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Prepared in cooperation with the U.S. Department of Energy

Purgeable Organic Compounds at or near the Idaho Nuclear Technology and Engineering Center, Idaho National Laboratory, Idaho, 2015



Open-File Report 2016–1083

Cover: U.S. Geological Survey hydrologist collecting a purgeable organic compound sample at a well.
(Photograph by Roy Bartholomay, USGS Idaho National Laboratory Project Office, April 13, 2015.)

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By Neil V. Maimer and Roy C. Bartholomay

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U.S. Department of the Interior
U.S. Geological Survey

U.S. Department of the Interior
SALLY JEWELL, Secretary

U.S. Geological Survey
Suzette M. Kimball, Director

U.S. Geological Survey, Reston, Virginia: 2016

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Conversion Factors

Inch/Pound to International System of Units

Multiply	By	To obtain
Length		
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
Area		
square mile (mi ²)	2.590	square kilometer (km ²)
Hydraulic conductivity		
foot per day (ft/d)	0.3048	meter per day (m/d)
Hydraulic gradient		
foot per mile (ft/mi)	0.1894	meter per kilometer (m/km)
Transmissivity*		
foot squared per day (ft ² /d)	0.09290	meter squared per day (m ² /d)

*Transmissivity: The standard unit for transmissivity is cubic foot per day per square foot times foot of aquifer thickness [(ft³/d)/ft²ft]. In this report, the mathematically reduced form, foot squared per day (ft²/d), is used for convenience.

Concentrations of chemical constituents in water are given in micrograms per liter (µg/L).

Datum

Horizontal coordinate information is referenced to the North American Datum of 1927 (NAD 27).

Abbreviations

ATRC	Advanced Test Reactor Complex (formerly RTC, Reactor Technology Complex; and TRA, Test Reactor Area)
CFA	Central Facilities Area
CWI	CH2M-WG, Idaho, LLC
DEQ	Department of Environmental Quality
DLQDC	Detection limit by DQCALC software
DOE	U.S. Department of Energy
DQCALC	Detection and quantitation calculation
EPA	U.S. Environmental Protection Agency
ESRP	eastern Snake River Plain
INL	Idaho National Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
LT-MDL	long-term method detection limit
MCL	maximum contaminant level
MDL	minimum detectable level
MFC	Materials and Fuels Complex
MRL	minimum reporting level
NLCID	No Longer Contained In Decision
NRF	Naval Reactors Facility
NWQL	National Water Quality Laboratory
PBF	Power Burst Facility
POC	purgeable organic compound
QA	Quality assurance
QC	Quality control
RCRA	Resource Conservation and Recovery Act
RL	reporting level
RLQDC	reporting limit by DQCALC software
RPD	Relative percent difference
RWMC	Radioactive Waste Management Complex
TAN	Test Area North
USGS	U.S. Geological Survey

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By Neil V. Maimer and Roy C. Bartholomay

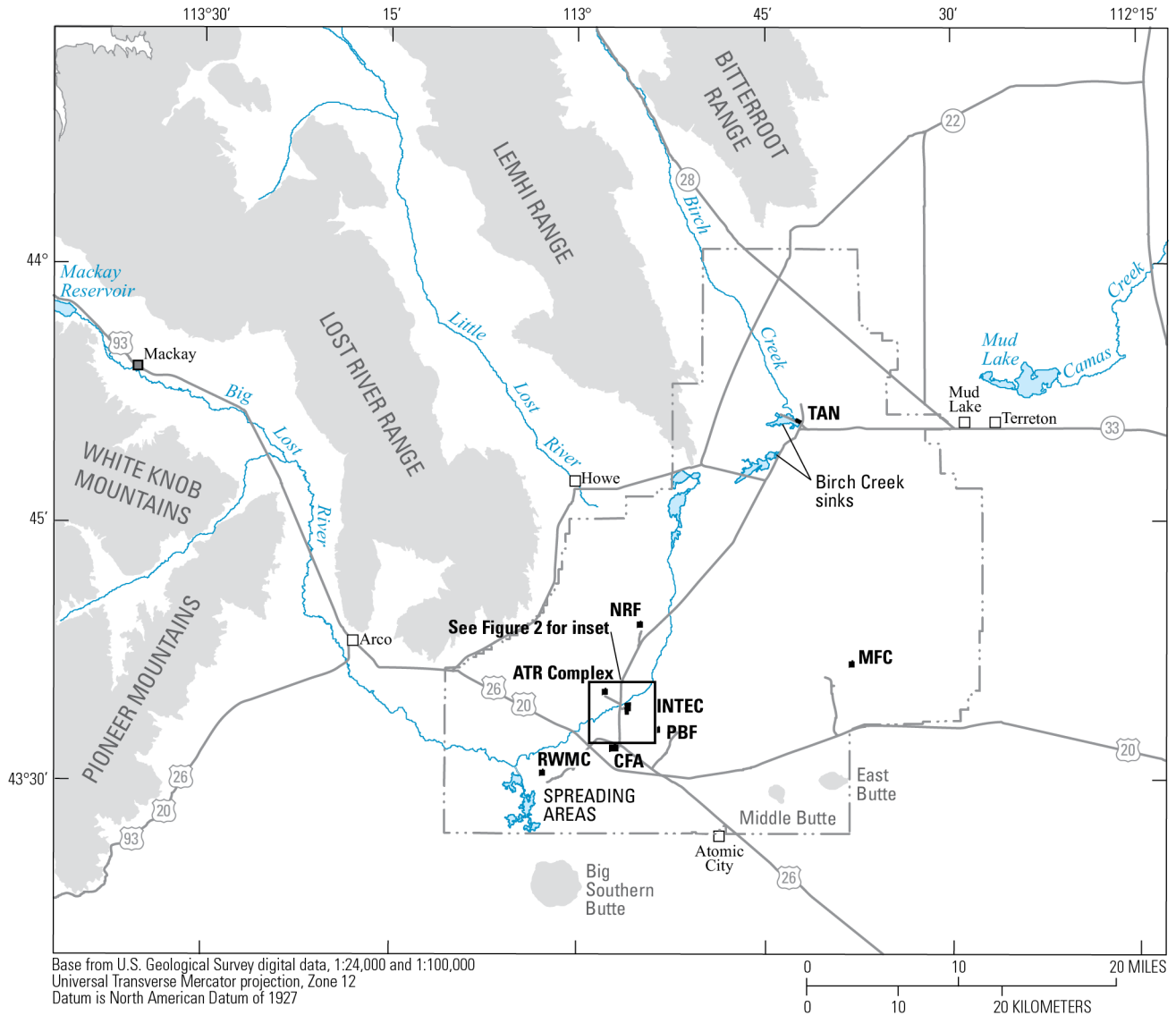
Abstract

During 2015, the U.S. Geological Survey, in cooperation with the U.S. Department of Energy, collected groundwater samples from 31 wells at or near the Idaho Nuclear Technology and Engineering Center (INTEC) at the Idaho National Laboratory for purgeable organic compounds (POCs). The samples were collected and analyzed for the purpose of evaluating whether purge water from wells located inside an areal polygon established downgradient of the INTEC must be treated as a Resource Conservation and Recovery Act listed waste.

POC concentrations in water samples from 29 of 31 wells completed in the eastern Snake River Plain aquifer were greater than their detection limit, determined from detection and quantitation calculation software, for at least one to four POCs. Of the 29 wells with concentrations greater than their detection limits, only 20 had concentrations greater than the laboratory reporting limit as calculated with detection and quantitation calculation software. None of the concentrations exceeded any maximum contaminant levels established for public drinking water supplies. Most commonly detected compounds were 1,1,1-trichloroethane, 1,1-dichloroethene, and trichloroethene.

Introduction

The Idaho National Laboratory (INL), operated by the U.S. Department of Energy (DOE), encompasses about 890 mi² of the eastern Snake River Plain (ESRP) in southeastern Idaho (fig. 1). The INL was established in 1949 to develop atomic energy, nuclear safety, defense programs, environmental research, and advanced energy concepts. Wastewater disposal sites at the Test Area North (TAN), the Naval Reactors Facility (NRF), the Advanced Test Reactor Complex (ATR Complex), and the Idaho Nuclear Technology and Engineering Center (INTEC) (fig. 1) have contributed radioactive- and chemical-waste contaminants to the ESRP aquifer. These sites incorporated various wastewater disposal methods, including lined evaporation ponds, unlined percolation (infiltration) ponds and ditches, drain fields, and injection wells. Waste materials buried in shallow pits and trenches within the Subsurface Disposal Area at the Radioactive Waste Management Complex (RWMC) also have contributed contaminants to groundwater.



EXPLANATION

- Selected facilities at the Idaho National Laboratory
- MFC** Materials and Fuels Complex
- CFA** Central Facilities Area
- INTEC** Idaho Nuclear Technology and Engineering Center
- NRF** Naval Reactors Facility
- PBF** Power Burst Facility
- RWMC** Radioactive Waste Management Complex
- ATR Complex** Advanced Test Reactor Complex—formerly known as Reactor Technology Complex (RTC) and Test Reactor Area (TRA)
- TAN** Test Area North
- Boundary of Idaho National Laboratory

Figure 1. Map showing location of the Idaho National Laboratory and selected facilities, Idaho.

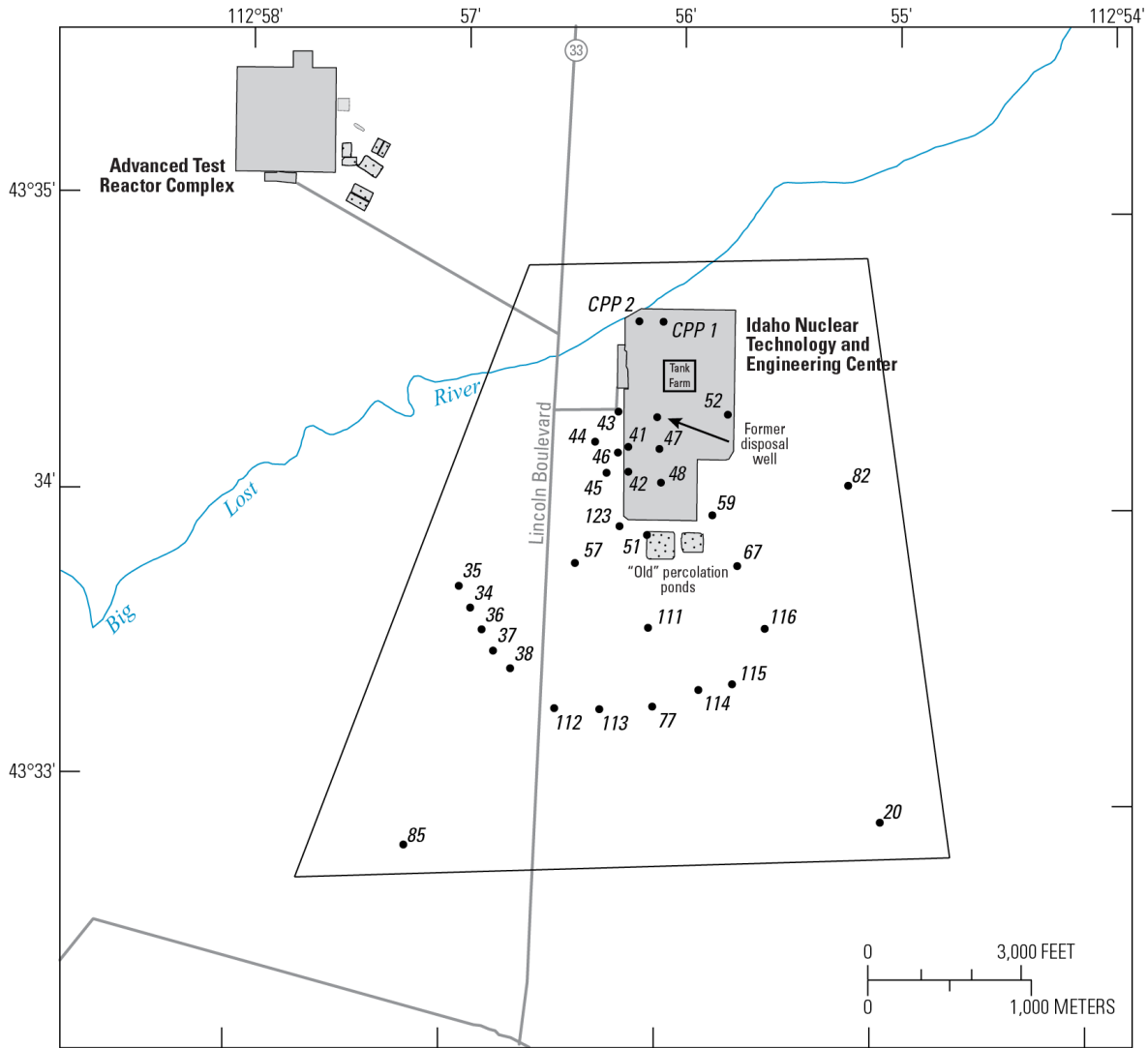
Since 1949, the U.S. Geological Survey (USGS) has worked in cooperation with the DOE at the INL to define: (1) the quality and availability of water for human consumption, (2) the usability of the water for supporting construction and cooling of facilities, (3) the location and movement of contaminants in the ESRP aquifer and perched groundwater zones, (4) the sources of recharge to the aquifer, (5) an early detection network for contaminants moving past the INL boundaries, and (6) the processes controlling the origin and distribution of contaminants and naturally occurring constituents in the aquifer (Ackerman and others, 2010).

In 2000, an areal polygon was established downgradient of the INTEC with groundwater that contained Resource Conservation and Recovery Act (RCRA) listed waste from the INTEC disposal well (fig. 2). In August 2000, the Idaho Department of Environmental Quality (DEQ) granted a conditional No Longer Contained In Decision (NLCID) to DOE, which allowed for groundwater removed from specific wells in the polygon to be discharged to the ground surface (Brian Monson, Idaho Department of Environmental Quality, written commun., August 21, 2000). The conditional NLCID was renewed by the DEQ in June 2002 (Brian Monson, Idaho Department of Environmental Quality, written commun., June 19, 2002), but was withdrawn in June 2003 (Brian Monson, Idaho Department of Environmental Quality, written commun., May 19, 2003). Beginning in October 2003, the USGS was no longer allowed to discharge purge water to the ground surface. DEQ required that purge water inside the areal polygon (fig. 2) be treated as RCRA-listed waste, which necessitated pumping it into containers and transporting it to an approved disposal site.

In 2015, INL contractor CH2M-WG, Idaho, LLC (CWI) in discussions with DOE, DEQ, and the U.S. Environmental Protection Agency (EPA) decided it was time to revisit the management decision made to include all the wells in the areal polygon in the RCRA “Contained In” listed hazardous waste. CWI evaluated the management approach, discussed it with DOE, EPA, and DEQ, and the agencies determined that if sufficient data became available, the size of the polygon (and number of wells containerized) could be reduced if analytical data showed that INTEC listed waste constituents are not present at concentrations greater than the minimum detectable levels (MDL) in the groundwater from those wells (Scott Reno, CH2M-WG, Idaho, LLC, written commun., February 10, 2015). It was determined that recent data were needed for carbon tetrachloride, tetrachloroethylene, trichloroethene, 1,1,1-trichloroethane, benzene, carbon disulfide, and toluene.

Purpose and Scope

The purpose of this report is to present results of purgeable organic compound (POC) sampling from wells the USGS sample at and near INTEC to determine whether concentrations of benzene, carbon disulfide, carbon tetrachloride, 1,1,1-trichloroethane, tetrachloroethylene, toluene, and trichloroethene, are equal to or greater than current MDLs. Samples were collected from 31 wells in 2015 to determine POCs. A sample schedule was used that included the seven compounds needed for a NLCID determination along with 42 other POCs. Samples were analyzed at the USGS National Water Quality Laboratory (NWQL) in Lakewood, Colorado. Results will be used to determine if future containerization of wells in the USGS sample program is needed.



Base from U.S. Geological Survey digital data, 1:24,000 and 1:100,000
 Universal Transverse Mercator projection, Zone 12
 Datum is North American Datum of 1927

EXPLANATION

Well in the USGS aquifer water-quality monitoring network and identifier

Local well identifier—Number only shows USGS well, other name are local well names

Geographically Based Polygon for Purge Waters for Monitoring Wells

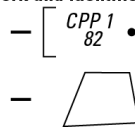


Figure 2. Map showing location of wells sampled for purgeable organic compounds at and near the Idaho Nuclear Technology and Engineering Center, Idaho National Laboratory, Idaho, 2015.

Geohydrologic Setting

The INL is located on the west-central part of the ESRP. The ESRP is a northeast-trending structural basin about 200 mi long and 50–70 mi wide. The basin has been filled with basaltic lava flows interbedded with terrestrial sediments. The basaltic rocks and sedimentary deposits combine to form the ESRP aquifer, which is the primary source of groundwater for the ESRP.

The ESRP aquifer is one of the most productive aquifers in the United States (U.S. Geological Survey, 1985, p. 193). Groundwater generally moves from northeast to southwest and discharges to springs along the Snake River downstream of Twin Falls, Idaho, about 100 mi southwest of the INL (fig. 1). Groundwater moves horizontally through basalt interflow zones and vertically through joints and inter-fingering edges of basalt flows. Infiltration of surface water, pumpage from groundwater wells, geohydrologic conditions, and seasonal fluxes of recharge and discharge locally affect the movement of groundwater (Garabedian, 1986). The ESRP aquifer is recharged primarily from infiltration of applied irrigation water, infiltration of streamflow, groundwater inflow from adjoining mountain drainage basins, and infiltration of precipitation (Ackerman and others, 2006).

At the INL, depth to water in wells completed in the ESRP aquifer ranges from about 200 ft below land surface in the northern part of the INL to more than 900 ft below land surface in the southeastern part of the INL. Depth to water near INTEC is about 475 ft below land surface. A significant proportion of the groundwater moves through the upper 200–800 ft of basaltic rock (Mann, 1986, p. 21). Ackerman (1991, p. 30) and Bartholomay and others (1997, table 3) reported transmissivity values for basalt in the upper part of the aquifer ranging from 1.1 to 760,000 ft²/d. The hydraulic gradient at the INL ranges from 2 to 10 ft/mi, with an average of 4 ft/mi (Davis and others, 2013, fig. 9). Horizontal flow velocities of 2–26 ft/d have been calculated based on the movement of various constituents in different areas of the aquifer at and near the INL (Robertson and others, 1974; Mann and Beasley, 1994; Cecil and others, 2000; Plummer and others, 2000; and Busenberg and others, 2001). These flow rates equate to a travel time of about 50–700 years for water beneath the INL to travel to springs that discharge at the terminus of the ESRP groundwater-flow system near Twin Falls, Idaho. Localized tracer tests at the INL have shown that vertical- and horizontal-transport rates are as high as 60–150 ft/d (Nimmo and others, 2002; Duke and others, 2007).

Previous Investigations

Hydrologic conditions and the distribution of selected wastewater constituents in groundwater are discussed in a series of reports describing the INL. A list of all reports published by the USGS on project work done at the INL is available at <http://id.water.usgs.gov/INL/Pubs/>.

Previous investigations of the POCs in groundwater at the INL have been done by Leenheer and Bagby (1982), Mann and Knobel (1987), Mann (1990), Liszewski and Mann (1992), and Greene and Tucker (1998). Hydrologic conditions reports that discuss POCs in the ESRP aquifer at the INL include Bartholomay and others (1995, 1997, and 2000); Davis (2006, 2008, and 2010); and Davis and others (2013). Davis and others (2015) described water quality trends for POCs at and near INTEC and RWMC and found wells near INTEC had decreasing trends for 1,1,1-trichloroethane and 1,1-dichloroethene.

Methods

Sample Collection and Analyses

Water samples were collected according to procedures described in the USGS National Field manual (U.S. Geological Survey, variously dated) and the USGS INL Project Office quality assurance plan (Bartholomay and others, 2014). After collection, samples were chilled and sent to the NWQL for analyses. Methods used to analyze the samples followed guidelines outlined in Goerlitz and Brown (1972), Wershaw and others (1987), Fishman (1993), and Rose and Schroeder (1995).

Water samples were placed in containers and preserved in accordance with laboratory requirements specified by the NWQL. Containers and preservatives used for this study were supplied by the NWQL and were processed using a rigorous quality-control procedure to minimize sample contamination (Pritt, 1989, p. 75).

Quality Assurance/Quality Control

Beginning in 1980, about 10 percent of water samples were collected for quality assurance (QA) purposes. Quality control (QC) water samples collected by the USGS INL Project Office generally include equipment blanks, splits, and replicates; however, other types of QC samples also have been collected throughout the history of the program. Comparative studies to determine agreement between analytical results for water-sample pairs by laboratories used by the INL Project Office QA program were summarized by Wegner (1989), Williams (1996, 1997), Rattray (2012), Davis and others, (2013), and Rattray (2014).

For this study, three replicate pairs were collected. The NWQL does not provide uncertainty for POCs, therefore the relative percent difference (RPD) was selected to compare equivalency of replicate pairs. The RPD is calculated based on the formula:

$$RPD = ((ABS(X1-X2)) / ((X1+X2)/2)) * 100 \quad (1)$$

where

- RPD* is the relative percent difference,
- ABS* is the absolute value,
- X1* is the result for primary environmental sample, and
- X2* is the result for field-replicate sample.

A typical data-quality objective for field-replicate samples is a maximum RPD of 20 percent (Taylor, 1987). Sample pairs that had both concentrations less than the reporting limits were considered statistically equivalent. For the constituents (1,1,1-trichloroethane, trichloroethene, and 1,1-dichloroethene) with concentrations greater than the detection limits, using equation 1, RPDs ranged from 0.2 to 16.4 percent for all eight sample pairs (100 percent) and can be considered statistically equivalent using this test.

Guidelines for Interpreting Results of Chemical Analysis

Water samples were analyzed for POCs at the NWQL in Lakewood, Colorado. NWQL reporting levels (RL) for ambient POC analytical results are determined using detection and quantitation calculation (DQCALC) software and are presented as a reporting limit by DQCALC (RLDQC) and minimum reporting level (MRL). The MRL is the smallest measured constituent concentration that can be reliably reported using a specific analytical method (Timme, 1995). The RLDQC is one of four new reporting level codes adopted by the NWQL to replace the long-term method detection limit (LT-MDL) and is equal to (or greater than) two times the detection limit DQCALC (DLDQC) (U.S. Geological Survey, 2015, p. 11). DLDQC is described as the lowest concentration that with 90 percent confidence will be exceeded no more than 1 percent of the time when a blank sample is measured (≤ 1 percent false positive risk.) (U.S. Geological Survey, 2015, p. 11). DQCALC is a Microsoft[®] Excel-based software package used to compute a method detection estimate (Standard Practice D7510-10; American Society for Testing Materials International, 2010). A more detailed explanation of the DQCALC procedures is available in U.S. Geological Survey (2015). Childress and others (1999) provide details about the approach used by the USGS regarding detection limits and reporting limits.

Purgeable Organic Compounds in Groundwater

The 49 POCs for which analyses were performed along with their respective reporting limit (RLDQC) and EPA maximum contaminant level (MCL) for public drinking water supplies are shown in table 1. None of the POC concentrations greater than the RLDQC exceeded MCLs or proposed MCLs established by the EPA.

Concentrations in water samples from 29 of the 31 wells completed in the ESRP aquifer were greater than the DLDQC of at least one of the eight constituents in table 2. None of the concentrations exceeded any MCLs established for public drinking water supplies. Concentrations for all other constituents sampled were less than their RLDQC. Concentrations of 1,1,1-trichloroethane were greater than the DLDQC in 28 wells and ranged from 0.013 to 0.093 $\mu\text{g/L}$. Concentrations of 1,1-dichloroethene were greater than the DLDQC in 25 wells and ranged from 0.011 to 0.183 $\mu\text{g/L}$. Concentrations of trichloroethene were greater than the DLDQC in six wells and ranged from 0.011 to 0.076 $\mu\text{g/L}$. Concentrations of chloroform were detected in two wells and tetrachloroethylene in one well (table 2). Concentrations of 1,1,1-trichloroethane were greater than the RLDQC in 21 of 29 wells, and had an additional 8 wells with concentrations greater than the DLDQC but less than the RLDQC. The RLDQC is two times the DLDQC. There were two wells with a concentration greater than the RLDQC for trichloroethene and four wells greater than the DLDQC but less than the RLDQC. The two chloroform concentrations and one tetrachloroethylene concentration were less than the RLDQC. One-half the wells were sampled in April when seasonal water levels in the aquifer are highest and one-half the wells were sampled in October when seasonal water levels are at their lowest (Bartholomay and Twining, 2015). No temporal variability was evident.

Table 1. Reporting limits and maximum contaminant levels for purgeable organic compounds in groundwater at or near the Idaho Nuclear Technology and Engineering Center, Idaho National Laboratory, Idaho, 2015.

[Analyses were performed by the U.S. Geological Survey's National Water Quality Laboratory using an analytical method that conforms to U.S. Environmental Protection Agency method 524 (Pritt and Jones, 1989). Reporting limit by detection and quantitation calculation (DQCALC) and maximum contamination levels are expressed in micrograms per liter ($\mu\text{g/L}$). **RLDQC:** Reporting limit by DQCALC. **MCL:** Maximum contaminant level. --, no data available]

Compound	RLDQC	MCL	Compound	RLDQC	MCL
1,1,1,2-Tetrachloroethane	0.040	--	Chloroform	0.03	⁽¹⁾
1,1,1-Trichloroethane	0.030	200	Chloromethane	² 0.1	--
1,1,2-Trichloroethane	0.046	5	<i>cis</i> -1,2-Dichloroethylene	0.022	70
1,1-Dichloroethane	0.022	--	<i>cis</i> -1,3-Dichloropropene	0.1	--
1,1-Dichloroethene	0.022	7	Dibromochloromethane	0.12	⁽¹⁾
1,1-Difluoroethane	0.022	--	Dichlorofluoromethane	0.05	--
1,2,3,4-Tetrahydronaphthalene	0.08	--	Dichloromethane	² 0.04	5
1,2,4-Trichlorobenzene	0.08	70	Ethylbenzene	0.036	700
1,2,4-Trimethylbenzene	0.032	--	Hexane	0.024	--
1,2-Dichloro-1,1,2,2-tetrafluoroethane	0.03	--	<i>n</i> -Pentane	0.022	--
1,2-Dichlorobenzene	0.028	600	<i>n</i> -Propylbenzene	0.036	--
1,2-Dichloroethane	0.08	5	Naphthalene	0.26	--
1,3-Butadiene	0.08	--	<i>sec</i> -Butylbenzene	0.034	--
1,4-Dichlorobenzene	0.026	75	Styrene	0.042	100
1-Chloro-1,1-difluoroethane	0.034	--	methyl <i>tert</i> -butyl ether	0.1	--
2,2-Dichloro-1,1,1-trifluoroethane	0.014		Tetrachloroethylene	0.026	5
Benzene	0.026	5	Tetrachloromethane	0.06	5
Bromochloromethane	0.06	--	Toluene	² 0.02	1,000
Bromodichloromethane	0.034	⁽¹⁾	<i>trans</i> -1,2-Dichloroethylene	0.0018	100
Bromoform	0.1	⁽¹⁾	<i>trans</i> -1,3-Dichloropropene	0.24	--
Bromomethane	0.2	--	Trichloroethylene	0.022	5
Butane	0.038	--	Vinyl chloride	0.06	2
Carbon disulfide	0.1	--	<i>m</i> - and <i>p</i> -Xylene	0.08	⁽³⁾
Chlorobenzene	0.026	100	<i>o</i> -Xylene	0.032	⁽³⁾
Chlorodifluoromethane	0.18	--			

¹Sum of the concentrations of all four trihalomethanes—bromoform, chloroform, bromodichloromethane and dibromochloromethane—cannot exceed 80 $\mu\text{g/L}$ as an annual average.

²Minimum reporting level (MRL).

³Sum of the concentrations of all three xylenes—ortho-xylene, meta-xylene and para-xylene—cannot exceed 10,000 $\mu\text{g/L}$, <http://water.epa.gov/drink/contaminants/basicinformation/disinfectionbyproducts.cfm>.

Table 2. Concentrations of selected purgeable organic compounds in groundwater at or near the Idaho Nuclear Technology and Engineering Center, Idaho National Laboratory, Idaho, 2015.

[Analyses were performed by the U.S. Geological Survey's National Water Quality Laboratory using an analytical method that conforms to U.S. Environmental Protection Agency method 524 (Pritt and Jones, 1989). Concentrations are given in micrograms per liter ($\mu\text{g/L}$). < 0.02 indicates the concentration was less than the reporting level of $0.02 \mu\text{g/L}$. Concentrations in bold indicate value exceeds the reporting level. **Value Qualifier Codes:** b, value extrapolated below the lowest calibration standard; c, see laboratory comments for this result (the reporting level was increased due to interference/the parameter 77041 (carbon disulfide) is a highly variable compound in schedule 4436); m, highly variable compound using this method (flake); questionable precision, and/or accuracy; n, less than the reporting level but equal to or greater than the detection level; t, less than the detection level. Replicate, a second sample submitted for analysis using a different identifier. **Abbreviations:** NA, not applicable. RPD, relative percent difference]

Station name	Station ID	Date sampled	Benzene	RPD	Carbon disulfide	RPD	Carbon tetrachloride	RPD	1,1,1-Trichloroethane	RPD
CPP 1	433433112560201	04/09/15	< 0.026	NA	< 0.1	NA	< 0.06	NA	0.013 b,t	NA
CPP 2	433432112560801	10/08/15	< 0.026	NA	< 0.1 c,m	NA	< 0.06	NA	< 0.030	NA
USGS 20	433253112545901	04/08/15	< 0.026	NA	< 0.1	NA	< 0.06	NA	0.041	NA
USGS 34	433334112565501	04/21/15	< 0.026	NA	< 0.1	NA	< 0.06	NA	0.050	NA
USGS 35	433339112565801	10/05/15	< 0.026	NA	< 0.1 c,m	NA	< 0.06	NA	0.047 b	NA
USGS 36	433330112565201	04/21/15	< 0.026	NA	< 0.1	NA	< 0.06	NA	0.055	NA
USGS 37	433326112564801	10/05/15	< 0.026	NA	< 0.1 c,m	NA	< 0.06	NA	0.054	NA
USGS 38	433322112564301	04/21/15	< 0.026	NA	< 0.1	NA	< 0.06	NA	0.058	NA
USGS 41	433409112561301	10/08/15	< 0.026	NA	< 0.1 c,m	NA	< 0.06	NA	0.036	NA
USGS 42	433404112561301	04/09/15	< 0.026	NA	< 0.1	NA	< 0.06	NA	0.043	NA
USGS 43	433415112561501	10/06/15	< 0.026	NA	< 0.1 c,m	NA	< 0.06	NA	0.013 b,t	NA
USGS 44	433409112562101	04/08/15	< 0.026	NA	< 0.1	NA	< 0.06	NA	0.050	NA
USGS 45	433402112561801	10/07/15	< 0.026	NA	< 0.1 c,m	NA	< 0.06	NA	0.0657	NA
USGS 46	433407112561501	04/21/15	< 0.026	NA	< 0.1	NA	< 0.06	NA	0.022 b,n	NA
USGS 47	433407112560301	10/08/15	< 0.026	NA	< 0.1 c,m	NA	< 0.06	NA	0.019 b,n	NA
USGS 47	433407112560301	10/08/15	< 0.026	0	< 0.1 c,m	0	< 0.06	0	0.016 b,n	16.4
USGS 48	433401112560301	04/09/15	< 0.026	NA	< 0.1	NA	< 0.06	NA	0.030 n	NA

Station name	Station ID	Date sampled	Benzene	RPD	Carbon disulfide	RPD	Carbon tetrachloride	RPD	1,1,1-Trichloroethane	RPD
USGS 48	433401112560301	04/09/15	< 0.026	0	< 0.1	0	< 0.06	0	0.030 n	0.2
USGS 51	433350112560601	04/08/15	< 0.026	NA	< 0.1	NA	< 0.06	NA	0.076	NA
USGS 51	433350112560601	04/08/15	< 0.026	0	< 0.1	0	< 0.06	0	0.072	5.8
USGS 52	433414112554201	10/05/15	< 0.026	NA	< 0.1 c,m	NA	< 0.06	NA	0.017 b,n	NA
USGS 57	433344112562601	10/07/15	< 0.026	NA	< 0.1 c,m	NA	< 0.06	NA	0.040	NA
USGS 59	433354112554701	04/08/15	< 0.026	NA	< 0.1	NA	< 0.06	NA	< 0.030	NA
USGS 67	433344112554101	10/05/15	< 0.026	NA	< 0.1 c,m	NA	< 0.06	NA	0.041 b	NA
USGS 77	433315112560301	10/05/15	< 0.026	NA	< 0.1 c,m	NA	< 0.06	NA	0.065	NA
USGS 82	433354112554701	04/21/15	< 0.026	NA	< 0.1	NA	< 0.06	NA	< 0.030	NA
USGS 85	433246112571201	04/08/15	< 0.026	NA	< 0.1	NA	< 0.06	NA	0.048	NA
USGS 111	433331112560501	04/07/15	< 0.026	NA	< 0.1	NA	< 0.06	NA	0.026 n	NA
USGS 112	433314112563001	10/06/15	< 0.026	NA	< 0.1 c,m	NA	< 0.06	NA	0.049	NA
USGS 113	433314112561801	04/07/15	< 0.026	NA	< 0.1	NA	< 0.06	NA	0.042	NA
USGS 114	433318112555001	10/06/15	< 0.026	NA	< 0.1 c,m	NA	< 0.06	NA	0.093	NA
USGS 115	433320112554101	10/06/15	< 0.026	NA	< 0.1 c,m	NA	< 0.06	NA	0.031	NA
USGS 116	433331112553201	04/21/15	< 0.026	NA	< 0.1	NA	< 0.06	NA	0.037	NA
USGS 123	433352112561401	10/07/15	< 0.026	NA	< 0.1 c,m	NA	< 0.06	NA	0.019 b,n	NA

Table 2. Concentrations of selected purgeable organic compounds in groundwater at or near the Idaho Nuclear Technology and Engineering Center, Idaho National Laboratory, Idaho, 2015.—Continued

[Analyses were performed by the U.S. Geological Survey's National Water Quality Laboratory using an analytical method that conforms to U.S. Environmental Protection Agency method 524 (Pritt and Jones, 1989). Concentrations are given in micrograms per liter ($\mu\text{g/L}$). < 0.02 indicates the concentration was less than the reporting level of $0.02 \mu\text{g/L}$. Concentrations in bold indicate value exceeds the reporting level. **Value Qualifier Codes:** b, value extrapolated below the lowest calibration standard; c, see laboratory comments for this result (the reporting level was increased due to interference/the parameter 77041 (carbon disulfide) is a highly variable compound in schedule 4436); m, highly variable compound using this method (flake); questionable precision, and/or accuracy; n, less than the reporting level but equal to or greater than the detection level; t, less than the detection level. Replicate, a second sample submitted for analysis using a different identifier. **Abbreviations:** NA, not applicable. RPD, relative percent difference]

Station name	Station ID	Date sampled	Tetrachloro-ethylene	RPD	Toluene	RPD	Trichloro-ethene	RPD	1,1-Dichloro-ethane	RPD	Remarks
CPP 1	433433112560201	04/09/15	< 0.026	NA	< 0.02	NA	< 0.022	NA	< 0.022	NA	
CPP 2	433432112560801	10/08/15	< 0.026	NA	< 0.02	NA	< 0.022	NA	< 0.022	NA	
USGS 20	433253112545901	04/08/15	< 0.026	NA	< 0.02	NA	< 0.022	NA	0.040	NA	
USGS 34	433334112565501	04/21/15	< 0.026	NA	< 0.02	NA	< 0.022	NA	0.013 b,n	NA	
USGS 35	433339112565801	10/05/15	< 0.026	NA	< 0.02	NA	< 0.022	NA	< 0.022	NA	
USGS 36	433330112565201	04/21/15	< 0.026	NA	< 0.02	NA	< 0.022	NA	0.011 b,n	NA	
USGS 37	433326112564801	10/05/15	< 0.026	NA	< 0.02	NA	< 0.022	NA	0.017 b,n	NA	
USGS 38	433322112564301	04/21/15	< 0.026	NA	< 0.02	NA	< 0.022	NA	0.013 b,n	NA	
USGS 41	433409112561301	10/08/15	< 0.026	NA	< 0.02	NA	< 0.022	NA	0.017 b,n	NA	
USGS 42	433404112561301	04/09/15	< 0.026	NA	< 0.02	NA	< 0.022	NA	0.019 b,n	NA	
USGS 43	433415112561501	10/06/15	< 0.026	NA	< 0.02	NA	< 0.022	NA	< 0.022	NA	
USGS 44	433409112562101	04/08/15	0.013 b,t	NA	< 0.02	NA	< 0.022	NA	0.014 b,n	NA	
USGS 45	433402112561801	10/07/15	< 0.026	NA	< 0.02	NA	< 0.022	NA	0.034	NA	
USGS 46	433407112561501	04/21/15	< 0.026	NA	< 0.02	NA	< 0.022	NA	< 0.022	NA	
USGS 47	433407112560301	10/08/15	< 0.026	NA	< 0.02	NA	< 0.022	NA	0.015 b,n	NA	
USGS 47	433407112560301	10/08/15	< 0.026	0	< 0.02	0	< 0.022	0	0.016 b,n	6.6	Replicate
USGS 48	433401112560301	04/09/15	< 0.026	NA	< 0.02	NA	0.013 b,n	NA	0.024 b	NA	

Station name	Station ID	Date sampled	Tetrachloro-ethylene	RPD	Toluene	RPD	Trichloro-ethylene	RPD	1,1-Dichloro-ethane	RPD	Remarks
USGS 48	433401112560301	04/09/15	< 0.026	0	< 0.02	0	0.013 b,n	2.9	0.025 b	0.8	Replicate
USGS 51	433350112560601	04/08/15	< 0.026	NA	< 0.02	NA	0.076	NA	0.097	NA	
USGS 51	433350112560601	04/08/15	< 0.026	0	< 0.02	0	0.072	4.9	0.093	4.8	Replicate
USGS 52	433414112554201	10/05/15	< 0.026	NA	< 0.02	NA	< 0.022	NA	0.021 b,n	NA	
USGS 57	433344112562601	10/07/15	< 0.026	NA	< 0.02	NA	< 0.022	NA	0.011 b,n	NA	
USGS 59	433354112554701	04/08/15	< 0.026	NA	< 0.02	NA	< 0.022	NA	0.013 b,n	NA	
USGS 67	433344112554101	10/05/15	< 0.026	NA	< 0.02	NA	0.022 b,n	NA	0.061	NA	Chloroform: 0.014 b,t
USGS 77	433315112560301	10/05/15	< 0.026	NA	< 0.02	NA	0.030	NA	0.110	NA	
USGS 82	433354112554701	04/21/15	< 0.026	NA	< 0.02	NA	< 0.022	NA	< 0.022	NA	
USGS 85	433246112571201	04/08/15	< 0.026	NA	< 0.02	NA	< 0.022	NA	0.019 b,n	NA	
USGS 111	433331112560501	04/07/15	< 0.026	NA	< 0.02	NA	< 0.022	NA	0.025	NA	
USGS 112	433314112563001	10/06/15	< 0.026	NA	< 0.02	NA	< 0.022	NA	0.019 b,n	NA	
USGS 113	433314112561801	04/07/15	< 0.026	NA	< 0.02	NA	0.011 b,t	NA	0.027	NA	
USGS 114	433318112555001	10/06/15	< 0.026	NA	< 0.02	NA	< 0.022	NA	0.183	NA	Chloroform: 0.018 b,n
USGS 115	433320112554101	10/06/15	< 0.026	NA	< 0.02	NA	< 0.022	NA	0.017 b,n	NA	
USGS 116	433331112553201	04/21/15	< 0.026	NA	< 0.02	NA	< 0.022	NA	0.032	NA	
USGS 123	433352112561401	10/07/15	< 0.026	NA	< 0.02	NA	0.014 b,n	NA	0.046	NA	

Summary

During 2015, the U.S. Geological Survey, in cooperation with the U.S. Department of Energy, sampled groundwater from 31 wells completed in the eastern Snake River Plain aquifer at or near the Idaho Nuclear Technology and Engineering Center (INTEC) at the Idaho National Laboratory for 49 purgeable organic compounds (POCs). Water samples were collected for the purpose of evaluating whether purge water from wells located inside an areal polygon established downgradient of the INTEC must be treated as Resource Conservation and Recovery Act listed waste.

POC concentrations in water samples from two wells were less than their DLDQC; five wells contained one POC concentration greater than the DLDQC; 16 wells contained two different POCs greater than their DLDQC; 7 wells contained three different POCs greater than their DLDQC; and 1 well contained four different POCs greater than their DLDQC. Of the 29 wells with concentrations greater than their DLDQCs, only 20 had concentrations greater than their RLDQC. None of the concentrations exceeded any maximum contaminant levels established for public drinking water supplies.

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