

LIST OF LEAKS AND SPILLS AT
OPERATING U.S. COMMERCIAL NUCLEAR POWER PLANTS
OCTOBER 11, 2023

INTRODUCTION

This is a list of operating reactor sites that experienced a radioactive leak or spill to the onsite owner controlled area where the concentration of tritium in the leak source, or in a groundwater sample exceeded 20,000 pCi/L at some time since initial startup. A tritium concentration of 20,000 pCi/L is used as the threshold for inclusion in the list because it is the drinking water standard in Environmental Protection Agency's (EPA's) Safe Drinking Water Act. This version updates the October 2021 list of leaks and spills.

SOURCE OF INFORMATION

Recent information was compiled by the U.S. Nuclear Regulatory Commission (NRC) staff based on input from the nuclear power plant staff, Annual Radioactive Effluent Release Reports and Annual Radiological Environmental Operating Reports (see the NRC's web site for each site's detailed annual reports at <https://www.nrc.gov/reactors/operating/ops-experience/tritium/plant-info.html>). Historical information is based on Annual Radioactive Effluent Release Reports, Annual Radiological Environmental Operating Reports, Groundwater Questionnaires, Preliminary Notifications, Event Notifications, Licensee Event Reports, NRC Inspection Reports, Special Reports, and other documents submitted by the licensees to the NRC.

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After a radioactive leak or spill, tritium is generally the first radionuclide to be identified in groundwater. This is because tritium travels as a form of water through the soil faster than other radionuclides. The tritium concentrations for each plant documented in the list below consist of (1) the historical maximum concentration and (2) the "current" concentration. These values provide a reasonable approximation of the magnitude and extent of the historical leaks and spills as well as the current conditions.

The value listed as the "Historical Maximum Concentration of Tritium in a Leak Source or in a Groundwater Sample" is an approximation of the historical maximum tritium concentration from abnormal releases in which tritium from reactor operations contacted the onsite soil since initial startup. The timeframe in which the historical maximum tritium releases occurred is listed next to the maximum concentration value.

The value listed as the "Current Maximum Groundwater Sample Tritium Concentration" is a reasonable approximation of the current maximum tritium concentrations based on reported abnormal releases to onsite groundwater, or groundwater samples that have been collected and analyzed by the licensee. If a value has not been updated from the one listed in the previous version, it indicates the value continues to be a good approximation of the current conditions.

As documented in the licensee annual reports, groundwater samples were collected from onsite locations and analyzed including both drinking water wells and non-drinking water sample points (e.g., groundwater monitoring wells, storm drains, man holes, bore holes, piezometer tubes,

surface water, puddles, and rain water). Although some values in the list exceed 20,000 pCi/L, none of those samples were collected from a drinking water well or from a municipal drinking water system. None of the samples collected from drinking water wells and municipal drinking water systems have ever exceeded the EPA drinking water standard of 20,000 pCi/L.

SUMMARY

There are 54 nuclear power plant sites in the United States that are currently operating. Historical records indicate 37 of these sites have at one time or another had leaks or spills that involved tritium concentrations greater than or equal to 20,000 pCi/L. Six sites are currently reporting tritium in groundwater, from a leak or spill, in excess of 20,000 pCi/L. No site is currently detecting tritium in groundwater in the offsite environment, or in drinking water, in excess of 20,000 pCi/L. Tritium rapidly disperses and dissipates in the environment, and as a result, tritium from leaks and spills is typically not detected outside the facility boundary.

List of Historical Leaks and Spills at Operating U.S. Commercial Nuclear Power Plants

It is important that the preceding paragraphs accompany any reproduction of this list so that the information is communicated in the proper context.

October 11, 2023 Updates

Plant	Historical Maximum Concentration of Tritium in a Leak Source or in a Groundwater Sample, pCi/L	Timeframe of Historical Maximum Concentration of Tritium in a Leak Source or in a Groundwater Sample, pCi/L	Current Maximum Groundwater Sample Tritium Concentration, pCi/L
Beaver Valley	25,583	September, 2010	1,800
Braidwood	247,000	1998	1,630
Browns Ferry	36,444	March, 2016	1,480
Brunswick	19,000,000	December, 2010	227,418
Byron	82,000	February, 2006	567
Callaway	1,600,000	July, 2014	580
Catawba	47,500	October, 2007	2,870
Columbia	270,000	March, 1993	10,500
Davis-Besse	37,500	October, 2008	679
Dresden	10,312,000	July, 2004	19,400
Fitzpatrick, J.A.	105,000	April, 2010	652
Ginna, R.E.	20,000	1995	553
Grand Gulf	2,240,000	March, 2014	20,300
Hatch, E.I.	6,840,000	September, 2011	419,400
Limerick	3,950,000	February, 2009	3,250
LaSalle	1,230,000	July, 2010	3,000
Millstone	4,000,000	November, 2007	<1760
Monticello	4,220,000	November, 2022	4,090,000

Nine Mile Point	44,000	August, 2012	381
North Anna	79,559	August, 2013	4,979
Oconee	45,000	December, 2011	3,730
Palisades*	217,351	December, 2009	32,254
Palo Verde	4,200,000	March, 1993	<460
Peach Bottom	196,000	March, 2010	19,100
Perry	59,900	2006	287
Quad Cities	7,500,000	2008	60,000
River Bend	1,135,000	February, 2013	280,000
Salem	15,000,000	April, 2003	79,400
Seabrook	750,000	1999	<578
Sequoyah	25,060	2015	9,960
St. Lucie	161,000	2000	4,360
Summer	23,000	July, 2011	<438
Surry	31,900	October, 2007	3,000
Susquehanna	>20,000	1995	<387
Turkey Point	>20,000	1979	3,980
Vogtle	>20,000	1990s	368
Waterford	22,000	1997	<588
Watts Bar	550,000	February, 2005	5,645

*Palisades Nuclear Plant ceased power operations on May 20, 2022.