, however, that the concentration of tritium in these drain lines is similar to that of systems that process predominantly liquids with concentrations of about 3 million pCi/L. The Health Department Laboratory will continue to perform additional analyses on well samples from this new investigation area.

Vermont Yankee officials also noted that they are plotting all of the underground utilities that run through the plume from the Advanced Off-Gas (AOG) building area. This will help in evaluating whether these structures and components could act as conduits of tritium from the AOG plume into the area sampled by wells GZ-24S and GZ-6.

Vermont Yankee officials noted that the soils near GZ-24S and GZ-6 are of very low permeability. This means groundwater moves slowly through the soils. State officials will get further hydrogeological information at a technical briefing scheduled for February 10.

Sampling Provisions

The Health Department has been urging Vermont Yankee to sample river water at the river's edge near the centerline of the AOG plume.

The Departments of Health and Environmental Conservation have recommended for some time that samples be frequently obtained from the Construction Office Building (COB) well. Regular sampling will help determine the tritium concentration in this former drinking water well, which is 360 feet deep into bedrock, and help to better understand if other deep water sources could become contaminated.

Vermont Yankee officials have verified that they have made provisions to keep the river's edge site free from

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winter ice that could prevent testing, and that they plan to sample the COB well again in February.

Groundwater Extraction

According to Vermont Yankee, as of February 3 approximately 317,000 gallons of tritium-contaminated groundwater has been pumped out of the ground to date, with approximately 9,700 of those gallons extracted since the re-start of that process on December 30, 2010.

Groundwater Monitoring Well Results

The results that follow are as reported by Vermont Yankee for tritium on February 3, 2011. In addition, Vermont Yankee has been reporting sample results every day to the Health Department since February 1, 2011.

As of this report, 11 of the 31 groundwater monitoring wells are testing positive for tritium. With the exception of wells GZ-23S, GZ-6 and GZ-24S, the trend over the past several months has been that tritium concentrations in groundwater near plant structures, systems and components are decreasing. Trends for wells GZ-14 and GZ-22D, the two extraction sites, are trending downward as expected. Trends for GZ-23S, GZ-6 and GZ-24S, as described above, have remained relatively stable over the past two weeks. For this week, only GZ-15 had an increased tritium concentration compared to the last sample date.

To date, gamma spectroscopy and special analyses for hard-to-detect radionuclides have not identified any other nuclear power plant-related radioactive materials in groundwater, drinking water or river water.

GZ-1:	<LLD on 1/31/11
GZ-2:	<LLD on 1/31/11
GZ-3:	108,000 on 1/31/11, down from 121,275 on 1/24/11
GZ-4:	70,000 on 1/31/11, down from 78,555 on 1/24/11
GZ-5:	<LLD on 1/4/11
GZ-6:	<LLD on 2/1/11, down from 1,024 on 1/26/11
GZ-7:	3,117 on 1/31/11, down from 3,474 on 1/4/11
GZ-8:	No sample; dry well
GZ-9:	<LLD on 1/4/11
GZ-10:	<LLD on 1/31/11
GZ-11:	<LLD on 1/4/11
GZ-12S:	1,877 on 1/31/11, down from 3,268 on 1/17/11
GZ-12D:	114,962 on 1/31/11, down from 130,857 on 1/17/11
GZ-13S:	<LLD on 2/1/11, down from 801 on 1/4/11
GZ-13D:	880 on 1/31/11, down from 1,095 on 1/4/11
GZ-14S:	334,136 on 1/31/11, down from 442,149 on 1/10/11
GZ-14D:	<LLD on 1/31/11
GZ-15:	144,700 on 1/26/11, up from 141,585 on 1/4/11
GZ-16:	<LLD on 1/31/11
GZ-17:	<LLD on 1/4/11
GZ-18S:	<LLD on 1/31/11

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GZ-18D:	<LLD on 1/31/11, down from 749 on 1/4/11
GZ-19S:	<LLD on 11/1/10
GZ-19D:	<LLD on 11/1/10
GZ-20:	<LLD on 1/4/11
GZ-21:	6,853 on 1/31/11, down from 8,673 on 1/17/11
GZ-22D:	354,906 on 1/31/11, down from 398,557 on 1/17/11
GZ-23S:	<LLD on 1/31/11, down from 721 pCi/L on 1/26/11
GZ-24S:	4,857 on 2/3/11, down from 8,139 on 1/26/11
GZ-25S:	<LLD on 1/31/11
GZ-26S:	<LLD on 1/31/11
GZ-27S:	<LLD on 1/31/11

JANUARY:
January 31, 2011
Tritium Contamination in Wells GZ-6 and GZ-24S

As reported on January 21, samples from groundwater monitoring well GZ-6 have shown low levels of tritium contamination. This finding was overshadowed by the results from GZ-24S provided to the Health Department the same day. (While the Health Department's analytical result from GZ-6 for December 6, 2010 was 627 ± 201 picocuries per liter (pCi/L), the results from GZ-24S were in the range of 9,000 pCi/L.)

A January 4 sample analyzed by the Health Department of well GZ-6 shows it is still contaminated with tritium. The preliminary January 4 GZ-6 sample result was 631 ± 202 pCi/L. The plus-or-minus figure given for each sample result is the statistical uncertainty (95 percent confidence level). For the sample of January 4, for example, the real result could be between 833 and 429 pCi/L accounting for this statistical uncertainty.

Contamination North of the AOG Plume

According to Entergy Vermont Yankee in a conference call on January 27, there is still no confirmed source of the groundwater contamination in the GZ-24S and GZ-6 area. These wells are about 250 and 150 feet north of the plume that the Health Department has been reporting on since January 2010. This plume was created when two pipes from the Advanced Off-Gas (AOG) Building leaked into a pipe tunnel that subsequently leaked into the surrounding soils. It is possible that there is either a new leakage source near GZ-42S and GZ-6, or that tritium contaminated groundwater from the AOG plume is being "channeled" northward by human-made or natural features beneath the ground. According to Vermont Yankee, testing is underway to identify if specific pipes are the source of new leakage. Four drain lines from the reactor and turbine building and a number of lines from the AOG Building are specifically being evaluated.

From Entergy Vermont Yankee analytical results supplied to the Health Department today, the tritium contamination levels in well GZ-24S have fluctuated between 2,441 pCi/L from a sample obtained on December 28, to 9,524 pCi/L from a sample obtained on January 29. There is no upward trend since daily sampling began on January 20. However, nine out of these 11 daily samples have been greater than 5,000 pCi/L.

In response to a formal request from the Health Department, Entergy Vermont Yankee is now sending all of its

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radiochemical test results on a daily basis. This apply to results from both from their on-site laboratory and from their contract laboratory – and results from all media including water, fish, sediments and soils. This will allow the Health Department to identify trends more quickly.

Groundwater Extraction Continues

Entergy Vermont Yankee also reported that, as of January 27, they have pumped out a total of 316,700 gallons of tritiated water from the ground. Groundwater extraction had been halted on November 18, 2010, and began again on December 30, 2010. Extraction is via wells at GZ-14S and GZ-22D. Since the extraction was restarted, about 8,000 gallons of tritium-contaminated groundwater have been removed from the ground. Equipment for this effort is protected from cold and freezing.

Groundwater Monitoring Well Results

The results that follow are as reported by Vermont Yankee for tritium on January 27, 2011.

As of this report, 14 of the 31 groundwater monitoring wells are testing positive for tritium. With the exception of wells GZ-6 and GZ-24S, the trend over the past several months has been that tritium concentrations in groundwater near plant structures, systems and components are decreasing. Trends for wells GZ-14 and GZ-22D, the two extraction sites, are trending downward as expected. Trends for GZ-6 and GZ-24S, as described above, have remained relatively stable.

To date, gamma spectroscopy and special analyses for hard-to-detect radionuclides have not identified any other nuclear power plant-related radioactive materials in groundwater, drinking water or river water.

GZ-1:	<LLD on 1/24/11
GZ-2:	<LLD on 1/20/11
GZ-3:	121,275 on 1/24/11, down from 178,931 on 12/20/10
GZ-4:	78,555 on 1/24/11, up from 67,139 on 12/20/10
GZ-5:	<LLD on 1/4/11
GZ-6:	1,024 on 1/26/11, up from <LLD on 12/20/10
GZ-7:	3,474 on 1/4/11, up from 2,474 on 12/20/10
GZ-8:	No sample; dry well
GZ-9:	<LLD on 1/4/11
GZ-10:	<LLD on 1/24/11
GZ-11:	<LLD on 1/4/11
GZ-12S:	3,268 on 1/17/11, down from 3,665 on 12/20/10
GZ-12D:	130,857 on 1/17/11, up from 101,354 on 12/20/10
GZ-13S:	801 on 1/4/11, up from <LLD on 12/20/10
GZ-13D:	1,095 on 1/4/11, down from 1,100 on 12/6/10
GZ-14S:	442,149 on 1/10/11, down from 454,738 on 12/20/10
GZ-14D:	<LLD on 1/24/11

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GZ-15:	141,585 on 1/4/11, up from 137,835 on 12/20/10
GZ-16:	<LLD on 1/4/11
GZ-17:	<LLD on 1/4/11
GZ-18S:	<LLD on 1/24/11
GZ-18D:	749 on 1/4/11, up from <LLD
GZ-19S:	<LLD on 11/1/10
GZ-19D:	<LLD on 11/1/10
GZ-20:	<LLD on 12/6/10
GZ-21:	8,673 on 1/17/11, down from 11,137 on 12/13/10
GZ-22D:	398,557 on 1/17/11, down from 515,891 on 12/20/10
GZ-23S:	<LLD on 1/10/11
GZ-24S:	8,139 on 1/26/11, up from <LLD on 12/13/10
GZ-25S:	<LLD on 1/17/11
GZ-26S:	<LLD on 1/24/11
GZ-27S:	<LLD on 1/24/11

January 21, 2011

The Department of Health was notified this morning by Entergy Vermont Yankee officials that a sample taken from groundwater monitoring well GZ-24S has been confirmed as being contaminated with tritium. Groundwater monitoring well GZ-24S is a newer well completed and first sampled last November. GZ-24S is located 150-200 feet north of the bulk of the plume released from the Advanced Off-Gas (AOG) Building. The source of this tritium contamination is not yet known. Entergy Vermont Yankee is investigating possible sources of any new leaks, including four drain lines from the reactor and turbine building ventilation system, and one drain line from the AOG Building. Plant officials are also investigating whether other plant structures might serve as "conduits" of tritium contaminated water away from the estimated AOG plume area.

According to information provided to the Department of Health today by Entergy Vermont Yankee, the concentration of tritium in GZ-24S has been trending upward since late December. At that time, a sample taken from well GZ-24S tested at a concentration of approximately 2,500 picocuries per liter (pCi/L). A sample from that well taken January 20, 2011, had a concentration of about 9,000 pCi/L. On December 6, 2010, the only sample from well GZ-24S that was provided by Vermont Yankee to the Department of Health Laboratory for analysis tested at less than the lower limit of detection (LLD).

Entergy Vermont Yankee officials report that its on-site laboratory has not detected tritium above the LLD at groundwater monitoring wells near GZ-24S. However, a sample from well GZ-6 independently analyzed by the Department of Health Laboratory as well as by Entergy Vermont Yankee's contract laboratory has tested for tritium slightly above the LLD.

Entergy Vermont Yankee is now sampling well GZ-24S daily. The Department of Health has requested split samples of GZ-24S to be provided weekly for analysis.

January 10, 2011
NRC Issues New Groundwater Inspection Report

On January 7, 2011, the U.S. Nuclear Regulatory Commission (NRC) issued its latest groundwater monitoring

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inspection report for the inspection concluded November 18, 2010. The report identified "no findings of significance."

This was the second inspection by the NRC of Entergy Vermont Yankee's groundwater protection program since confirming tritium contamination in a groundwater monitoring well on January 7, 2010. An initial report was issued on May 20, 2010. This newest report provides Entergy Vermont Yankee's estimate of the total tritium activity discharged into the environment: 2.79 curies. Of that amount, an estimated 10 percent has been removed by extracting approximately 307,000 gallons of contaminated groundwater – preventing that amount of radioactive tritium from entering the Connecticut River.

In each of the reports, the NRC noted that Entergy Vermont Yankee had not completed some of the requirements of the Nuclear Energy Institute (NEI) voluntary groundwater protection initiative. In the January 7, 2011 report, the NRC noted that both the conceptual site model (CSM) and the long-term groundwater monitoring program are still incomplete. The CSM is important because it provides the basis for groundwater flow characteristics, including those characteristics that may protect the bedrock aquifer that provides drinking water. The NRC intends to re-inspect progress on the CSM and the long-term groundwater monitoring program at a later date. The report states that numerous requirements of the NEI groundwater protection initiative have been implemented as a result of the ongoing investigation into the source of tritium contamination of groundwater.

Groundwater Extraction Resumes

On December 30, 2010, Entergy Vermont Yankee resumed groundwater extraction in an effort to further remove environmental contamination from the site. Extraction is reported to be from locations where tritium concentrations in groundwater are the highest on site, near or at wells GZ-14S and GZ-22D.

The Health Department has encouraged continuing groundwater extraction to remove as much tritium contamination as possible. Then Governor-elect Peter Shumlin requested Vermont Yankee to resume groundwater extraction by letter on December 7 and during a tour of the plant on December 17.

Independent Fish Testing Confirms Strontium-90 at Background Levels

The Health Department has received the results of independent analysis for strontium-90 for two sets of fish.

Fish Data Comparison: Strontium-90				
Collection Information		VDH-Contracted: Concentration (pCi/kg)	VY-contract: Concentration (pCi/kg)	
Early February	Edible	Upstream from VY	< LLD	< LLD
		Near VY	< LLD	< LLD
	Inedible	Upstream from VY	30	58.8
		Near VY	47	< LLD
Early Spring	Edible	Upstream from VY	< LLD	< LLD
		Near VY	< LLD	< LLD
	Inedible	Upstream from VY	77	109, 103 (spl tested twice)
		Near VY	50	62.4, 69.5 (spl tested twice)

<LLD = less than lower limit of detection

The fish were collected in February and early Spring of 2010. For each collection, one set of fish was collected several miles upstream of Vermont Yankee and one set of fish was collected just outside of Vermont Yankee.

No strontium-90 was detected in the edible flesh portions of the fish. Inedible portions of the fish (e.g., bone, skull) tested positive for low levels of strontium-90. Strontium, like calcium and magnesium, is expected to accumulate in the bones. The levels reported are consistent with what are considered to be background levels as a result of fallout from nuclear weapons testing in the 1950s, and the Chernobyl release in 1986. The levels reported are also consistent with the data provided by Vermont Yankee’s contract lab.

Groundwater Monitoring Well Results

The results that follow are as reported by Vermont Yankee for tritium on January 6, 2011.

As has been the trend over the past several months, tritium concentrations in groundwater near plant structures, systems and components are generally decreasing, while tritium concentrations in the wells near the Connecticut River continue their trend of slowly increasing in concentration. To date, gamma spectroscopy and special analyses for hard-to-detect radionuclides have not identified any other nuclear power plant-related radioactive materials in groundwater, drinking water or river water.

GZ-1	<LLD on 11/1/10
GZ-2	<LLD on 12/6/10
GZ-3	178,931 on 12/20/10, down from 181,200 on 12/13/10
GZ-4	67,139 on 12/20/10, up from 49,100 on 12/13/10
GZ-5	<LLD on 12/6/10

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GZ-6	<LLD on 12/20/10
GZ-7	2,474 on 12/20/10, down from 4,700 on 12/13/10
GZ-8	No sample; dry well
GZ-9	<LLD on 12/6/10
GZ-10	<LLD on 12/20/10
GZ-11	<LLD on 11/1/10
GZ-12S	3,665 on 12/20/10, up from 3,300 on 12/13/10
GZ-12D	101,354 on 12/20/10, up from 74,500 on 12/06/10
GZ-13S	<LLD on 12/20/10
GZ-13D	1,100 on 12/6/10, down from 1,170 on 11/8/10
GZ-14S	454,738 on 12/20/10, down from 508,800 on 12/9/10
GZ-14D	<LLD on 12/20/10
GZ-15	137,835 on 12/20/10, up from 112,900 on 12/9/10
GZ-16	<LLD on 12/20/10
GZ-17	<LLD on 12/6/10
GZ-18S	<LLD on 12/20/10
GZ-18D	<LLD on 12/20/10
GZ-19S	<LLD on 11/1/10
GZ-19D	<LLD on 11/1/10
GZ-20	<LLD on 12/6/10
GZ-21	11,137 on 12/13/10, down from 14,100 on 12/13/10
GZ-22D	515,891 on 12/20/10, down from 558,600 on 12/6/10
GZ-23S	<LLD on 12/20/10
GZ-24S	<LLD on 12/13/10
GZ-25S	<LLD on 12/13/10
GZ-26S	<LLD on 12/13/10
GZ-27S	<LLD on 12/13/10