

CHARLES D. BAKER
Governor

KARYN E. POLITO
Lieutenant Governor

The Commonwealth of Massachusetts
Executive Office of Health and Human Services
Department of Public Health
Bureau of Environmental Health
250 Washington Street, Boston, MA 02108-4619
Phone: 617-624-5757 Fax: 617-624-5777
TTY: 617-624-5286

MARYLOU SUDDERS
Secretary

MONICA BHAREL, MD, MPH
Commissioner

Tel: 617-624-6000
www.mass.gov/dph

MEMORANDUM

TO: Radiation Control Program
FROM: Environmental Toxicology Program
CC: Bureau of Environmental Health (BEH) Director; BEH Deputy Director
DATE: November 16, 2016
SUBJECT: Pilgrim Nuclear Power Station Tritium in Groundwater Investigation Update

PURPOSE

This document updates the results of on-going tritium in groundwater and surface water monitoring at Pilgrim Nuclear Power Station (PNPS) in Plymouth, MA for the first six months of 2016.

OVERVIEW

- Of the 23 groundwater wells that are routinely sampled, results for six indicate no detectable activity above background, and the remaining 17 showed stabilization in tritium levels.
- Increased levels of tritium were measured at two wells. Following an investigation by the owner and operator of PNPS (Entergy), likely tritium sources were identified and leaks repaired. Tritium levels in both wells subsequently decreased to near previous levels.
- Minor modifications were made to the sampling frequency of three wells.
- On-site efforts by Entergy have focused on identifying sources of tritium and monitoring for new sources.
- Staff from the MDPH Bureau of Environmental Health continue to review new information from the monitoring efforts and to maintain regular contact with the Massachusetts Emergency Management Agency (MEMA), the Nuclear Regulatory Committee (NRC), and Entergy.

INTRODUCTION

This document describes monitoring results for tritium in groundwater and surface water at the Pilgrim Nuclear Power Station located in Plymouth, MA during the first six months of 2016. The investigation history and previous updates are available online¹.

Entergy collects samples at 23 groundwater wells and two surface water locations on-site at PNPS. The sampling intervals range from weekly to quarterly and are based on past monitoring results and analysis of possible groundwater tritium pathways. Well and surface water samples are sent by Entergy to an independent analytical lab, Teledyne, and duplicate (or “split”) samples are provided to MDPH for analysis at the Massachusetts Environmental Radiation Lab (MERL). Entergy regularly reports the Teledyne results to MDPH, MEMA, and NRC officials. Summaries of both laboratory results are on the MDPH website².

This letter updates results from both Entergy and MERL for the sampling performed during the first six months of 2016. These results were compared to conservative (health protective) screening levels of 3,000 picocuries per liter (pCi/L), (or 1/10th the NRC-approved level of 30,000 pCi/L tritium in non-drinking water sources); and the US Environmental Protection Agency (EPA) drinking water standard for tritium of 20,000 pCi/L. The closest municipal drinking water wells are 2.5 miles from PNPS and are not expected to be impacted by on-site tritium sources.

RESULTS

Of the 23 on-site groundwater wells that are routinely monitored², only MW-218 had levels of tritium detected above 3,000 pCi/L during the first half of the year. All results were well below the EPA drinking water standard of 20,000 pCi/L. Increased tritium levels at MW-211 and MW-218 reduced to near previous measurements after likely sources were identified and repaired. Figure 1 shows results for the first half of the year for three wells of interest with tritium levels reaching 2,000 pCi/L (1/10th of the EPA drinking water standard), and a historic results for MW-216, MW-218 and MW-211. Two additional wells, MW-209 and MW-206, are sampled weekly due to their location in preferential pathways of water from seismic gaps and have low tritium levels (ranging from non-detectable to under 1,000 pCi/L).

Results for the remaining wells showed stabilization and reduction in tritium levels. Results for those sampled monthly ranged from 420 to 1,370 pCi/L and from no detection to 635 pCi/L for quarterly. No tritium was detected in surface water samples collected during the first half of 2016.

¹ Previous PNPS Tritium in Groundwater Investigation Updates are available here:
mass.gov/eohhs/gov/departments/dph/programs/environmental-health/exposure-topics/radiation/environmental-monitoring

² Summary tables of groundwater and surface water monitoring results are on the MDPH website:
mass.gov/eohhs/gov/departments/dph/programs/environmental-health/exposure-topics/radiation/environmental-monitoring

DISCUSSION

Monitoring results for the first six months of 2016 show stabilization in groundwater tritium levels in 21 of 23 wells. Increases in tritium at MW-218 and MW-211 were attributed by Entergy personnel to a leaking valve in a high RAD area.

Minor adjustments in sampling frequency were made by Entergy to account for changes in well results and new information about preferential pathways of water coming from the plant's seismic gaps. Sampling frequency for MW-211 was adjusted to monthly in March following two instances of tritium increases shown in Figure 1. Entergy determined MW-215 would be a better indicator of the preferential path of water coming from the seismic gap than MW-209, and switched MW-215 and MW-209 between monthly and weekly frequency.

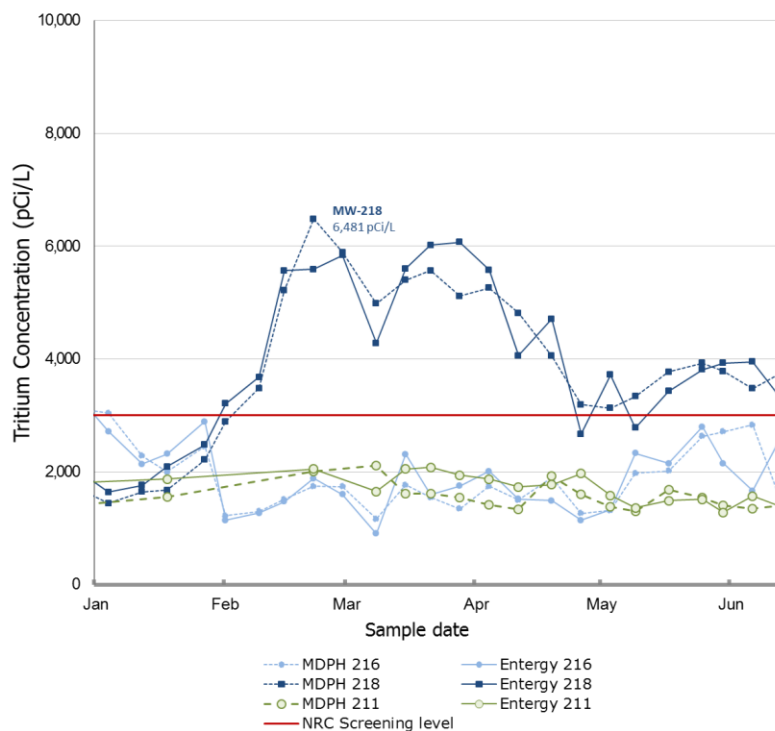
Currently, MDPH monitors weekly results for MW-211 and MW-218. In December 2015 tritium levels at MW-211 increased from 1,050 to 1,990 pCi/L; in March, MW-218 rose from 1,673 to 6,481 pCi/L. During an internal investigation, Entergy identified a leaking valve in a high-dose radiation area of the plant which is normally inaccessible. Entergy concluded that water from the leak traveled through the seismic gap to the soil near MW-211 and then MW-218. A drip containment system was immediately implemented, and the valve was repaired during the next down power. Subsequently, tritium levels in both wells dropped to near the previous values.

MDPH monitors weekly results for MW-216. Tritium levels in this well continued to stabilize during the first half of the year with all results less than 3,000 pCi/L.

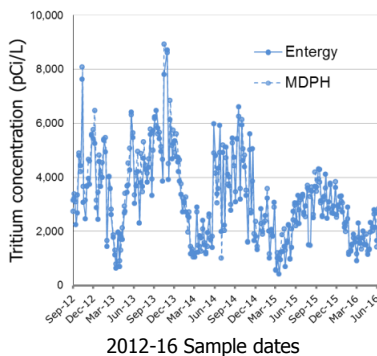
Entergy's staff continue to monitor for sources of tritium reaching MW-216 and MW-218. In February 2016, Entergy resampled three deep groundwater wells. They were installed in 2014 in response to the Fukushima Dai-chi tragedy to provide a secondary source of cooling water. No tritium was detected in any of the samples.

Staff from the MDPH Bureau of Environmental Health will continue to review groundwater monitoring results, and maintain contact with MEMA, NRC, and Entergy to discuss on-going tritium in groundwater activities at PNPS.

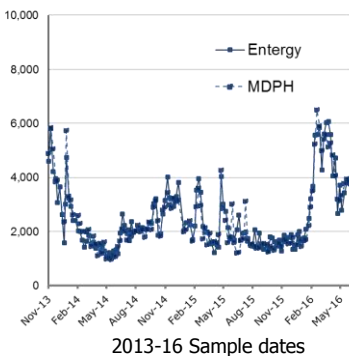
(a) Wells of Interest in 2016



(b) Monitoring Well 216



(c) Monitoring Well 218



(d) Monitoring Well 211

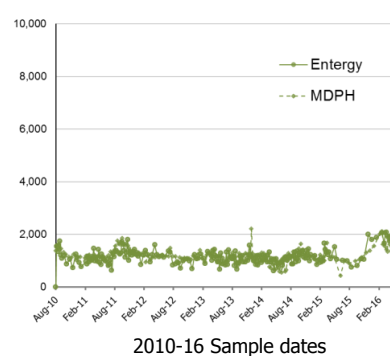


Figure 1. January through June 2016 three wells of interest and historical results for MW-216, MW-218 and MW-211 from tritium in groundwater samples collected from Pilgrim Nuclear Power Station (PNPS). Data are plotted separately based on PNPS operator (solid lines) or MDPH (dotted lines) produced results. The solid red line at 3,000 pCi/L represents the screening level which is $1/10^{\text{th}}$ of the 30,000 pCi/L NRC level of concern. (a) Results from samples collected during 2016 at wells with tritium levels above 2,000 pCi/L (MW-218, MW-216, and MW-211) showing a maximum level of 6,481 on March 7, 2016 at MW-216. (b-d) Historical monitoring results for MW-216, MW-218 and MW-211.