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Prepared in cooperation with the
Maine Center for Disease Control and Prevention

Assessment of Arsenic Concentrations in Domestic Well Water, by Town, in Maine, 2005–09

Scientific Investigations Report 2010–5199

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

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By Martha G. Nielsen, Pamela J. Lombard, and Luther F. Schalk

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KEN SALAZAR, Secretary

U.S. Geological Survey
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Foreword

The U.S. Geological Survey (USGS) is committed to providing the Nation with reliable scientific information that helps to enhance and protect the overall quality of life and that facilitates effective management of water, biological, energy, and mineral resources (http://www.usgs.gov/). Information on the Nation's water resources is critical to ensuring long-term availability of water that is safe for drinking and recreation and is suitable for industry, irrigation, and fish and wildlife. Population growth and increasing demands for water make the availability of that water, measured in terms of quantity and quality, even more essential to the long-term sustainability of our communities and ecosystems.

The USGS implemented the National Water-Quality Assessment (NAWQA) Program in 1991 to support national, regional, State, and local information needs and decisions related to water-quality management and policy (http://water.usgs.gov/nawqa). The NAWQA Program is designed to answer: What is the quality of our Nation's streams and ground water? How are conditions changing over time? How do natural features and human activities affect the quality of streams and ground water, and where are those effects most pronounced? By combining information on water chemistry, physical characteristics, stream habitat, and aquatic life, the NAWQA Program aims to provide science-based insights for current and emerging water issues and priorities. From 1991 to 2001, the NAWQA Program completed interdisciplinary assessments and established a baseline understanding of water-quality conditions in 51 of the Nation's river basins and aquifers, referred to as Study Units (http://water.usgs.gov/nawqa/studies/study_units.html).

In the second decade of the Program (2001–2012), a major focus is on regional assessments of water-quality conditions and trends. These regional assessments are based on major river basins and principal aquifers, which encompass larger regions of the country than the Study Units. Regional assessments extend the findings in the Study Units by filling critical gaps in characterizing the quality of surface water and ground water, and by determining water-quality status and trends at sites that have been consistently monitored for more than a decade. In addition, the regional assessments continue to build an understanding of how natural features and human activities affect water quality. Many of the regional assessments employ modeling and other scientific tools, developed on the basis of data collected at individual sites, to help extend knowledge of water quality to unmonitored, yet comparable areas within the regions. The models thereby enhance the value of our existing data and our understanding of the hydrologic system. In addition, the models are useful in evaluating various resource-management scenarios and in predicting how our actions, such as reducing or managing nonpoint and point sources of contamination, land conversion, and altering flow and (or) pumping regimes, are likely to affect water conditions within a region.

Other activities planned during the second decade include continuing national syntheses of information on pesticides, volatile organic compounds (VOCs), nutrients, trace elements, and aquatic ecology; and continuing national topical studies on the fate of agricultural chemicals, effects of urbanization on stream ecosystems, bioaccumulation of mercury in stream ecosystems, effects of nutrient enrichment on stream ecosystems, and transport of contaminants to public-supply wells.

The USGS aims to disseminate credible, timely, and relevant science information to address practical and effective water-resource management and strategies that protect and restore water quality. We hope this NAWQA publication will provide you with insights and information to meet your needs, and will foster increased citizen awareness and involvement in the protection and restoration of our Nation's waters.

The USGS recognizes that a national assessment by a single program cannot address all water-resource issues of interest. External coordination at all levels is critical for cost-effective management, regulation, and conservation of our Nation's water resources. The NAWQA Program, therefore, depends on advice and information from other agencies—Federal, State, regional, interstate, Tribal, and local—as well as nongovernmental organizations, industry, academia, and other stakeholder groups. Your assistance and suggestions are greatly appreciated.

William H. Werkheiser

USGS Associate Director for Water

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Conversion Factors and Datum

Inch/Pound to SI

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)

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

Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83).

Assessment of Arsenic Concentrations in Domestic Well Water, by Town, in Maine, 2005–09

By Martha G. Nielsen, Pamela J. Lombard, and Luther F. Schalk

Abstract

Prior studies have established that approximately 10 percent of domestic wells in Maine have arsenic levels greater than the U.S. Environmental Protection Agency maximum contaminant limit (10 micrograms per liter (µg/L)). Of even greater concern are multiple discoveries of wells with very high arsenic levels (> 500 µg/L) in several areas of the State. A study was initiated to assist the Maine Center for Disease Control and Prevention (ME-CDC) in developing a better understanding of the statewide spatial occurrence of wells with elevated arsenic levels at the individual town level, identify areas of the State that should be targeted for increased efforts to promote well-water testing, and generate data for potential use in predicting areas of the State likely to have very high levels of arsenic. The State's Health and Environmental and Testing Laboratory (HETL) annually analyzes samples from thousands of domestic wells for arsenic. Results of arsenic analyses of domestic well water submitted to the HETL from 2005 to 2009 were screened and organized, by town, in order to summarize the results for all towns with samples submitted to the HETL. In order to preserve the privacy of well owners, the screening and organization of samples was conducted in the offices of the ME-CDC, following applicable Maine and United States laws, rules, and privacy policies. After screening, the database contained samples from 531 towns in Maine and from 11,111 individual wells. Of those towns, 385 had samples from 5 or more individual wells, 174 towns had samples from 20 or more individual wells, and 49 towns had samples from 60 or more wells. These samples, because they were submitted by homeowners and were not part of a random sample, may not be representative of all wells in a given area. The minimum, maximum, and median arsenic values for the towns with five or more samples were calculated, and the maximum and median values were mapped for the State. The percentages of samples exceeding 10, 50, 100, and 500 µg/L were calculated for the 174 towns with 20 or more sampled wells, and statewide maps were prepared for each of these categories. More than 25 percent of the sampled wells in 44 towns exceeded 10 µg/L. Many fewer towns had wells with samples that exceeded the 50, 100, or 500 µg/L categories. For 19 towns, more than 10 percent of the sampled wells had arsenic concentrations that exceeded 50 µg/L, and in 45 towns, 1 percent or more exceeded 100 µg/L. Of these, Surry in Hancock County had 120 wells tested, and 23 percent of those wells had arsenic concentrations that exceeded 100 µg/L, which is a much higher rate than for other towns. In only four towns (Danforth in Washington County, Surry and Blue Hill in Hancock County, and Woolwich in Sagadahoc County), 1 percent or more of the sampled wells had arsenic concentrations greater than 500 µg/L during 2005–09. The distribution of high arsenic concentrations in wells follows some geographic patterns, which are generally geologically controlled. There are clusters or belts of towns with high arsenic concentrations (> 50 µg/L), such as in southern coastal areas, the Kennebec County area, and towns along the central coastal part of Maine. In contrast, there are areas of the State with low arsenic concentrations, such as the northernmost towns, as well as towns in the western and west-central areas. There appear to be three distinct large-scale areas of high concentrations of arsenic in groundwater—one in southern coastal areas, one in central Kennebec County, and one in the town of Ellsworth (Hancock County) and the surrounding areas. In addition, several smaller clusters of isolated high concentrations of arsenic in groundwater exist. Earlier testing has identified other clusters of very high arsenic concentrations in groundwater in the towns of Northport, Buxton/Hollis, and Waldoboro, but those samples were collected before 2005 and did not factor in this analysis.

Introduction

The widespread occurrence of arsenic in groundwater is a well known public health issue in Maine. Arsenic occurs naturally in bedrock in Maine and dissolves into groundwater along bedrock fractures. Arsenic (in the forms of lead arsenate, calcium arsenate, and sodium arsenate) also was widely used as a crop pesticide on apples, potatoes, and blueberries in the early 20th century (D'Angelo and others, 1996). Arsenic has been found in groundwater across Maine in both public water-supply wells and domestic (private) wells at concentrations ranging from less than 0.5 micrograms per liter (µg/L) to more

than 5,000 µg/L, which are some of the highest concentrations reported in the United States (Focazio and others, 1999). Because of the link between arsenic ingestion and several forms of cancer (primarily bladder and skin cancers), the U.S. Environmental Protection Agency (USEPA) has set the maximum contaminant level (MCL) for arsenic in public water supplies at 10 µg/L (U.S. Environmental Protection Agency, 2001), which was revised downward from the previous MCL of 50 µg/L in 2001. All public water suppliers in Maine are required to test for arsenic and to ensure that water delivered to the public complies with USEPA standards. There are no requirements for homeowners in Maine to test their wells for arsenic.

Public water supplies account for only 52 percent of the drinking water consumed in Maine, however. According to USGS water-use data from 2005, domestic wells account for 20 percent (in Cumberland County) to more than 80 percent (in Washington County) of the drinking water used in Maine (U.S. Geological Survey, 2005). Overall, approximately 40 to 45 percent of the Maine population relies on domestic wells for their drinking water (U.S. Geological Survey, 2005), and most of these domestic wells have not been tested for arsenic. Earlier studies estimated that 12 to 13 percent of Maine's rural population may have wells with arsenic concentrations exceeding 10 µg/L and 1 to 3 percent exceeding 50 µg/L (Loiselle and others, 2001). The study by Loiselle and others (2001) along with other studies elevated the general awareness of the problem of arsenic in domestic well water, and the Maine Department of Health has been aggressively working to encourage Maine residents to test their well water for arsenic. Since 2002, many of the water tests offered by the Maine Health and Environmental Testing Laboratory (HETL) include arsenic as an analyte, removing the prior need for an individual to specifically request and purchase testing for arsenic as an additional analyte. It is believed that this has increased the frequency of testing for arsenic and may possibly lessen the phenomenon of self-selection bias.

The HETL provides water testing services to State agencies and to the general public. Homeowners submit samples (collected using kits and instructions supplied by the laboratory) to the HETL. State agencies that test domestic wells, monitoring wells, and public supply wells also use the HETL for water-testing services. Over the years, the HETL has analyzed tens of thousands of arsenic samples from homes across Maine, but the data have not been rigorously organized and assembled for scientific or public-health analyses. In 2009, the Maine Center for Disease Control and Prevention (ME-CDC) began a cooperative program with the USGS to retrieve, organize, screen, and analyze these data, to be used by the ME-CDC to develop a better understanding of the statewide spatial occurrence of wells with elevated arsenic levels at the individual town level, to identify areas of the State that should be targeted for increased efforts to promote well-water testing, and to generate data for potential use in predicting areas of the State likely to have very high levels of arsenic.

Purpose and Scope

The purpose of this report is to describe the steps taken to retrieve, screen, edit, and analyze arsenic data for domestic well water that have been compiled by the HETL and to describe the distribution of domestic wells with elevated levels of arsenic in towns having samples from at least 20 wells. The data span the period from January 2005 through July 2009 and include samples from domestic wells submitted by homeowners and by State agencies. This report describes the sample submission, sample data forms, procedures for maintaining homeowner privacy, and quality assurance of the database and laboratory analyses. Assumptions made about incomplete data, handling of multiple samples for a well, potential for self-selection bias, and the handling of "filtered" samples also are described. The second part of the report presents the descriptive analysis of the dataset once all screening steps had been completed, including the numbers of sampled wells in each town; the minimum, median, and maximum arsenic concentrations found in each town (for towns with 5 or more sampled wells); and the percentage of wells in each town with arsenic levels greater than 10, 50, 100, and 500 µg/L (for towns with 20 or more sampled wells). The towns in Maine with at least one well sample recorded in the database are shown in figure 1. Cumulative distribution plots of the data in several representative towns are presented, along with several maps of the State showing the spatial distribution of the samples and of arsenic occurrence.

Previous Investigations

The presence of high levels of arsenic (more than 50 µg/L) in domestic wells in Maine became recognized in the early 1990s when the Maine Geological Survey (MGS) and other State agencies published a report documenting high arsenic levels in domestic wells in the Buxton/Hollis area in southern Maine (see fig. 2) and the occurrence of relatively high arsenic levels in other areas of Maine (Marvinney and others, 1994). This study showed that the problem was not confined to a few towns in southern Maine but that high arsenic levels occurred in many geologically diverse areas across the State (Marvinney and others, 1994). Shortly thereafter, the USGS and others began analyzing data from public supply wells in Maine and New Hampshire, selected domestic wells, and stream sediments (Ayotte and others, 1999; Peters and others, 1999; Ayotte and others, 2003; Ayotte and others, 2006; Robinson and Ayotte, 2006; Peters, 2008) and concluded that there is a strong spatial correlation between the presence of arsenic in well water and the presence of certain bedrock geologic units (Robinson and Ayotte, 2006). Although arsenical pesticides applied throughout the region in the 1900s could not be ruled out as a source in some areas, it did not appear to be a controlling factor in the overall presence of bedrock groundwater arsenic (Ayotte and others, 2006). A joint study by the MGS and ME-CDC is the only Maine study

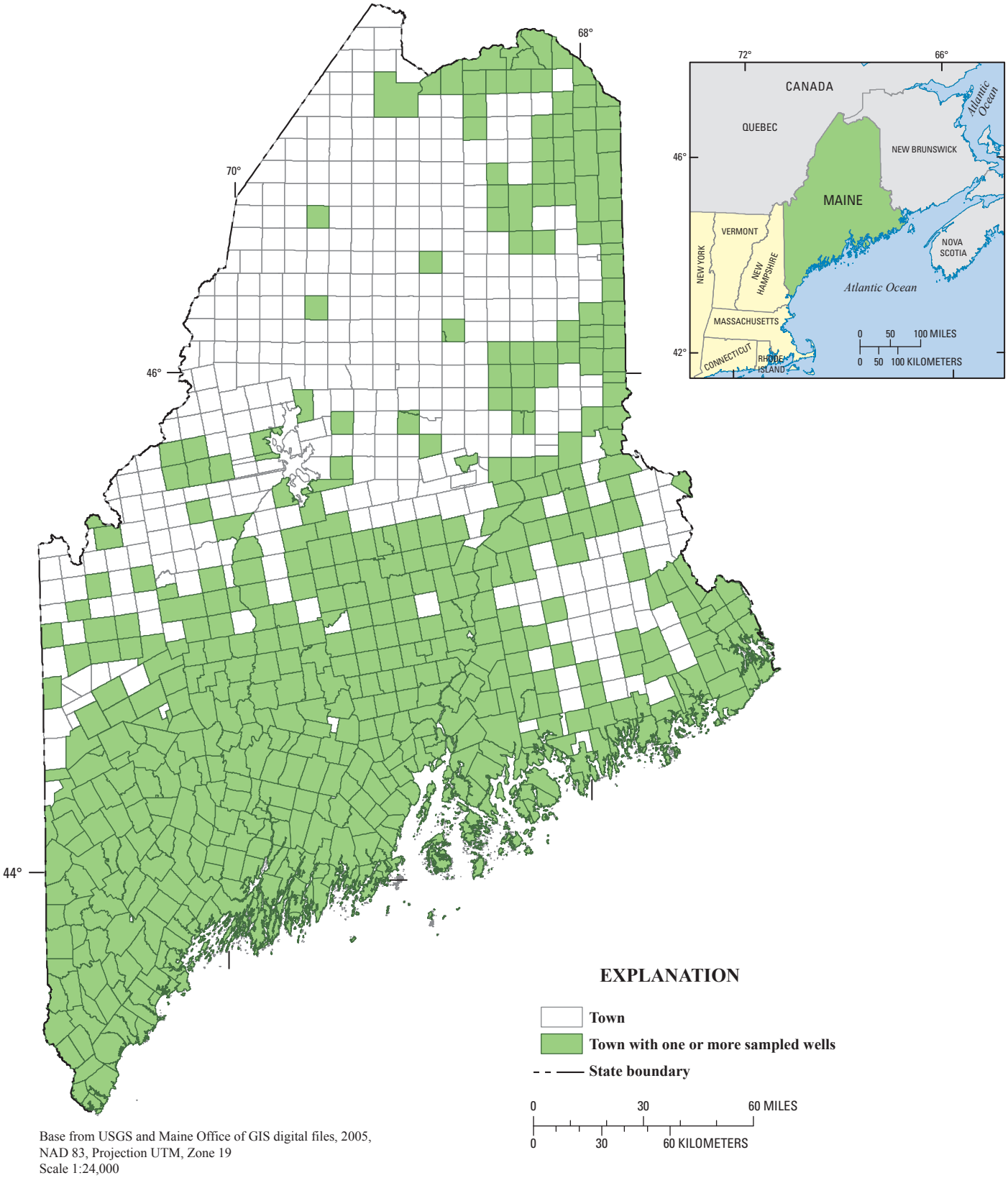

Figure 1. Towns in Maine with at least one domestic well sample recorded in the Maine Health and Environmental Testing Laboratory database, 2005–09.

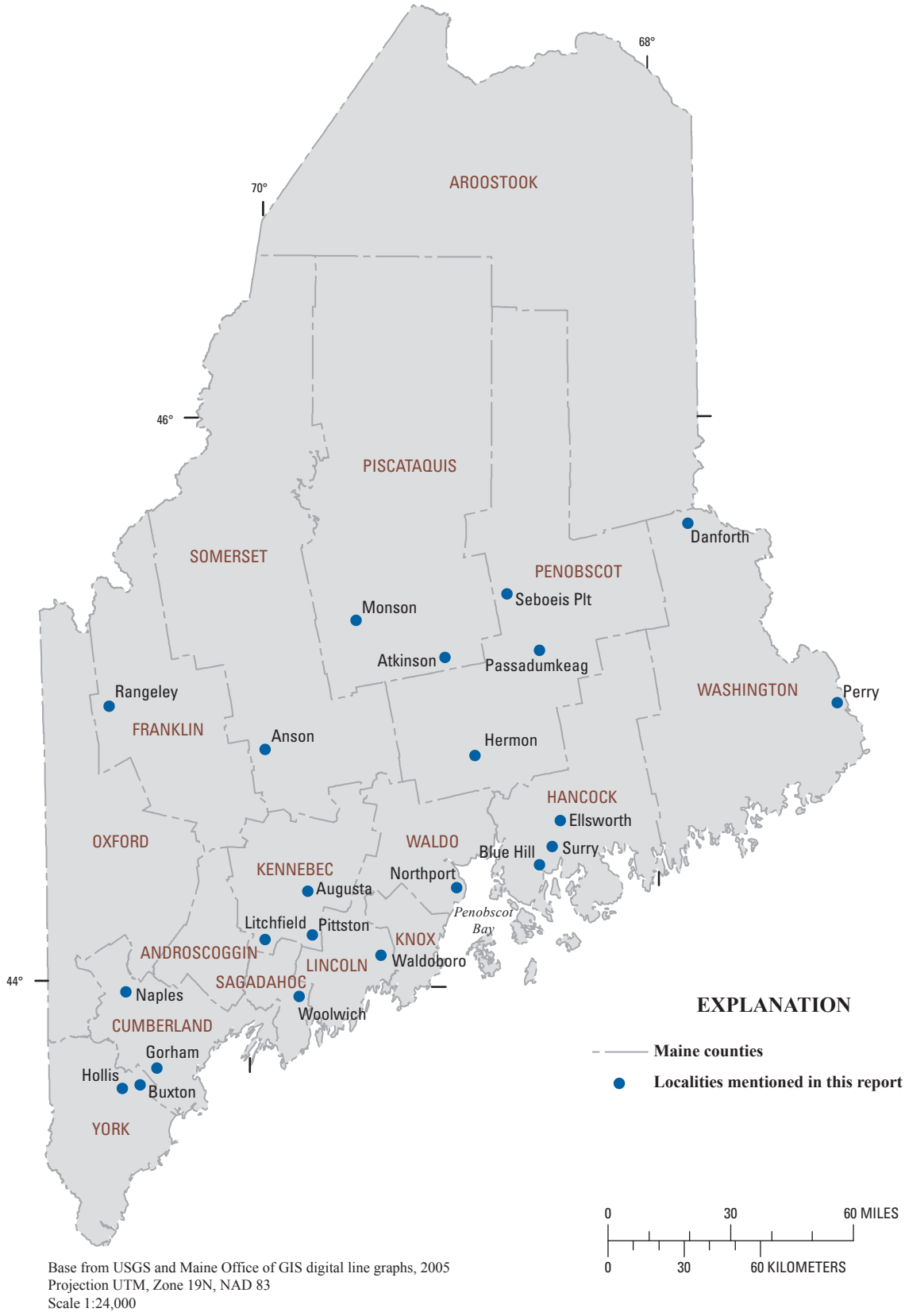

Figure 2. Maine counties and other Maine localities.

that used a random-sampling design to support estimates of population exposure to arsenic in well water (Loiselle and others, 2001). This study reported that 10 percent of sampled wells in Maine had arsenic levels of 10 µg/L or higher.

Studies have shown that the occurrence of high levels of arsenic in Maine appears to be highly clustered in areas from a few kilometers to tens of kilometers across (Loiselle and others, 2001; Yang and others, 2009). Arsenic clusters have been identified in several coastal and inland areas of Maine, particularly in the Buxton/Hollis area in southern Maine (Marvinney and others, 1994), the Waldoboro area in central coastal Maine (Sidle and others, 2001; Sidle, 2003), the greater Augusta area (Yang and others, 2009), the Northport area on western Penobscot Bay, (Lipfert and others, 2006), the Ellsworth/Blue Hill area (Andrew Smith, ME-CDC, oral commun., 2008), the town of Rangeley in northwestern Maine (Andrew Smith, ME-CDC, written commun., 2009), and Danforth in far eastern Maine (Andrew Smith, ME-CDC, written commun., 2008). Some of the clusters of wells with high concentrations of arsenic encompass several towns, and maximum arsenic concentrations are in hundreds of micrograms per liter (southern Maine, greater Augusta area, and Ellsworth/Blue Hill). Other clusters encompass much smaller geographic areas but have maximum arsenic concentrations in thousands of micrograms per liter (Northport and Danforth, for example).

These small, extreme-concentration clusters within the State continue to be discovered; the most recent is the 2008 discovery of a cluster of wells in Danforth with arsenic levels of 1,000 to 3,000 µg/L (Andrew Smith, ME-CDC, oral commun., 2008). There is an understandable desire by public health agencies to identify other areas of the State likely to have other extreme-concentration clusters, so outreach efforts can be better targeted. There is also a desire to understand in which towns in the State there has been considerable testing for arsenic in well water and in which there have not. A systematic compilation and analysis of the large domestic well-water dataset available from the HETL, which consists of thousands of records from water tests for arsenic, was viewed as potentially helpful in meeting these needs.

Description of Database, Data Screening, and Statistical Analysis

A detailed description of the data screening methods is provided in this report because the HETL dataset is an opportunistic dataset, which means that data were neither collected nor stored with any intent or subsequent plans for retrieval and analysis to support investigations. The purpose of the data screening exercise was to reduce the database to one sample per well that represented, as well as possible given the information available, untreated or "raw" groundwater from that well.

Database of Domestic Well-Water Samples from the Maine Health and Environmental Testing Laboratory

The database used for this analysis was compiled from the results of water samples submitted for analysis by homeowners; by real estate agents (for clients); and by a few State agencies, including the Maine Department of Transportation, Maine Department of Health and Human Services—Bureau of Child and Family Services, and the Maine Department of Environmental Protection. Samples were analyzed for arsenic at the HETL in Augusta. A large proportion of the samples was sent to the laboratory for general water tests, which have all included arsenic since 2002. Test kits for water analysis were provided by the HETL to those requesting analyses; the kits consist of instructions for collecting samples, sample bottles, boxes for mailing the samples to the HETL, and a sample identification sheet to be filled in by the person requesting the sample analysis. Test kits may be picked up in person at the HETL, but most often the HETL mails the test kit to the person requesting the sample analysis. These kits also can be ordered online through the State of Maine Website. A sample kit includes a clear polyethylene sample bottle with no preservative. Sample tracking is conducted using a barcode label on the bottle and a corresponding barcode on a label affixed to the sample information sheet. Instructions for collecting samples of drinking water direct the homeowner to run the water from a tap (usually a kitchen sink) for 5 to 10 minutes before filling the bottle. After filling the sample bottle and completing the sample identification sheet (fig. 3), the test kit is returned to the HETL (by mail or in person). The instructions, which are the same for most water tests offered by the HETL, state that the sample is to be sent to the HETL on the same day that it is collected and that the sample is not to be collected and sent on a Friday or Saturday. After arriving at the HETL, the sample is logged in using the sample identification sheet and barcode, the sample is acidified with nitric acid to a pH of less than 2, and the sample analysis is begun usually within 24 hours (John Nims, Maine Health and Environmental Testing Laboratory, written commun., 2010).

The database into which the samples are logged has specific fields for much, but not all, of the information contained in the sample information sheet. The client name, address, town, state, zip code and address are entered, along with the date and time of sample collection, person collecting the sample, sample location (town or city), sample state, and zip code of sample location. As the person collecting the sample may not always be the client (the party paying for the sample analysis), this information is important in determining where the sample came from. Also recorded are whether the sample is from a public source or private home, the sample type, company name (if given—often this field is filled in with "cash client" or "walk-in client"), and sample description. The sample description field is a catchall field and includes

See back for sampling instructions and when to expect laboratory results

DEPARTMENT OF HEALTH & HUMAN SERVICES
HEALTH & ENVIRONMENTAL TESTING LABORATORY **DATE REC'D @ LAB**
TEL: (207)287-1716 FAX: (207) 287-1884

TEMP UPON ARRIVAL @ LAB_____C

( ) NAME AND ADDRESS (IF NOT ON LABEL)
( ) CHANGE OF NAME OR ADDRESS

IF YOU HAVE REMOVED THIS
LABEL, PUT IT BACK. IT NEEDS
TO STAY WITH THIS FORM

NAME: _____
STREET: _____
TOWN: _____
ZIP CODE: _____
PHONE (EVE): _____

PHONE (DAY): _____ FAX_____

( ) PLEASE CHECK HERE IF YOU WOULD LIKE A SIMPLIFIED FINAL REPORT

PLEASE COMPLETE THIS SECTION

DATA FOR DATE AND TIME SAMPLED, AND CHLORINE TREATMENT ARE REQUIRED

DATE SAMPLED_____	**CHLORINE TREATMENT**	SAMPLE POINT
TIME SAMPLED_____**AM/PM**	( ) NONE	( ) BEFORE FILTER
SAMPLED BY_____ (PERSON TAKING SAMPLE)	( ) BLEACH	( ) BETWEEN FILTER
SAMPLE LOCATION_____ (CITY OR TOWN)	( ) CHLORINATOR	( ) AFTER FILTER
STATE_____	( ) OTHER _____	( ) OTHER _____
ZIP _____		

SAMPLE SOURCE	WATER USED BY	
( ) DUG WELL	( ) PRIVATE HOME	( ) FOSTER CARE CHILDREN
( ) DRILLED WELL	( ) DAY CARE	( ) MOBILE HOME PARK
( ) OTHER_____	( ) EATING PLACE	( ) ADULT RESIDENTIAL CARE
	( ) LODGING PLACE	( ) OTHER_____

COMMENTS

---------- Cut here on line ----------

WRITE YOUR SAMPLE NUMBER FROM THE BARCODED LABEL ABOVE FOR YOUR RECORDS

EXAMPLE: C123456 **DO NOT REMOVE BARCODED LABEL FROM THIS FORM OR BOTTLES**

PLEASE WRITE YOUR SAMPLE NUMBER HERE_____

Figure 3. Sample information sheet used by the Maine Health and Environmental Testing Laboratory for submission of samples, 2005–09.

information on sample-collection point (before or after filter), sample source (if "other" was checked on the form), other treatment or filtration information, anything in the "comment" field, and often the name and address of the house from which the sample was collected if the client was not a homeowner.

All these data are associated with each arsenic sample in the HETL database. Each sample result in the database has a unique Analyte field and associated Result field. For this study, the authors requested a compilation of all the HETL data from January 1, 2005, to July 20, 2009, for which the Analyte field was arsenic, the Result included a numerical value (including non-detects), the Sample State was Maine, the Public/Private field was either private or blank, and the Sample Type was either drinking water or blank. The fields for each record requested from the HETL are shown in table 1.

From this initial set of data, the authors screened, sorted, re-categorized the information, and stripped out all personally identifiable information (PII) to create the database that was used in the final analysis. The procedure for doing these tasks is described in the following sections.

Table 1. Fields requested from the Maine Human Health and Environmental Testing Laboratory database.

[HETL, Health and Environmental Testing Laboratory]

Field	Description
Sample Number	Unique sample number used by HETL
Profile/test	Analyte code requested for sample
Analyte	Arsenic
Results, units	Numeric result, or less than value, and units (primarily micrograms per liter)
Sample Date	Date sample was collected
Client Name	Name of person requesting sample
Client Address	Address of person requesting sample
Client Town	Town of person requesting sample
Client State	State of person requesting sample
Client Zip	Zip Code of person requesting sample
Sampler	Person collecting the sample, often the same as the client
Sample Location	Location (town, city) in which the sample was collected
Sample State	State in which the sample was collected
Sample Zip	Zip code of sample location
Public/Private	Use of water: public well or private well
Sample Type	DW-H2O (drinking water) or blank
Company Name	"Cash clients," "walk-in clients," or company/agency name
Sample Description	Catch-all field for notes, well type, filtration information, or any other information

Privacy Issues

Parties submitting samples to the HETL have a reasonable expectation that their information will remain private and confidential under the Privacy Act of 1974, as amended in 1988 (5 U.S.C. §552a). However, the screening and sorting of the data required the use of PII, such as the names and street addresses, in order to identify samples taken from the same source. Under Maine State Law (22 MRSA §1692-B.), the ME-CDC is given access to all reports and records filed by physicians, hospitals, or other private- or public-sector organizations with all departments, agencies, commissions or boards of the State for the purpose of conducting investigations within the department's disease surveillance programs. This statute thus provides authorization for ME-CDC to have access to private well-water data in HETL's possession. The statute also requires that the department follow the data confidentiality requirements of the departments, agencies, commissions or boards of the State that provide this information (including the HETL). Therefore, all screening work of these data was conducted by the USGS within the ME-CDC offices, using ME-CDC computers, and following all the ME-CDC confidentiality requirements and United States laws. Once the screening was completed, all PII was removed from the database, and this version was used by the USGS in subsequent analyses. Town names and an arbitrary number representing each unique source remained with each sample.

Laboratory Methods and Quality Assurance/ Quality Control Methods

At the HETL, drinking-water samples are analyzed for metals (including arsenic) following USEPA method 200.8, using inductively coupled plasma/mass spectrometry (ICP/MS). Because the homeowner sample kits contain no preservative, all samples for arsenic analysis received by the HETL are first treated with high purity nitric acid in order to adjust the pH of the samples to less than 2 prior to sample analysis by ICP/MS.

An assessment of HETL arsenic analyses was derived from a 2006–07 comparison of arsenic concentrations reported by HETL and the Underwriters Laboratory (UL; Underwriters Laboratories, Inc., Drinking Water Laboratory, South Bend, Ind.) as part of a project to review the efficacy of treatment systems in removing arsenic from domestic well water (Charles Culbertson, U.S. Geological Survey, written commun.). During that project, 64 samples from wells with concentrations of arsenic ranging from 5 to 420 µg/L were replicated (sampled at the same time, from the same source, and using USEPA method 200.8; samples acidified to pH < 2 for both laboratories) and sent separately to HETL and UL. The results of the analyses for total arsenic from the two laboratories were compared to assess quality assurance in the analytical process.

The distributions of total arsenic concentrations in the paired samples from the two laboratories (fig. 4) were similar, and the overall differences in the distributions were slight. The mean concentration of total arsenic analyzed by HETL was 97.3 µg/L (standard error = 11.1 µg/L), whereas the mean concentration of total arsenic analyzed by UL was 98.0 µg/L (standard error = 11.9 µg/L). Neither dataset is normally distributed (Shapiro-Wilk method, Shapiro and Francia, 1972).

In general, the average difference in concentration for the 64 sample pairs analyzed by HETL and UL, expressed as the absolute value of the relative percent difference between the samples, was about 7.6 percent (|[HETL-UL]/([HETL+UL]/2)|*100). A comparison of concentrations for the paired samples (fig. 5) shows that, for the most part, this difference is primarily at the upper end of the range in concentrations of total arsenic (with one exception at the lower end of the range). The range in relative percent difference is 0 to 105 percent, but only two samples have a relative percent difference greater than 16.7 percent. The best-fit line through the data points has an r^2 of 0.983. According to a one-way analysis of variance of the datasets, the concentration means are not significantly different at the $p = 0.05$ level.

Data Screening and Assumptions about Samples

After receiving all the requested data from HETL, several data screening, sorting, and coding tasks were completed. The purpose of the data screening was to reduce the dataset to samples collected from domestic wells that represented "raw" groundwater, or at least groundwater that was not treated to remove arsenic. Furthermore, the intent was to compile statistics, by town, on wells (not on samples) so that one well sampled many times did not skew the town statistics. The screening/sorting/coding tasks included (1) screening out duplicate samples; (2) determining the minor civil division (town) in which the sample was collected; (3) screening out samples that were probably not domestic well-water samples, even though they passed an initial data screening step; (4) determining which samples in each town probably were either repeat samples from the same well or a unique sample from a well; and (5) documenting what was known about any possible filtration of the water sample.

Several new fields were created in the database to hold information gleaned from the original list of fields. These fields are listed in table 2.

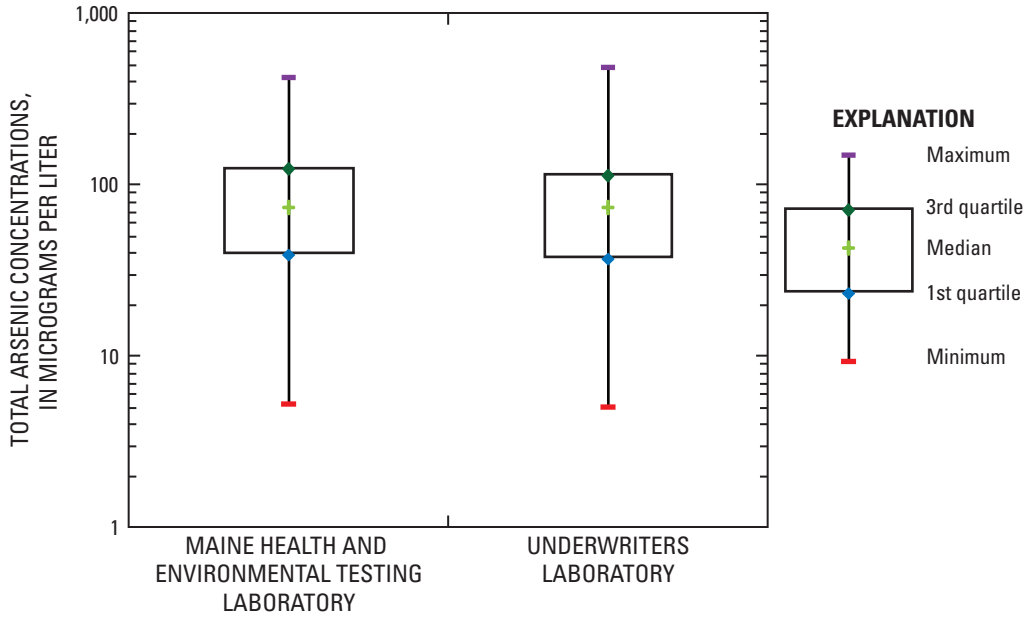

Figure 4. Distribution of total arsenic concentrations in sample pairs analyzed by the Maine Health and Environmental Testing Laboratory and the Underwriters Laboratory, 2006–07.

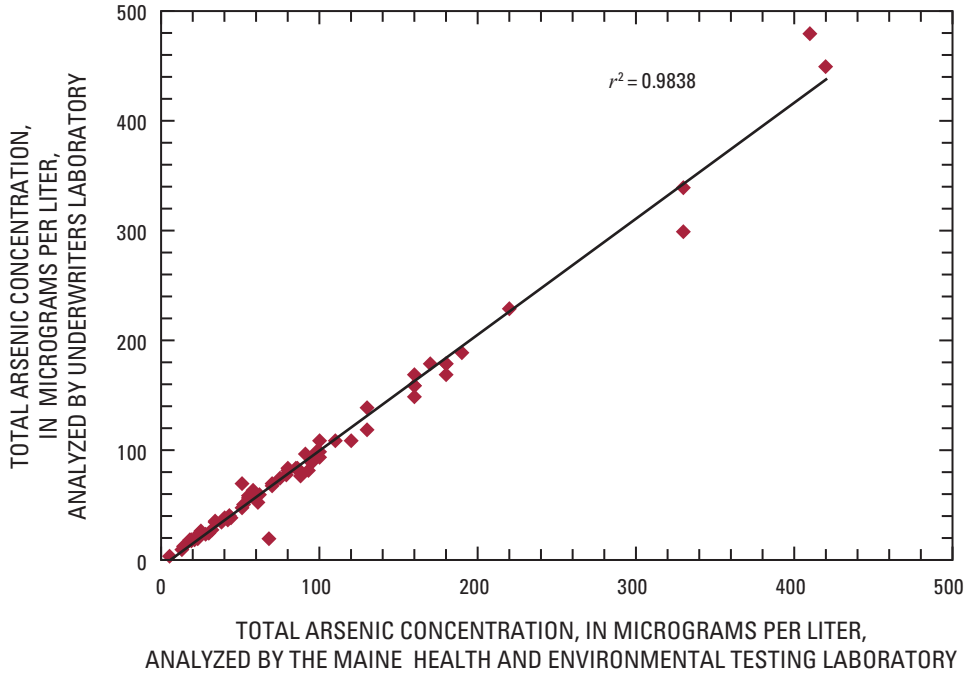

Figure 5. Arsenic concentrations in paired samples analyzed by the Maine Health and Environmental Testing Laboratory and Underwriters Laboratory, 2008.

Table 2. Fields added to the Health and Environmental Testing Laboratory database for data screening and analysis.

New field	Example	Description
Real Client Town	Woolwich	Minor civil division of the Client Address field.
Town	Woolwich	Minor civil division of the Sample Location field.
SourceNo	000, 001, 002, …, 999	Numeric identifier used for assigning samples to a unique well. “000” indicates that there is not enough information to assign the sample to a unique well. “999” indicates that the sample may not actually be from that town or may be from a public supply.
Rep	a, b, c, ….	Lowercase letter code for each replicate sample from the same well. “a” would be the first sample encountered in the original list (not sorted by date).
Filter	AF, BF, NF, Raw	Filtration status, as determined from original Sample Description field (after filter, before filter, no filter, raw water).
Filter Type	“As” or “other”	If the Sample Description field indicates that an arsenic filter or treatment system was used on the sampled water, “As” was used; “other” was used if the filter type was something else or not stated.
Well Type	Drilled well, dug well	Only filled in when the Sample Description had this information.
Source	Well, tap, faucet, spring, tank, water body, tub, pipe, sink, bottled water	Source of water sample, from Sample Description field. Samples with entries other than “Well,” “tap,” “faucet,” “spring,” or “sink” were not kept.
Agency	Department of Transportation, other State agencies	Agency of collecting client, if named.
Note		Extra information from sample description field, including filter information, special study identifier.

Data Sorting and Elimination of Erroneous Sample Data

The original request for data from HETL produced 18,009 records. The initial screening found 3,765 duplicated Sample Numbers; these records were removed from the database. Next, the Sample Location field was parsed through a lookup table to sort out the Town (minor civil division) in which minor localities were located. Misspellings and typographical errors in the place name were corrected during this step. If a misspelling of a place name or town had an ambiguous solution (could be corrected to more than one specific town), this record was discarded. Several locations of samples were found to be outside Maine, even though they were tagged as being in Maine, and these records were discarded. Although the data requested from the HETL was for domestic well-water data, sometimes samples were coded incorrectly, and information in either the Client or Sample Description fields indicated that the water was from a public supplier, institution, or other water source, such as a pond or stream, or was purchased (bottled) water. These records also were removed from the database. The final number of records passing the screening tests was 14,175.

Determination of Water Source

The most difficult part of the data screening was the determination of whether a particular water sample was from a unique well in a given town. The general procedure involved an examination of the fields Town, Sampler, ClientName, ClientAddress, Real Client Town, Company Name, and Sample Description. Each town was screened individually (531 towns are represented in the database with 1 to 217 individual wells sampled in each). The data were sorted first by the Sampler field, and each unique "sampler" was given a SourceNo (001, 002, … 00x), which became the tentative unique well number. These were then compared to the Client Name and Client Address fields to see if other samples with different samplers were likely to be from the same location. For example, in town X, John Southman collected sample 1 and was also the Client. Judy Southman collected sample 2 and was the Client, but John and Judy shared an address and probably were related. Therefore, the samples were probably from the same well. Sample 3 was collected by Alan Southman, but the Client was John Southman, and the address had the same street name as samples 1 and 2 (but no number), so sample 3 was assumed to be from the same well as samples 1 and 2. Sample 4 was collected for the Maine Department of Transportation by a State employee, but the Sample Description has "John Southman well," so the sample was assumed to be from the same well as samples 1, 2, and 3. (This was done only if the name was a full name and not a common name.) A substantial amount of subjective judgment was used in the determination of the SourceNo field, and because the street address of the sample location was not requested on the sample information sheet, there is inherent uncertainty in this determination. Therefore, caution was used in assigning multiple samples to a unique SourceNo. If there was reasonable ambiguity about whether the sample could be assigned to a unique well, it was given a SourceNo of "000" and not used in the subsequent analysis. (In late 2009 the HETL changed the sample information sheet and now requests the address of the sample location. This will greatly simplify this process in the future). Additional assumptions made in this screening step are listed below.

1. If the sampler was the same for two or more records, and there were no data to indicate otherwise, it was generally assumed that the sample came from the same source, even though this may not in fact have been the case (except for samples collected by State agencies or real estate agents; see below). For example if Joel sampled his parents' well across the street but wrote himself down as "sampler" for both his own sample and his parents' sample, there was no way to distinguish these two samples by source since the sample location as well as all client information would match. In cases where two samplers were the same but their client names were different, the record with matching client name and sampler was given a unique number, and the record with nonmatching client name and sampler was given a SourceNo of 000 because there was not enough information to confirm replication.

2. The address of the sample location was not requested on the sample information sheet until late 2009. The authors made assumptions about the sample address based on Sample Location (city or town), Client Address (this should be a street address), Sampler, and Client Name.

3. Post Office boxes were used, if available, to determine whether a source (well) was unique, even though the well could not be pinned to a location. In some instances, one Sampler or Client Name was linked to a street address in one record and a post office box in another; it was assumed in these cases that both samples were replicates from the same source.

4. If the Sample Location field was blank, the sample was not collected by an agency, and there was unique PII in the client fields, it was assumed that the Client Town and Client Address were the same as the sample town and address.

Several agencies, particularly the ME-CDC and Maine Department of Transportation (DOT), collected samples in various towns, but the Client Name and Client Address were always in Augusta, and the sampler was always a State employee. Therefore, unless the Sample Description contained enough site-identification information, the records were marked "000" in SourceNo. If the Sample Description did contain PII, that information was compared to other samplers, client names, and client addresses in that town

to check for replicates. Often the PII was a last name with or without a first name or initial, and some names were found repeatedly within that agency's samples from that town. If the names could be linked to, or distinguished from, those of other records with any certainty (first and last names were consistently the same, for example), they were given nonzero SourceNo's; otherwise, the records were marked "000." Sometimes the agency comments consist of information such as "New well—John Southman." If there were multiple samples, some before and some after the new-well comment, it was assumed that the samples were from different wells on the same property (particularly if the arsenic values were quite different).

Conversion of Less Than Values to Numeric Values

The Result field in the original data was populated with numeric values if the arsenic values were greater than the detection limit, or a less than 0.5 value if arsenic was not detected. These less-than values were recoded for data analysis and were converted to a value of 0.1 for graphing and data summary statistics. When the summary statistics were calculated, if a median value fell between a value at the detection limit and one below the detection limit, the median was set to less than 0.5.

Handling of Filtered Samples and Multiple Samples per Well

The stated goal of using samples that represented "raw" groundwater, or at least groundwater that was not treated to remove arsenic, determined how the available information on water treatment or filtration was utilized, particularly when deciding how to aggregate multiple samples per well to one representative value. Any available information on water treatment/filtration for each sample (in the sample description field) was distilled into the field Filter (coded as YES, NO, or UNK for unknown). Forty-eight percent of the total samples had no information on whether the sample had gone through some kind of treatment or filter. Of the rest, 54 percent were noted as being untreated, and 46 percent had been collected after some sort of filter or treatment system. Once again, some judgment was needed in determining what to use for the Filter field because the comments in the sample description field were often vague. Even where the description indicated that a sample was collected after a filter, there was rarely information about the type of filter (for example, chlorine filter, sediment filter, or reverse osmosis filter). If a sample record did not contain "After Filter" or "AF" in the Sample Description field but did contain the name of a type of filter, such as just the word "anion," it was assumed that the sample was indeed collected after the filter of the given type. Where a determination could be made that a sample was filtered, the Filter field was set to YES. If the information indicated that the sample was definitely not filtered or treated, the field Filter was filled in with NO.

An analysis of how the filtration status (as determined above) affected the arsenic concentration in the samples was conducted to both determine how to handle multiple samples at a given well and whether to keep or discard all the sample records marked "Filtered." The variation in arsenic concentration at any given well in the dataset may be the result of natural variation or the use of a treatment system in the home (or a combination of both). Because many of the water-treatment systems and filters installed in homes do not affect arsenic concentrations appreciably, the authors did not want to discard data for all 3,263 samples that were tagged as "Filtered" unless the data indicated that the samples were in some way different from the other arsenic samples. To assist in determining the best strategy for dealing with these Filtered samples, the authors created cumulative distribution graphs of the data in the Filter categories (YES, NO, or UNK) (fig. 6).

Figure 6 shows that the samples described as unfiltered (NO) have a slightly different distribution than the samples that were described as filtered/treated (YES) and the samples for which no information was available (UNK). The unfiltered samples generally have slightly higher arsenic concentrations than the other two types up to the 98th percentile, which is not surprising. The samples described as filtered and samples with filter unknown (UNK) have similar distributions and are essentially identical at concentrations greater than 3 µg/L. Many of the filter unknown samples probably do have some sort of treatment because the distribution is so similar to that of the Filtered samples. This indicates that while many filters or treatment systems that are not intended to treat for arsenic do in fact affect the arsenic concentrations somewhat. However, because this study is primarily concerned with identifying towns that have wells with high arsenic concentrations (>50 µg/L), there seemed to be little basis for discarding all the samples described as filtered (YES) from the overall dataset. There were 195 samples in the dataset that were described as being treated for arsenic specifically, and these were removed from the analysis.

There were several options for handling these multiple samples from a well: average the values to get a composite concentration, take the sample that was collected first because first samples often had the highest concentrations and were used to determine whether a treatment system was necessary (subsequent samples often were collected to test the efficacy of a treatment system) or select one sample (unfiltered if possible) from each well. If all the variations in arsenic concentrations for a well were the result of natural variation, taking the average would result in a representative concentration for that well. For the wells with multiple samples, however, it was common to have some samples filtered and some not. Oftentimes, the first sample in the dataset for a well was high in arsenic concentration, and a later sample would be tagged as filtered and be less than the detection level (or it may not have been tagged as filtered although it was less than the detection level anyway).

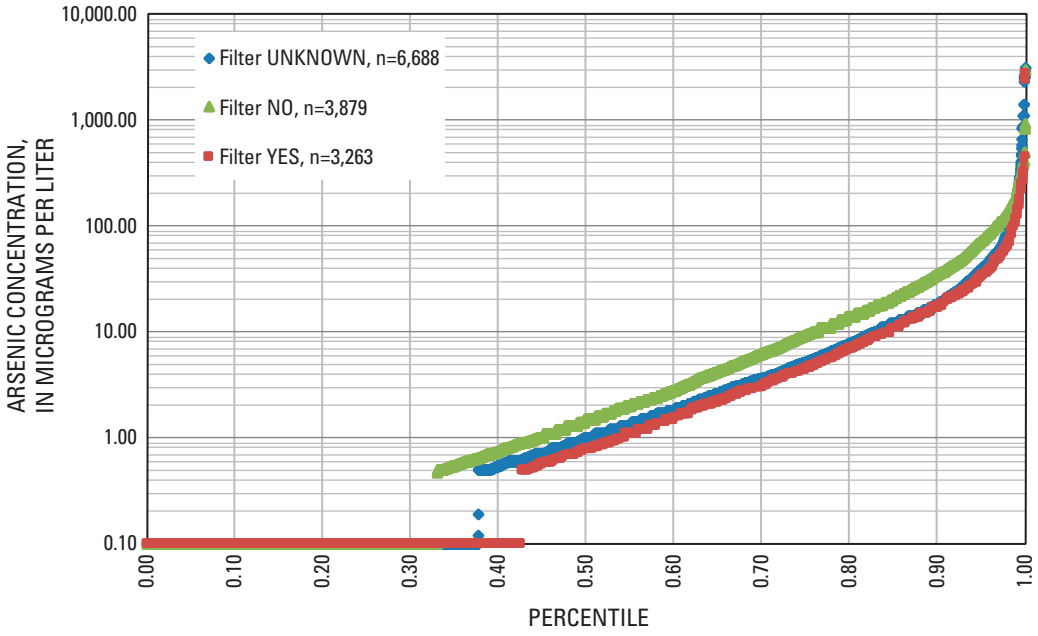

Figure 6. Cumulative distribution of arsenic concentrations, by filtration status, in Maine, 2005–09.

Many times, Before Filter and After Filter samples were collected on the same day. Because of the mix of filtered and unfiltered samples (and not knowing necessarily which was which), the most conservative and simple approach was to take the maximum concentration at each well. This was most likely to catch all the samples described as unfiltered, as well as unknown samples that were not treated/filtered.

Overall, 16 percent of the wells had from two to six samples, the remaining 84 percent had only one sample. On the basis of the analysis described above, the wells with multiple samples were given one value representing the maximum concentration at that well. The final dataset consisted of one value for each of the 11,111 wells.

Demographic Data Used in the Analysis

Demographic data were used to put the number of sampled wells in each town into context, specifically, to compare the number of wells sampled to the estimated number of self-supplied households. Population data are available for all the organized towns in Maine (488), but there are an additional 420 unorganized minor civil divisions (plantations, surpluses, unorganized townships) for which individual population estimates are not available. (The census combines these into blocks of unorganized territories for demographic data.) Seven of the minor civil divisions that have arsenic data in this study have no individual census population estimates, so those areas were left out of the demographic analyses described later in the report.

The 1990 census was the last to survey water sources for households, and those data are the only data currently available for demographic analyses of water source. Maine residents get their drinking water from either a self-supplied source (such as a domestic well) or from a public-water system. Public-water systems can include both community-wide systems or smaller systems designed to serve a smaller number of housing units, such as a trailer park. Self-supplied sources include drilled wells, dug wells, springs, purchased water, or a surface-water source. In Maine, the primary self-supply is from groundwater, either a drilled or dug domestic well (U.S. Census Bureau, 1990). (Springs are also used occasionally and for this report are considered the same as domestic wells because they also have a groundwater source.) This study used 2008 population estimates (U.S. Census

Bureau, 2008), data on the number of households per town in the 2000 census (U.S. Census Bureau, 2000), and the percentage of households using domestic wells to estimate the number of households in each town using domestic wells for their drinking water. The number of wells sampled divided by the estimated number of self-supplied households was used to give a calculated "sampling rate" for each town.

Statistical Analysis of the Final Dataset

Data summaries using the final dataset were completed for each town. For all towns, regardless of the number of samples or wells in the database, the following were tabulated: number of samples, number of wells with samples, range in concentrations, and number of wells sampled per 100 households using wells for drinking water (see above). For towns with five or more sampled wells (385 towns), the median arsenic concentration was calculated. For towns with 20 or more sampled wells (174 towns), the percentage of wells with concentrations of arsenic greater than 10, 50, 100, and 500 µg/L was calculated. For towns with 40 or more samples (77 towns), cumulative distribution graphs were prepared (many of which are shown in a subsequent section).

Estimates of Populations and Households Served by Domestic Wells, by Town

In 1990, public-water sources in Maine supplied 54 percent of the households. Forty-one percent of households reported using a drilled or dug well, and 5 percent reported using "other" for a water supply (U.S. Census Bureau, 1990). In areas of the State without large population centers, households generally are all self-supplied (fig. 7). Many areas of southern and coastal Maine have experienced substantial population growth since the last water-source survey in 1990. Because residential development growth since 1990 has generally tended to occur in rural areas outside the more densely populated town centers that are served by public-water systems (The Brookings Institution, 2006), these data probably underestimate the current percentage of town populations using a self-supply (groundwater) for drinking water. The estimated number of self-supplied households (fig. 8) in southern and coastal Maine particularly is probably underestimated. All of the demographic data are provided in Appendix 1.

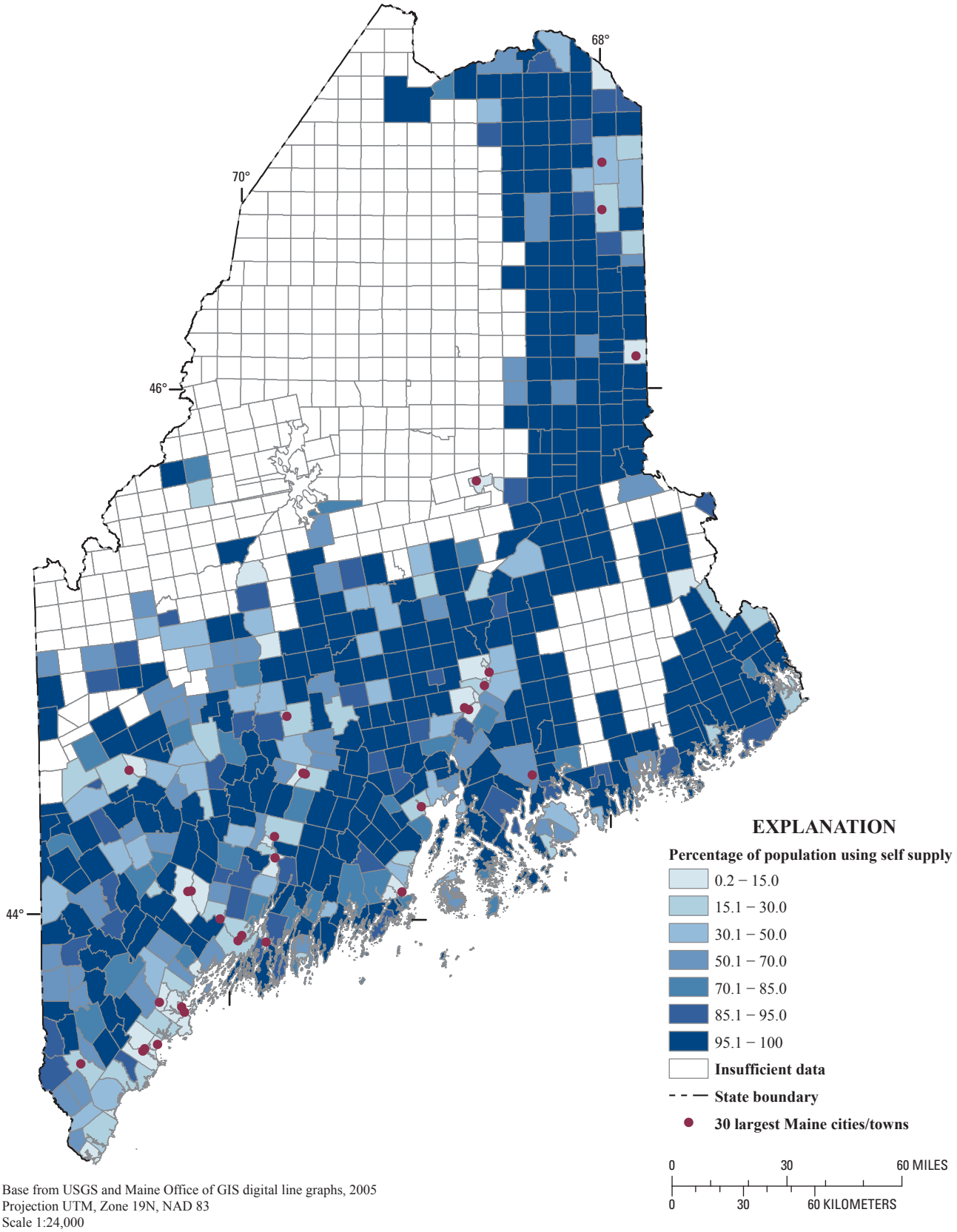

Figure 7. Percentage of town populations using a self-supply water source, generally wells, in Maine, 1990 census. Some towns have insufficient demographic data because of low population density.

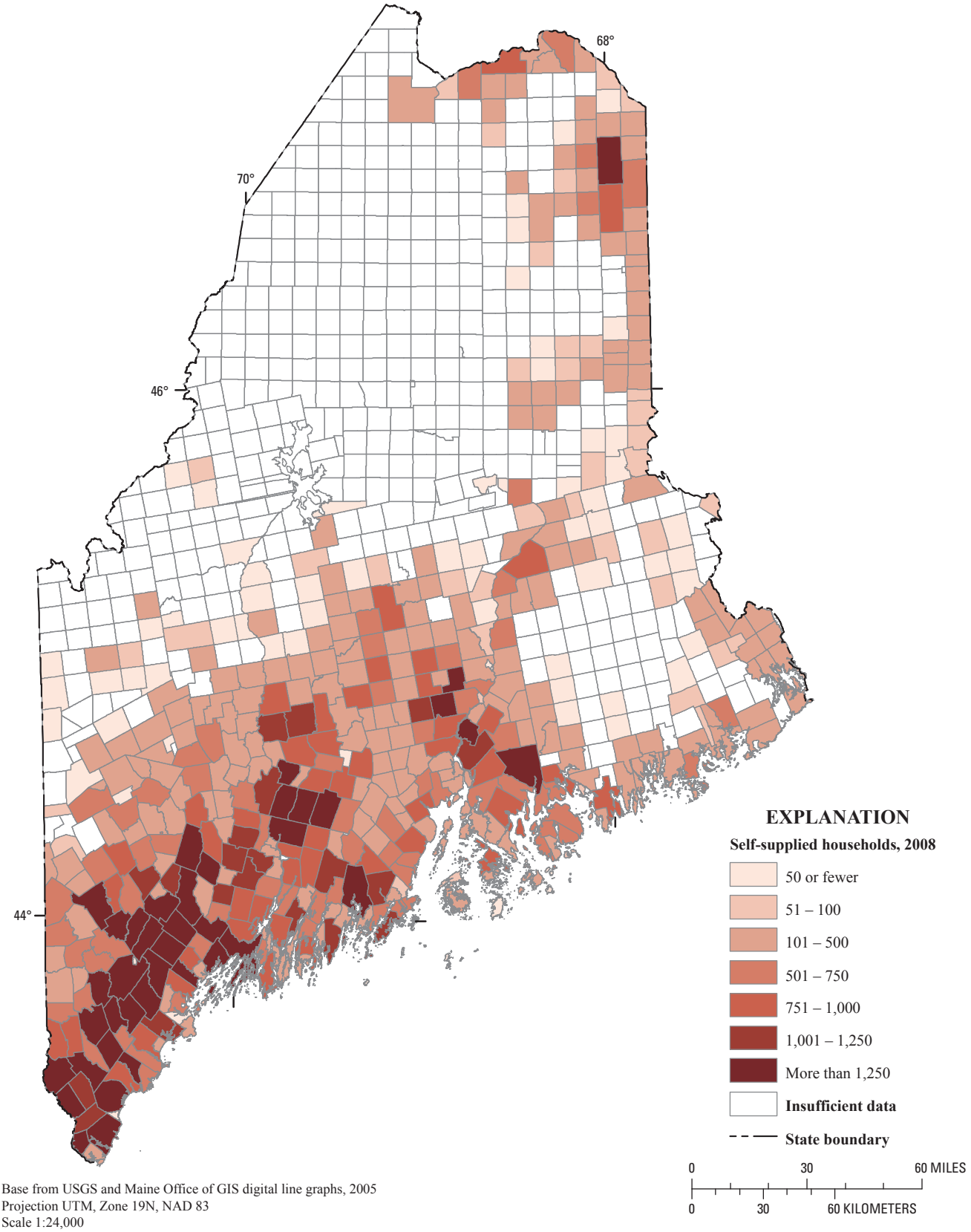

Figure 8. Estimated number of self-supplied households, by town, in Maine, 2008. Some towns have insufficient demographic data because of low population density.

Considerations for Using Domestic Well-Water Data for Town-Wide Summaries of Arsenic Concentrations in Maine

One of the concerns about using an opportunistic dataset, such as the HETL, is the phenomenon of self-selection bias. This refers to scenarios where a domestic well owner finds that the concentration of arsenic in their domestic well is high, and alerts people living in the vicinity who also test their wells, many of which also have high concentrations of arsenic. This is thought to result in a dataset in which the locations tested are not randomly distributed, as the testing frequency would be skewed towards areas higher in arsenic. To conduct a very general test for this at the town level, data on the sampling frequency (number of wells with samples divided by the number of self-supplied households) were compared to the median and maximum arsenic concentrations for each town. Since the HETL added arsenic analyses to all their general water tests in 2002, there is a larger percentage of samples that were submitted for reasons other than specifically testing for arsenic than before 2002, which would tend to lessen the effect of self-selection bias in the dataset.

The calculated sampling rate for the organized towns in Maine for which population data were available (fig. 9) ranged from zero percent to 100 percent. Of those towns with zero percent, 20 towns had no samples in the HETL database for 2005 to 2009; 8 of those had populations of greater than 40 households. All the towns with greater than 40 percent sampling rates had very low populations—fewer than 20 self-supplied households—and the calculated sampling rates in those towns are thought to be skewed by two factors: (1) seasonal property owners sending in samples from their wells and (2) underestimation of the number of self-supplied households for the 2008 population estimates. The median rate of testing in the HETL dataset for this time period is 3.8 percent, but this represents only samples sent to the HETL, not to those sent to other laboratories, so 3.8 percent is not representative of all households in Maine. The calculated sampling rate was mapped to show how this rate varied spatially across the State (fig. 10). As shown in the histogram of the sampling rates (fig. 9), most towns in the State are represented by fewer than 5 wells per hundred households (5 percent sampling rate). A few towns west of Augusta

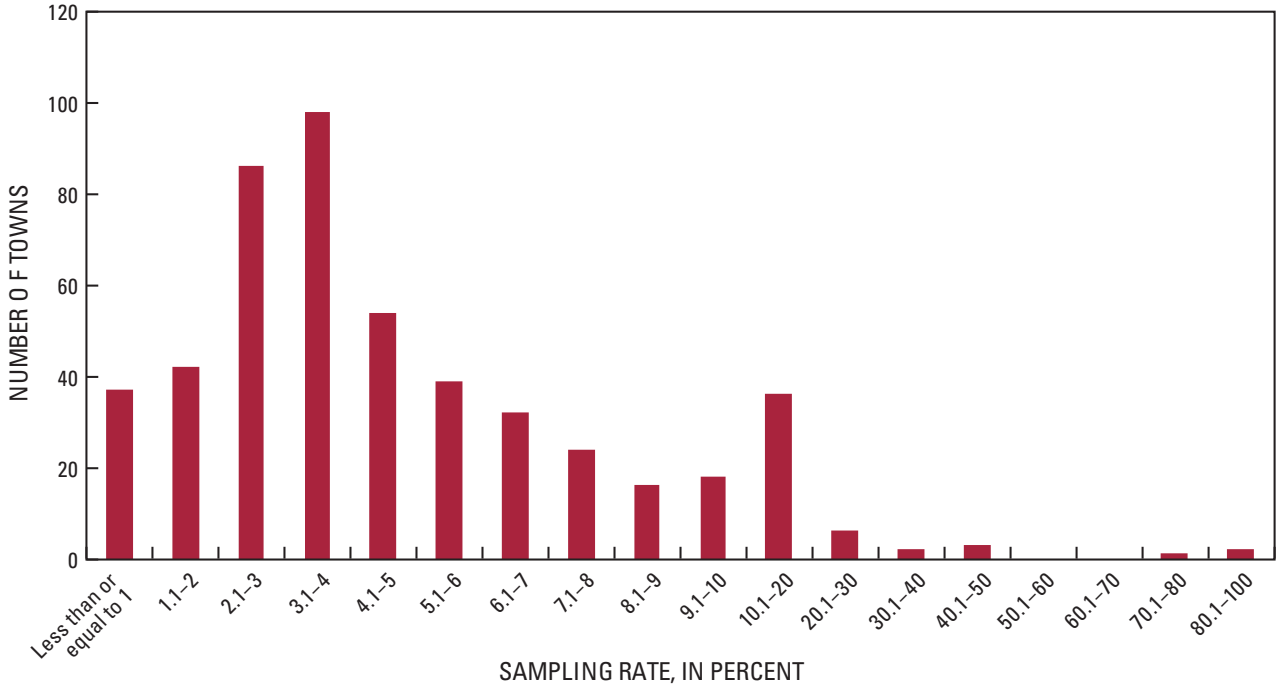

Figure 9. Distribution of sampling rates for arsenic in Maine towns, 2005–09. The sampling rate is the number of sampled wells in the Maine Health and Environmental Testing Laboratory dataset divided by the number of self-supplied households in each town, expressed as a percentage.

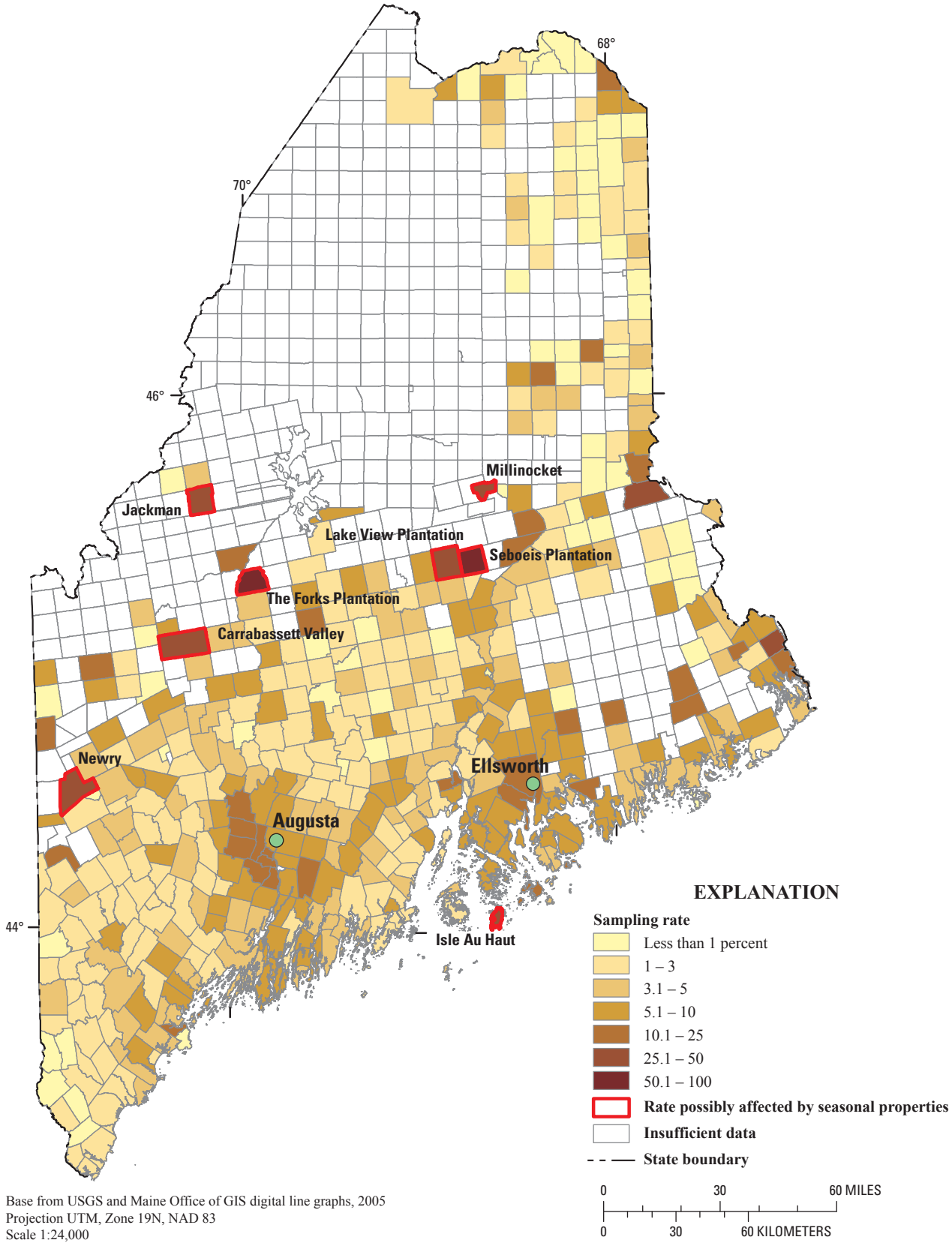

Figure 10. Sampling rate for towns, calculated as the number of sampled wells per hundred self-supplied households, in Maine, 2005–09. Some towns have insufficient demographic data because of low population density.

have sampling rates greater than average, as do a few other towns around Ellsworth. These are areas known for having a high percentage of wells with arsenic concentrations greater than 10 µg/L, but there do not appear to be other significant clusters of wells with higher sampling rates. On the northern fringe of the populated part of western and central Maine, there are several towns with very high sampling rates. These towns have very low populations (fewer than 40 households) and many seasonal homes. It is likely that samples submitted for seasonal properties have artificially elevated the sampling rate for households in these towns.

In order to investigate the possibility of a self-selection bias, the rate of sampling in each town was plotted against the median and maximum arsenic concentrations (fig. 11). Self-selection bias, if it exists at the town level, should be indicated by an increase in the sampling rate with increases in either the town median or maximum arsenic concentrations. It does not appear, from figure 11, that there is any overall change in the percentage of self-supplied households tested with increases in the median arsenic concentrations, but there may be an increase in the percentage of households sampled with the higher maximum concentrations.

Besides the possibility of self-selection bias in the dataset, where residents themselves alter the distribution by deciding to sample or not based on a neighbor's test results, there is the possibility of a bias in this database from efforts by State agencies, such as the ME-CDC, to encourage testing in some towns, which could affect sampling rates in towns with high concentrations of arsenic. According to staff at the ME-CDC, 124 towns were targeted during 2005–09 for increased outreach in the form of pamphlets and posters sent to town offices encouraging residents to test for arsenic (Eric Frohmberg, ME-CDC, written commun., 2010). Some of these towns also were recruited for inclusion in specific studies on arsenic distributions (Yang and others, 2009), although the samples for arsenic-specific studies were analyzed at other laboratories. The distribution of sampling rates for towns that were targeted for outreach and (or) included in specific studies and towns that were not are shown in figure 11C. Although it is not surprising that the average maximum concentrations in the targeted towns were considerably higher than in the non-targeted towns (median and mean maximum concentrations for the non-targeted towns were 12 and 37 µg/L, respectively, and for targeted towns, 34 and 115 µg/L, respectively), the actual sampling rates in the targeted towns, as the percentage of self-supplied households with sampled wells in the dataset, were similar for both groups. (Median and mean sampling rates for the unsolicited towns were 6 and 4 percent, respectively, for targeted towns, 5 and 4 percent, respectively). Therefore, while the targeted towns had relatively high levels of arsenic in well water, these towns do not appear to be represented any more or less in the database than the non-targeted towns. Although the data available do not appear to indicate a high degree of self-selection bias in the medians of the town arsenic concentrations or bias from outreach by the ME-CDC, neither do the data rule out the possibility of some degree of bias in the overall distribution of arsenic when compared to a randomly designed sampling of wells in Maine, especially as it pertains to the representativeness of the maximum arsenic concentrations in towns that have relatively few samples.

Another way to look at the representativeness of samples submitted to the HETL for analysis is to consider the overall number of samples in the dataset. Towns with higher numbers of samples are believed to have data that better represents the range of conditions in those towns than towns with few samples. Towns with very few samples would need additional testing to better understand the range of arsenic concentrations in domestic wells. The range in the number of sampled wells, by town, is illustrated in figure 12. Although the authors do not propose a criterion for what constitutes enough samples, the range of arsenic found in wells in towns with 25 or more sampled wells is a better representation of actual conditions than the range in towns with fewer than 10 sampled wells.

Additional factors inherent in the dataset indicate the use of a cautious approach in the interpretation of these data. For example, the level of certainty about the physical address of each sampled well is unknown, as the actual sampled location was not requested, and only 56 percent of the sampled wells had street addresses corresponding to the town that the sample was collected in. Most of the remaining sampled wells did not have a street address. Determining which samples can be assumed to be from the same source (that is, well) involves some judgment, and the database records do not differentiate between samples collected from different wells on the same property. In the early 1990s, the HETL recorded the well type in the database, but that practice was discontinued sometime after the study by Marvinney and others (1994) and before 2005.

As already described, filtration or water treatment is another issue that cannot be definitively determined for most of the samples in this dataset. For reasons described above, the filtration information recorded in the database is incomplete and cannot be relied on for statistical segregation. Many residents may not provide the information because it is not necessary for their understanding of their own water sample. (They likely already know whether or not it is filtered.) Other residents may not know exactly what filtration is being applied to their water, particularly if the house was purchased with a filtration system already installed. Furthermore, the form does not state the importance of the information, and the HETL does not have a separate field for the information in the database. (Filtration information is included in the Sample Description field when data are entered.) Also, many filters that are commonly used, such as sand filters (which are quite common), do little to affect arsenic concentrations, although iron and manganese filters may remove some arsenic.

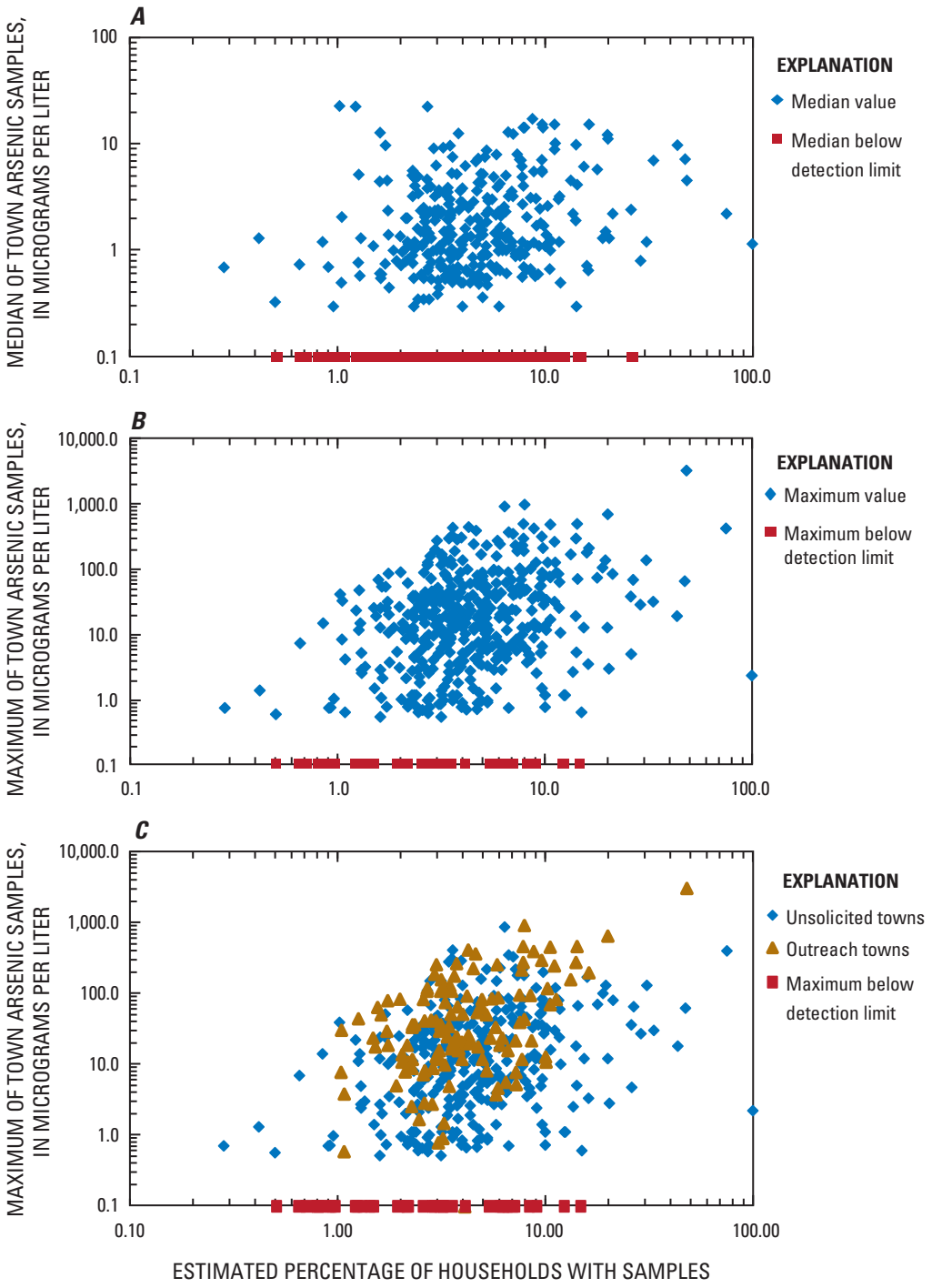

Figure 11. Estimated percentage of households with sampled wells in each town in relation to *(A)* the median of all samples in each town, *(B)* the maximum of all samples in each town, and *(C)*, the maximum of samples in each town broken down by whether the towns were targeted for outreach by the Maine Centers for Disease Control and Prevention or whether they were unsolicited. All towns with the median, for graph *(A)*, or the maximum, for graphs *(B)* and *(C)*, below the detection limit of 0.5 micrograms per liter are graphed at 0.1 micrograms per liter.

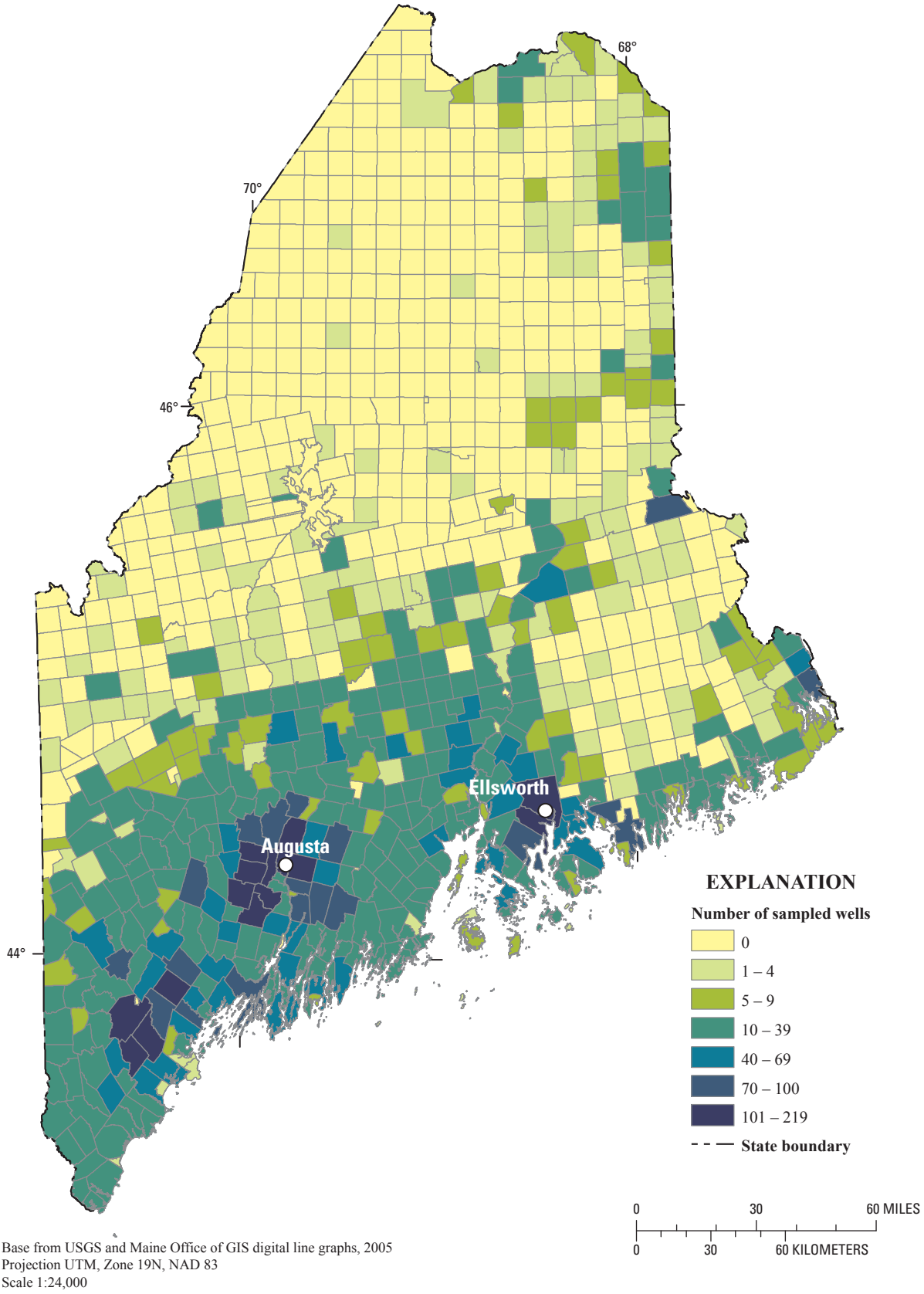

Figure 12. Total numbers of sampled wells in the Maine Health and Environmental Testing Laboratory database, 2005–09, and some known areas of elevated arsenic levels.

Arsenic Concentrations in Domestic Well Water in Maine

Overall, approximately 18,000 records were retrieved from the HETL database. Of these, 14,282 had unique laboratory identification numbers. After screening the data, 13,843 samples collected from 11,111 wells were used for analysis. Samples that had associated street addresses represent 56 percent of all the samples. Some information on filtration or water treatment was included in 52 percent of the samples. Just under 16 percent of the sampled wells had more than one sample recorded in the dataset.

A total of 531of Maine's 908 minor civil divisions (488 organized municipalities and 420 unorganized territories—all referred to as "towns" in this report) are represented in the dataset; the total number of wells with samples in the database, by town, is mapped in figure 12. Many of the towns with large sample densities, such as towns in Cumberland and Kennebec Counties and the area surrounding the town of Ellsworth, are areas that have been previously identified as having high concentrations of arsenic (> 50 µg/L). However, areas with very low population densities have few samples in the State database.

Overall, 18.4 percent of the wells with samples in the HETL database had arsenic concentrations greater than 10 µg/L, and 4 percent of these wells had arsenic concentrations greater than 50 µg/L. Given that there were approximately 241,000 self-supplied households in Maine in 2008, a generic extrapolation to the self-supplied population in Maine would indicate that more than 44,000 households in the State could possibly have well water with concentrations of arsenic that exceed the 10 µg/L USEPA standard. However, this calculation would assume that the HETL dataset is an unbiased sample of wells across the state, which it probably is not, especially since the number of wells sampled in each town varies so widely. An earlier study that used a random sampling design with almost 1,000 wells across the State found that 10 percent of sampled wells had arsenic levels of 10 µg/L or greater (Loiselle and others, 2001). Using the same number of self-supplied households, that study would indicate that over 24,000 households in Maine could have well water exceeding the USEPA standard. Given the spatial variability of the self-supplied rural population in Maine and the spatial variability of areas high in arsenic in groundwater, it would be difficult to design a study that determined definitively the number of wells in Maine with arsenic above the USEPA standard. In the end, these data do not represent a random sample of wells from each town; rather, they provide the best indicator of high concentrations, by town, of any available datasets and are a better indicator of arsenic hot-spots than data from randomly designed studies.

Statistical Distributions of Arsenic Concentrations, by Town

The number of samples, number of wells sampled, minimum and maximum concentrations, and median concentrations of arsenic are reported for all 531 towns in Appendix 2. Of the towns with five or more sampled wells recorded in the dataset, the 30 towns with the highest maximum arsenic concentrations are listed in table 3, and the 30 towns with the highest median arsenic concentrations are listed in table 4. The 30 highest maximum arsenic concentrations in wells in this dataset range from 200 to 3,100 µg/L, and the 30 highest median arsenic concentrations range from 5.5 to 22 µg/L. Many of the towns in these two lists could be considered well characterized because they are represented by samples from more than 40 wells. However, in both lists, there are several towns that have samples from fewer than 10 wells, such as the towns of Seboies Plantation and Atkinson, which have maximum concentrations of 400 and 290 µg/L, respectively, (table 3) and the towns of Passadumkeag, Anson, and Monson (see fig. 2), which have median concentrations from 9.5 to 12.4 µg/L (table 4). These towns are not heavily populated, but the relatively high concentrations in these towns may deserve further investigation.

Maps showing the spatial distribution of the maximum (fig. 13) and median (fig. 14) arsenic concentrations for the same towns show that the distribution of high arsenic concentrations (> 50 µg/L) in wells follows some geographic patterns. There are obvious clusters of towns with high arsenic occurrence (such as southern coastal areas, the Kennebec County area, and the central coastal part of Maine), as well as definite areas of the State with low arsenic concentrations, such as the northernmost towns sampled and the western and west-central part of Maine. The clusters in the areas around Augusta and Ellsworth, and the cluster in southern coastal Maine, are all well characterized because the towns in these areas have many samples in the dataset (see fig. 11) and have been well documented in past studies (Loiselle and others, 2001; Ayotte and others, 2003; Marvinney and others, 1994; Yang and others, 2009). Other isolated towns with relatively high maximum concentrations (> 100 µg/L), however, are in areas of the State with relatively few samples (and low populations). These towns and the towns around them may be targeted for further investigation.

The percentage of wells with arsenic concentrations exceeding 10, 50, 100, and 500 µg/L in the 174 towns with 20 or more sampled wells are listed in Appendix 3, and the towns with the 30 highest percentages of wells with concentrations greater than 10 µg/L are listed in table 5. Eleven towns had over 40 percent of the sampled wells exceeding 10 µg/L. Because these towns each had from 60 to 218 samples, these towns could be considered well characterized. Extrapolating to the total self-supplied

populations in these 11 towns, more than 17,500 people could be using wells with water that exceeds the USEPA limit for arsenic, if left untreated. As expected, many fewer towns had wells with concentrations exceeding the 50, 100, and 500 µg/L categories. Only 19 towns had more than 10 percent of wells exceeding 50 µg/L, and 44 towns had 1 or more percent exceeding 100 µg/L. In Surry, Hancock County (one of the 19 towns), 23 percent of the 120 wells sampled had concentrations exceeding 100 µg/L, which is a much higher frequency than for any other town. In only four towns (Danforth in Washington County, Surry and Blue Hill in Hancock County, and Woolwich in Sagadahoc County) was there 1 percent or more of the wells with concentrations greater than 500 µg/L during 2005–09. Most of these towns have relatively high numbers of wells in the dataset. Maps showing the percentage of wells with concentrations of arsenic exceeding 10, 50, 100, and 500 µg/L (figs. 15–18) portray the same distinct geographic patterns of high arsenic concentrations across the State as presented earlier, although these maps show only towns with 20 or more samples in the dataset. Earlier studies identified other clusters of very high arsenic levels in or near the towns of Northport (Lipfert and others, 2006), the Buxton/Hollis area (Marvinney and others, 1994), and Waldoboro (Sidle, 2003), but the associated samples were collected before 2005 and did not factor into this analysis.

Although the data in this study are limited in their usefulness by the fact that they are non-random data, and of low quality in terms of location and ancillary data, these data are unique in that they point specifically to towns with very high arsenic concentrations in bedrock groundwater. These high concentrations are rarely captured by randomly designed studies, so the strength of these analyses lies in the identification of towns with wells having high arsenic concentrations.

Ayotte and others (2006) published a map showing the probability of arsenic concentrations exceeding 5 µg/L in groundwater wells in bedrock in the southern half of Maine. This probability map is based on a logistic-regression model that takes into account bedrock geologic type, stream sediment arsenic, hydrologic variables, land use, and two geochemical processes (Ayotte and others, 2006). While this probability map is based on the probability of arsenic exceeding 5 µg/L, the spatial patterns can be compared to the spatial patterns observed in the map showing the percentage of wells found to have arsenic concentrations exceeding 10 µg/L from the HETL dataset (fig. 15). The areas of highest probabilities of having a well with arsenic greater than 5 µg/L in Maine correspond somewhat to the areas found to have wells exceeding 10 µg/L in the HETL dataset; particularly, the Ellsworth-Surry-Blue Hill area is identified in both maps. Both studies show few wells (or a predicted small probability of finding wells) with elevated arsenic in southern Oxford County and western Cumberland County. However, the area found to have high arsenic west of Augusta in Kennebec County in the HETL dataset (figs. 13–15) is not predicted to have as high a probability of elevated arsenic in the probability map as areas in southeast Kennebec County and Lincoln County, which were found in the HETL dataset to have quite low percentages of wells exceeding 10 µg/L (fig. 15). Predictions of relatively high probabilities of wells with elevated arsenic in eastern Washington County are not borne out by the HETL data, and the cluster in the Rangeley area was not predicted by the logistic-regression model. However, the HETL database was not designed to specifically test the logistic regression model, so it is difficult to draw specific conclusions about the accuracy of the model from these data.

Table 3. Towns with the 30 highest maximum arsenic concentrations, of the towns with five or more sampled wells in the Maine Health and Environmental Testing Laboratory database, 2005–09.

[µg/L, micrograms per liter; <, less than; Plt, plantation]

County	Town	Total number of samples	Number of wells with samples	Town arsenic concentrations		
				Minimum (µg/L)	Maximum (µg/L)	Median (µg/L)
Washington	Danforth	123	71	< 0.5	3,100	4.5
Hancock	Blue Hill	107	75	< .5	930	14.0
Sagadahoc	Woolwich	71	63	< .5	870	< .5
Hancock	Surry	141	120	< .5	660	11.0
Hancock	Ellsworth	272	219	< .5	470	4.1
Hancock	Sedgwick	41	33	< .5	470	4.0
Franklin	Rangeley	49	37	< .5	460	1.0
Cumberland	Standish	149	120	< .5	420	2.5
York	Biddeford	21	18	< .5	410	7.5
Kennebec	Litchfield	156	110	< .5	400	5.5
Penobscot	Seboeis Plt	17	9	.7	400	2.2
Kennebec	Vassalboro	75	60	< .5	370	6.8
York	Saco	84	63	< .5	350	3.2
Oxford	Buckfield	47	36	< .5	330	3.2
Knox	Rockport	35	22	< .5	310	5.3
Kennebec	Monmouth	127	111	< .5	300	7.0
Piscataquis	Atkinson	5	5	< .5	290	.5
Cumberland	Gorham	287	218	< .5	280	14.0
Kennebec	Readfield	179	129	< .5	280	9.7
Waldo	Lincolnville	40	30	< .5	280	2.7
York	Buxton	144	114	< .5	270	5.2
Cumberland	Gray	141	111	< .5	260	3.9
York	Hollis	65	49	< .5	260	2.1
Kennebec	Winthrop	173	130	< .5	250	8.8
Hancock	Penobscot	43	31	< .5	230	4.2
Knox	Union	50	36	< .5	230	2.9
Cumberland	Scarborough	84	61	< .5	220	8.6
Hancock	Franklin	36	31	< .5	220	.9
Kennebec	Belgrade	126	95	< .5	220	6.1
Kennebec	Chelsea	84	75	< .5	220	1.2

Table 4. Towns with the 30 highest median arsenic concentrations, of the towns with five or more sampled wells in the Maine Health and Environmental Testing Laboratory database, 2005–09.

[µg/L, micrograms per liter; <, less than; Plt, plantation]

County	Town	Total number of samples	Number of wells with samples	Town arsenic concentrations		
				Minimum (µg/L)	Maximum (µg/L)	Median (µg/L)
Knox	Camden	31	18	< 0.5	120	22.0
Kennebec	Manchester	175	111	< .5	200	15.0
Cumberland	Gorham	287	218	< .5	280	14.0
Hancock	Blue Hill	107	75	< .5	930	14.0
Washington	Columbia	22	17	< .5	200	14.0
Hancock	Otis	18	14	< .5	85.0	12.7
Penobscot	Passadumkeag	9	6	< .5	35.0	12.4
Hancock	Surry	141	120	< .5	660	11.0
Kennebec	Hallowell	18	15	.7	120	10.0
Kennebec	Readfield	179	129	< .5	280	9.7
Piscataquis	Lake View Plt	11	10	3.7	18.0	9.6
Somerset	Anson	8	6	< .5	24.0	9.6
Piscataquis	Monson	12	7	2.2	33.0	9.5
York	Newfield	18	16	< .5	28.0	9.0
Kennebec	Winthrop	173	130	< .5	250	8.8
Cumberland	Scarborough	84	61	< .5	220	8.6
Waldo	Northport	43	35	< .5	180	7.9
Washington	Baring Plt	15	6	2.3	150	7.9
York	Biddeford	21	18	< .5	410	7.5
Penobscot	Millinocket	10	9	1.1	62.0	7.1
Hancock	Trenton	53	44	< .5	97.0	7.1
Kennebec	Monmouth	127	111	< .5	300	7.0
Hancock	Mariaville	20	14	< .5	65.0	7.0
Knox	Isle Au Haut	10	7	< .5	30.0	6.9
Kennebec	Vassalboro	75	60	< .5	370	6.8
York	Eliot	55	39	< .5	42.0	6.2
Kennebec	Belgrade	126	95	< .5	220	6.1
Aroostook	Weston	18	15	< .5	70.0	5.7
Piscataquis	Brownville	22	19	< .5	69.0	5.6
Kennebec	Litchfield	156	110	< .5	400	5.5

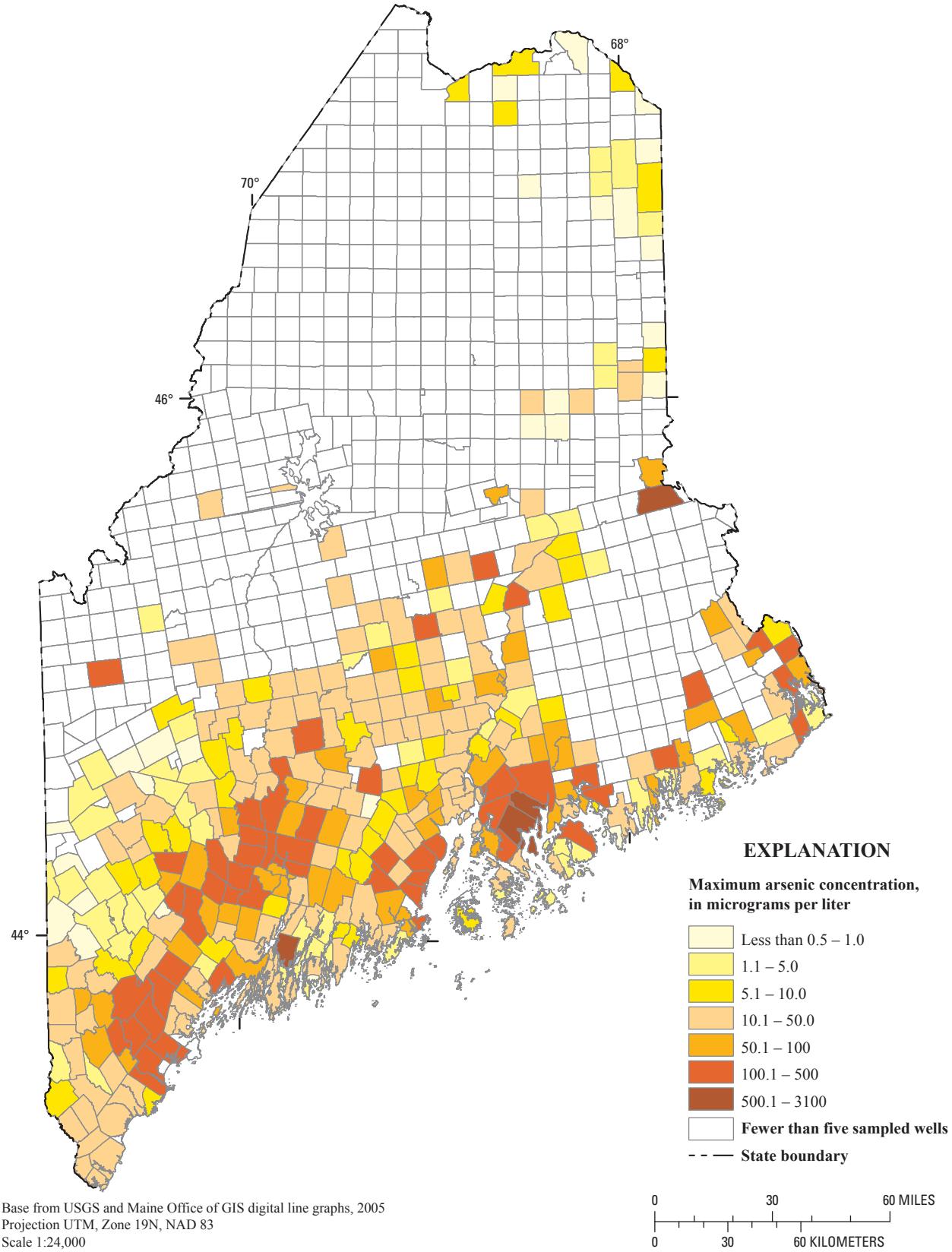

Figure 13. Maximum arsenic concentrations for towns with five or more sampled wells in Maine, 2005–09.

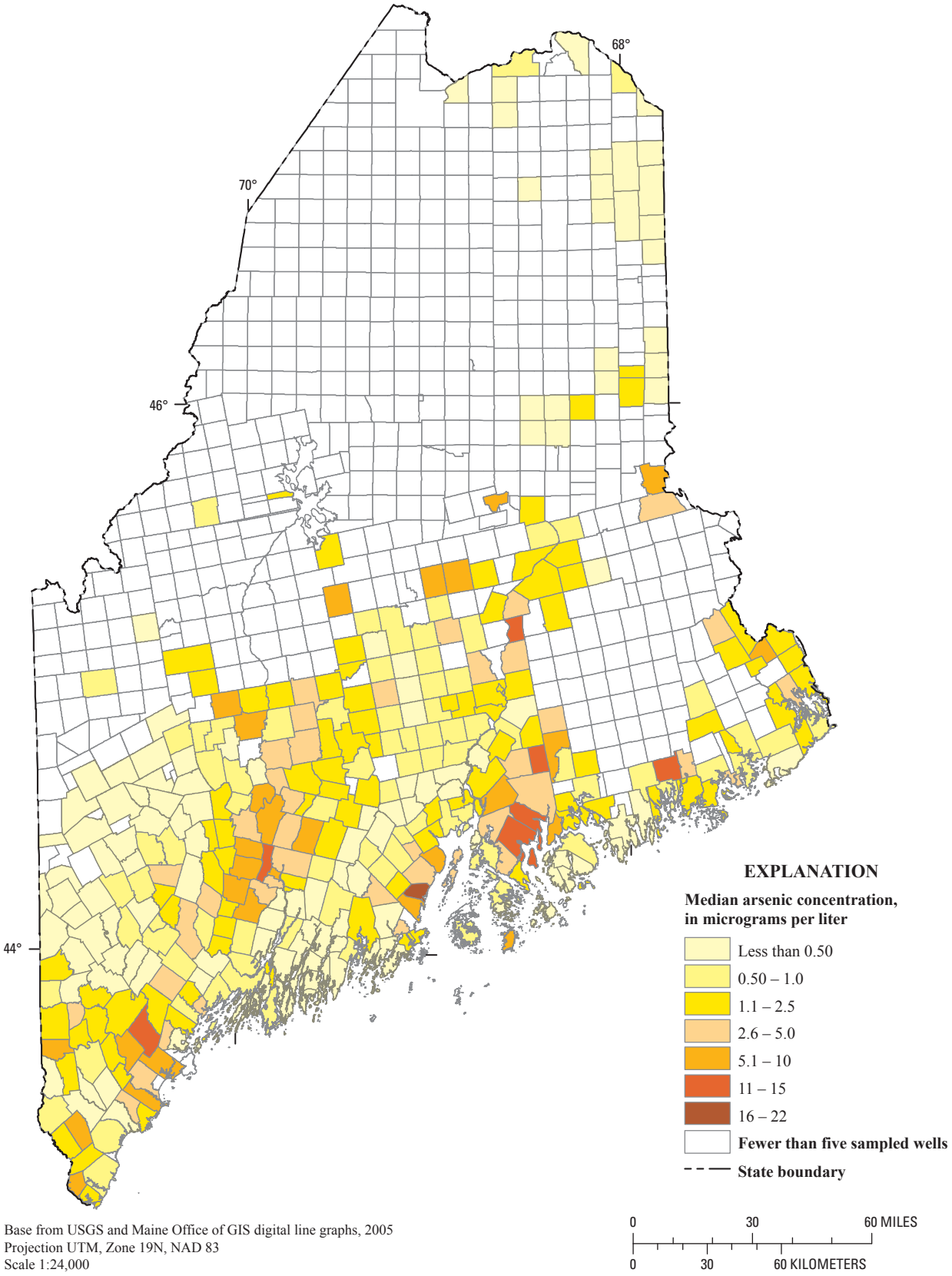

Figure 14. Median arsenic concentrations for towns with five or more sampled wells in Maine, 2005–09.

Table 5. Towns with the 30 highest percentages of wells with arsenic concentrations exceeding 10 micrograms per liter, of the towns with 20 sampled wells in the Maine Health and Environmental Testing Laboratory, 2005–09, and percentages of wells in those towns with arsenic concentrations exceeding 50, 100, and 500 migrograms per liter.

[µg/L, micrograms per liter; As, arsenic]

County	Town	Number of wells sampled	Percentage of wells exceeding 10 µg/L As	Percentage of wells exceeding 50 µg/L As	Percentage of wells exceeding 100 µg/L As	Percentage of wells exceeding 500 µg/L As
Kennebec	Manchester	111	62	19	3	0
Cumberland	Gorham	218	57	22	8	0
Hancock	Blue Hill	75	57	15	11	3
Hancock	Surry	120	51	33	23	2
Kennebec	Readfield	129	49	12	3	0
Cumberland	Scarborough	61	48	10	3	0
Kennebec	Winthrop	130	46	12	2	0
Kennebec	Monmouth	111	45	14	6	0
Washington	Danforth	71	42	20	11	8
Kennebec	Litchfield	110	42	15	5	0
York	Buxton	114	41	11	5	0
Hancock	Trenton	44	39	5	0	0
York	Eliot	39	38	0	0	0
Androscoggin	Greene	43	37	9	2	0
Waldo	Northport	35	37	14	6	0
Hancock	Ellsworth	219	37	11	5	0
Knox	Rockport	22	36	18	9	0
Franklin	Rangeley	37	35	8	5	0
Hancock	Orland	40	35	3	3	0
Kennebec	Vassalboro	60	35	2	2	0
Kennebec	Mount Vernon	86	35	5	1	0
York	Hollis	49	35	16	6	0
Androscoggin	Minot	32	34	3	3	0
Hancock	Sedgwick	33	33	12	9	0
Kennebec	Albion	24	33	0	0	0
Knox	Union	36	33	8	3	0
Somerset	Fairfield	24	33	0	0	0
York	Dayton	27	33	11	0	0
Kennebec	Belgrade	95	33	2	1	0
Androscoggin	Auburn	37	32	3	3	0
Somerset	Skowhegan	34	32	12	6	0

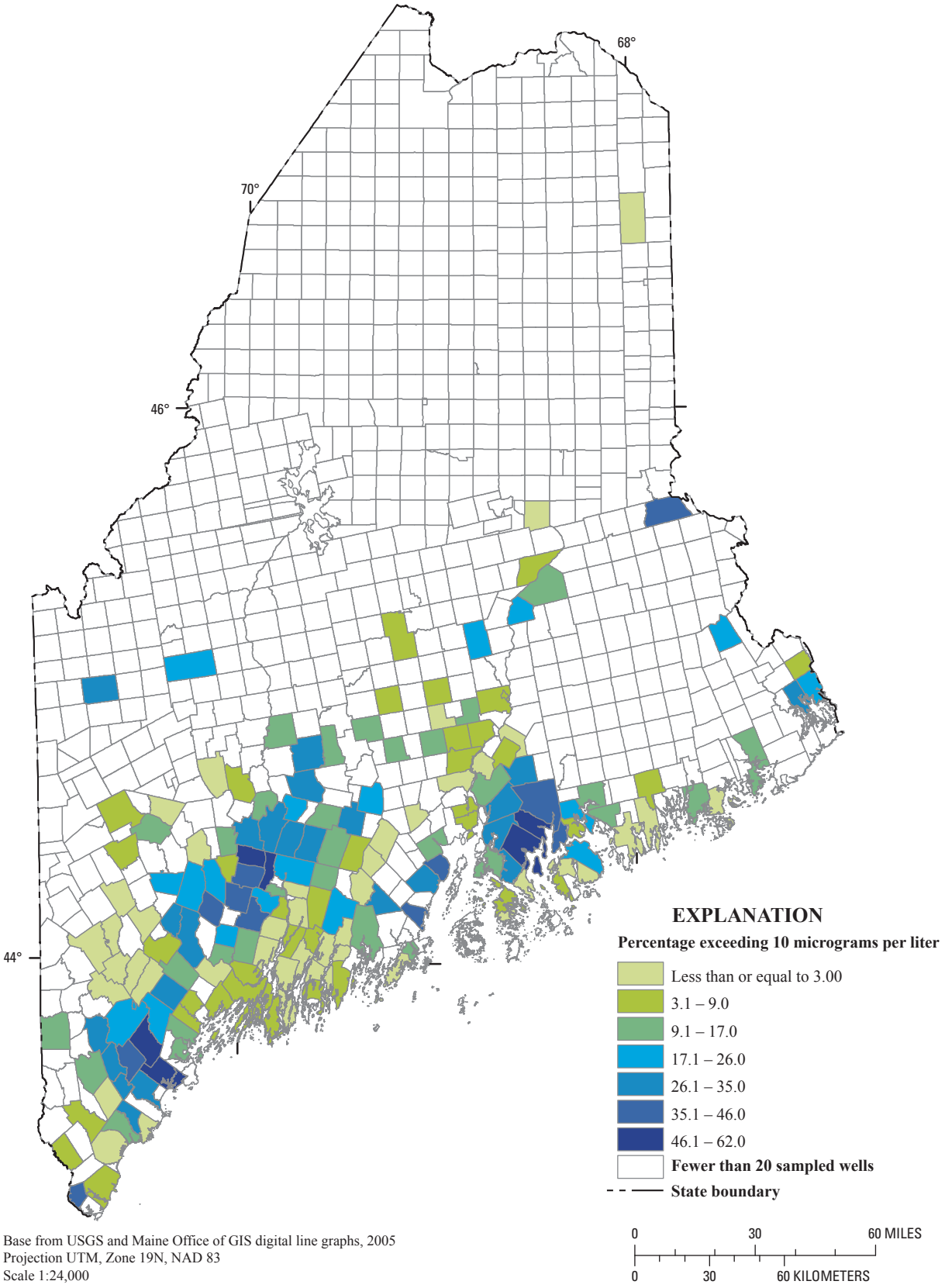

Figure 15. Percentage of wells in each town with arsenic concentrations greater than 10 micrograms per liter in Maine, 2005–09. Towns shown have 20 or more sampled wells.

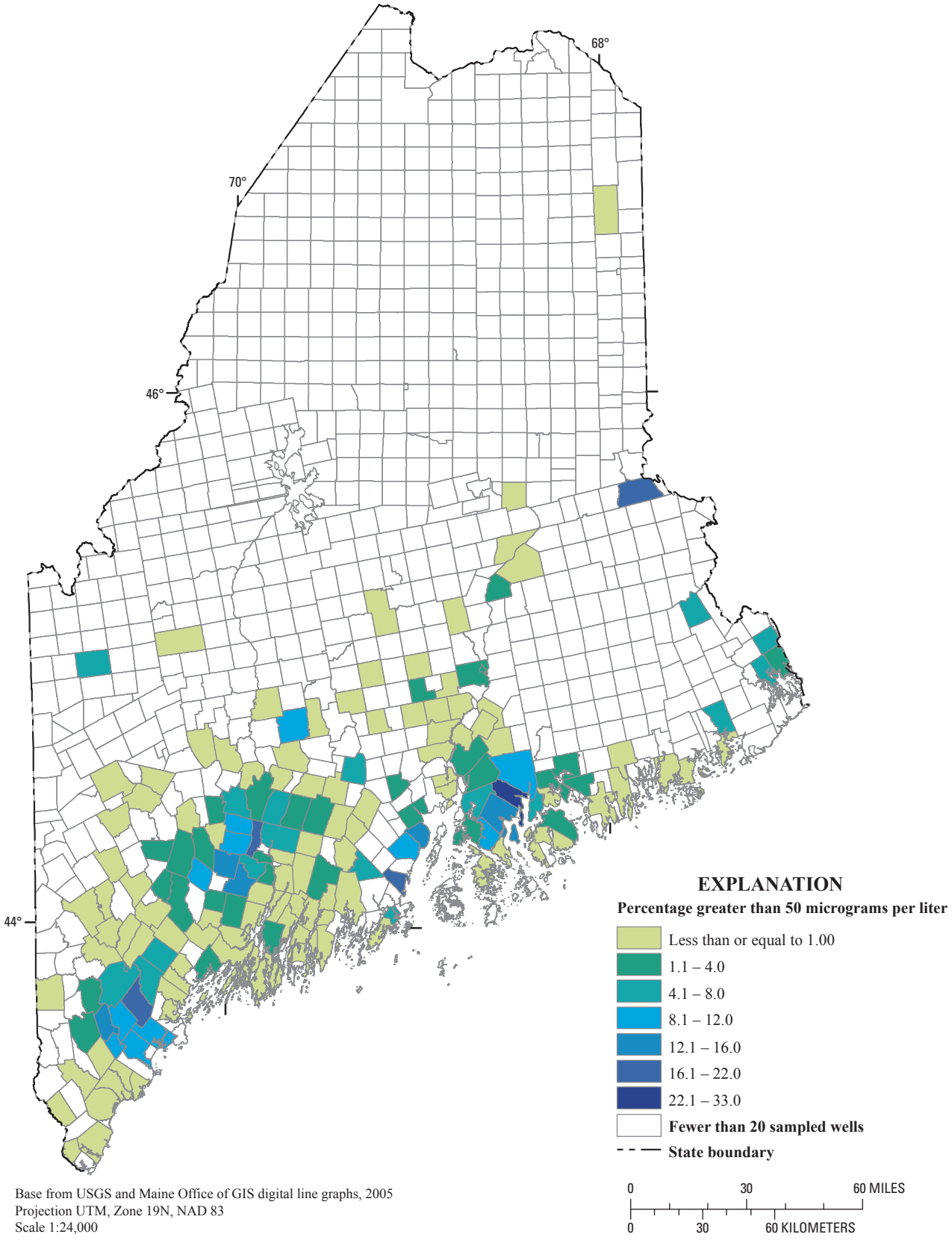

Figure 16. Percentage of wells in each town with arsenic concentrations greater than 50 micrograms per liter, in Maine, 2005–09. Towns shown have 20 or more sampled wells.

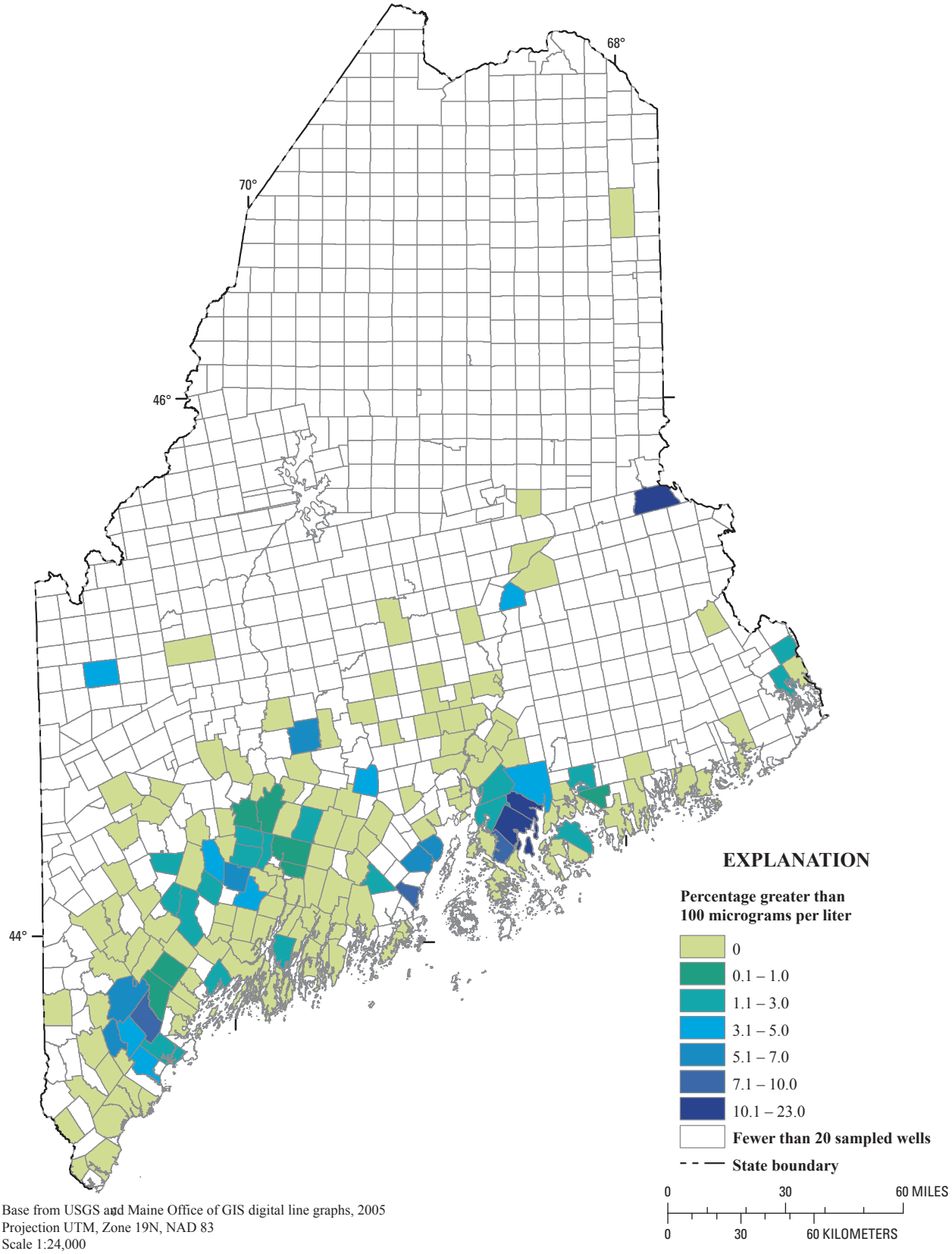

Figure 17. Percentage of wells in each town with arsenic concentrations greater than 100 micrograms per liter, in Maine, 2005–09. Towns shown have 20 or more sampled wells.

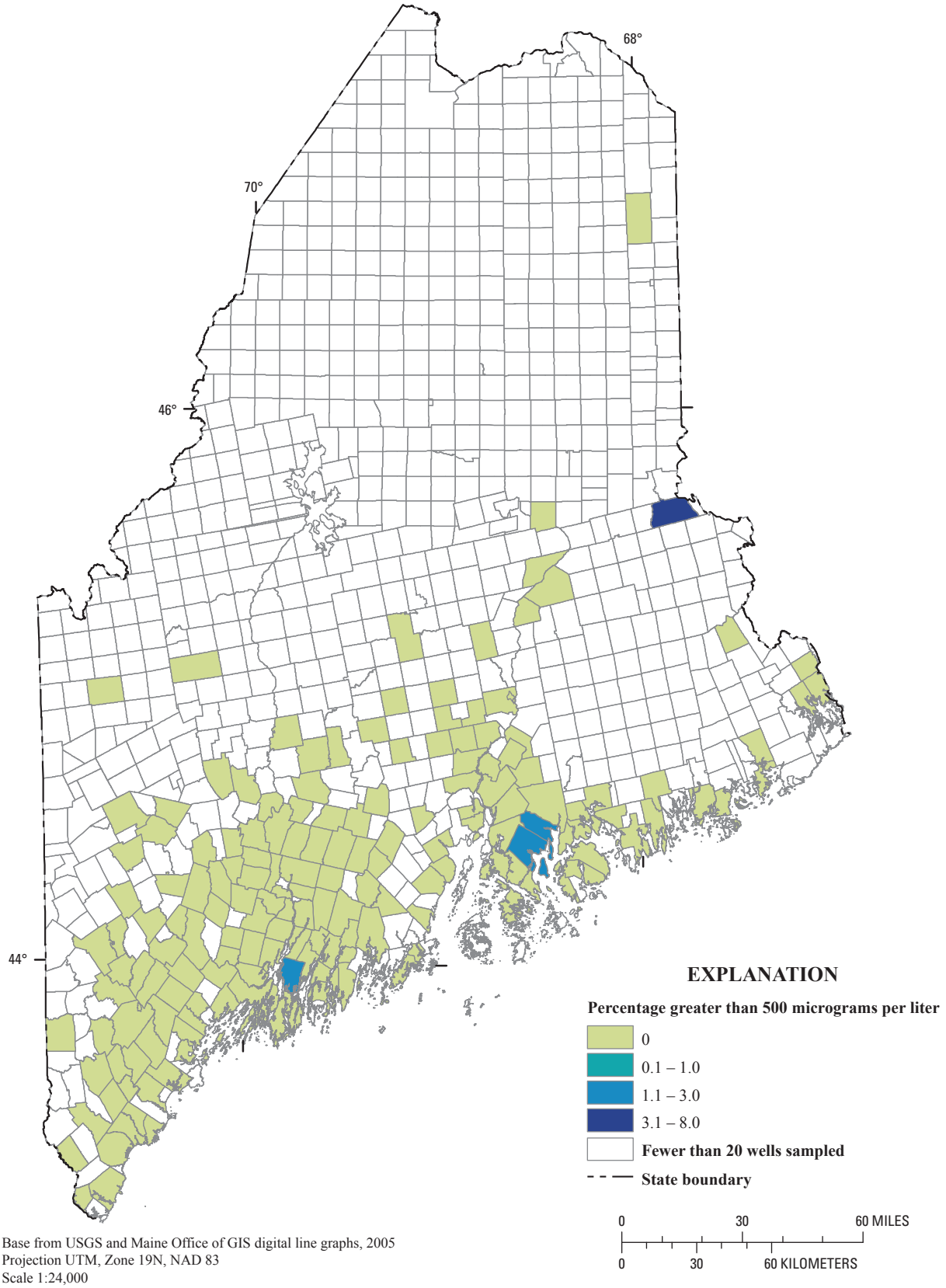

Figure 18. Percentage of wells in each town with arsenic concentrations greater than 500 micrograms per liter, in Maine, 2005–09. Towns shown have 20 or more sampled wells.

Cumulative Arsenic Distributions

Many towns (49) in the study had more than 60 sampled wells recorded in the database, and cumulative distribution plots of arsenic were created for these towns. Cumulative distribution plots show all the samples collected in each town, arranged in order of increasing concentration and normalized to represent 100 percent of the samples, so the horizontal axis ranges from 0 to 1 percentile. In these graphs, samples with arsenic concentrations less than the detection limit of 0.5 µg/L are shown with a concentration of 0.1 µg/L so they stand out on the log-scale vertical axis. The shapes of the cumulative distribution plots can indicate more about the distribution of arsenic in each town than the overall summary statistics. After all 49 cumulative distribution graphs in towns with more than 60 samples were examined, several general patterns emerged as being representative of cumulative arsenic distributions for many towns. These patterns are illustrated in figure 19 and described below as types 1–4.

Type 1. Very low overall arsenic concentrations (less than the detection limit of 0.5 µg/L), were present in more than half the samples from these towns, and none of the samples had concentrations greater than 50 µg/L. The towns of Pittston and Naples represent this type of distribution (fig. 19A–B).

Type 2. Generally low concentrations were present in most samples (but greater than the detection limit); the graphs show an even rise in distribution with few samples greater than 50 µg/L. This was a relatively uncommon distribution because of the heterogeneous nature of rock formations across town boundaries. The towns of Perry and Hermon represent this type (fig. 19C–D).

Type 3. Higher arsenic concentrations overall were present in most samples with few concentrations below the detection limit; an even rise to levels approaching 100 µg/L or more is shown in graphs of this type. The towns of Gorham and Surry represent this pattern (fig. 19E–F).

Type 4. Similar to type 3, high arsenic concentrations were present in most samples with few values less than the detection limit. An even rise in the middle of the distribution and a distinct "tail" at the high end is shown in graphs of this type. The towns of Litchfield and Danforth represent this pattern (fig. 19G–H). This was a common pattern; many towns exhibit some kind of "tail" for a few extra-high concentrations at the upper end.

The likely difference between types 3 and 4 is that, in the towns with an even rise in concentrations (type 4), the arsenic concentrations in the bedrock are likely somewhat evenly distributed, but in towns with a "tail" (type 4) there is probably a pocket or small area in the town with very different geology from that in the rest of the town. The town of Danforth in far eastern Maine is one such town that is known to have a cluster of extremely high (in the thousands of µg/L) concentrations where the bedrock is distinctly different from that in other areas (Robert Marvinney, Maine Geological Survey, written commun., 2008).

Summary and Conclusions

High levels of arsenic in some domestic wells in Maine were recognized in the early 1990s, when the Maine Geological Survey and other State agencies published a report documenting high arsenic levels in domestic wells in the Buxton/Hollis area in southern Maine and the occurrence of high arsenic levels (>50 µg/L) in geologically diverse areas across the State. Other previous studies have shown that elevated arsenic concentrations in Maine appear to be clustered in areas from a few kilometers to tens of kilometers across, and maximum arsenic concentrations in these clusters range from hundreds to thousands of micrograms per liter. It is important to identify the small, extreme-concentration clusters within the State so that public education efforts can ensure that domestic wells are tested, and wells with high concentrations of arsenic are treated.

The database used for this analysis was compiled from the results of water samples submitted for arsenic analysis by homeowners, real estate agents (for clients), and a few State agencies to the Maine Health and Environmental Testing laboratory (HETL) in Augusta. For this database analysis, more than 18,000 records of arsenic in water from 11,111 wells in the State were screened and analyzed. Because of the personally identifiable information contained in the sample set, all screening work on these data was performed within the ME-CDC offices, using ME-CDC computers, according to ME-CDC confidentiality requirements. Once the screening was completed, all personal information was removed. The data screening and coding included (1) removing duplicate samples, (2) determining the minor civil division (town) in which the sample was collected, (3) removing data that probably did not pertain to domestic well-water samples (even though the data passed the initial data screening step), (4) determining which samples in each town probably were either repeat samples from the same well or were unique samples from individual wells, and (5) determining what was known about the filtration (water treatment) of the sample. Once the data were cleaned and sorted, they were reduced to one value per well.

In order to investigate the possibility of a self-selection bias, the rate of well sampling in each town was plotted against the median and maximum arsenic concentrations. Although the data available do not appear to indicate that there is a high degree of self-selection bias in the medians of the town arsenic concentrations or bias from outreach by the ME-CDC, neither do the data rule out the possibility of some degree of bias when compared to a randomly designed sampling of wells in Maine, especially as it pertains to the representativeness of the maximum arsenic concentration in towns that have relatively few samples. Another way to look at the representativeness of samples submitted to the HETL for analysis is to consider the overall number of samples in the dataset. Towns with higher numbers of samples probably have data that better represent the range of conditions

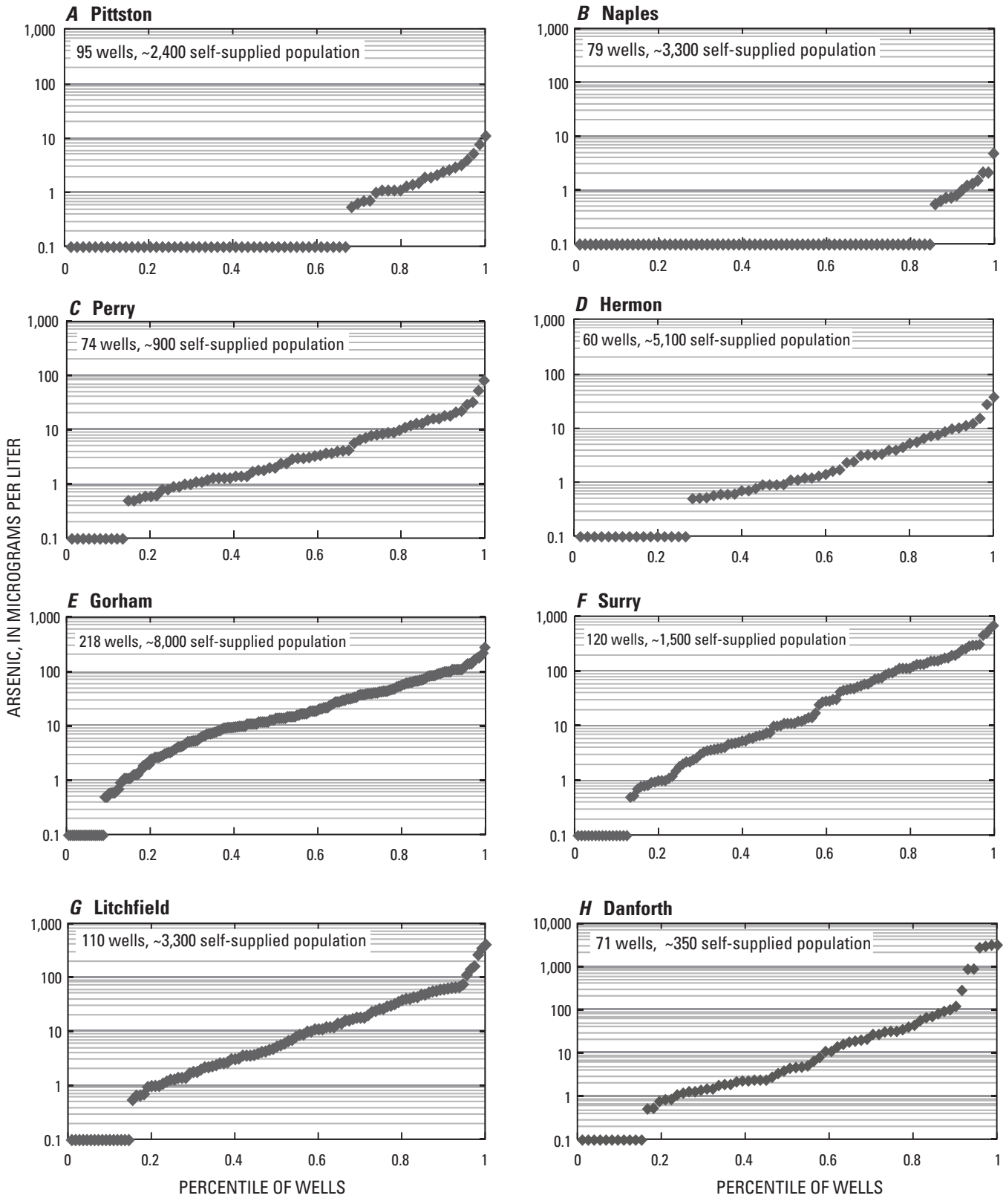

Figure 19. Cumulative distribution plot types 1 *(A–B)*, 2 *(C–D)*, 3 (E–F), and 4 *(G–H)* for arsenic in wells in Maine, 2005–09. Values less than detection limit (< 0.5) plot as 0.1. See text discussion for plot types.

in those towns. Towns with very few samples would need additional testing to better understand the range of arsenic concentrations in homeowner wells.

The goal of using samples that represented "raw" groundwater, or at least groundwater that was not treated to remove arsenic, determined how the available information on water treatment or filtration was utilized, particularly when deciding how to aggregate multiple samples per well to one representative value. (Although 84 percent of the wells had only 1 sample in the database, the remaining 16 percent had from 2 to 6 samples.) There were several options for handling multiple samples at a well: average the values to get a "composite" concentration; take the sample that was collected first, as these were often the highest concentrations used to determine whether a treatment system was necessary (subsequent samples often were collected to test the efficacy of a treatment system); or select one sample (unfiltered if possible) from each well. If all the variations in arsenic concentrations at a well were due only to natural variation, taking the average would result in a representative concentration for that well, but because of the mix of filtered and unfiltered samples (and not knowing necessarily which was which), the more conservative and simple approach was to take the maximum concentration at each well.

Beyond the factors listed above, when using a dataset such as the HETL for scientific studies, ideally, caution should be exercised in the use and interpretation of the data because of the inherent uncertainties in the demographic information and other variables that go along with each sample. The physical address of each sample is often unknown because only 56 percent of the samples had street addresses that match the sample town location. (Most of the rest did not have a street address.) Also, the database does not differentiate between samples collected from different wells on the same property.

Five hundred thirty-one of Maine's 908 minor civil divisions (488 organized municipalities and 420 unorganized territories—all referred to as "towns" in this report) are represented in the dataset. Overall, 18.4 percent of wells had arsenic concentrations greater than 10 µg/L in the entire database, and 4 percent of the sampled wells had concentrations greater than 50 µg/L. These data do not represent a random sample of wells from each town; rather, they provide the best indicator of high concentrations, by town, of any available datasets and are a better indicator of arsenic hot spots than data from randomly designed studies. Sampling density is greatest in areas with known high levels of arsenic. Towns with very low populations and towns with well-recognized arsenic issues have greater sample representation (per capita) in the database than areas with greater populations and less data on arsenic occurrence or few arsenic issues. The 30 highest maximum arsenic concentrations in towns in this dataset range from 200 to 3,100 µg/L, and the 30 highest median arsenic concentrations (by town) range from 5.5 to 22 µg/L. Many of the towns in these two lists could be considered well characterized because samples were obtained from more than 40 wells in these towns. However, there are several towns in the highest groups with samples from fewer than 10 wells, such as the towns of Seboeis Plantation, Atkinson, Passadumkeag, Anson, and Monson. These towns are not heavily populated, but the relatively high concentrations of arsenic in these towns may deserve further investigation.

There appear to be three distinct large-scale areas of high arsenic concentrations—one in south coastal areas, one in central Kennebec County west of Augusta, and one in Ellsworth and surrounding towns—and several smaller clusters of isolated high-arsenic zones. The clusters in the areas around Augusta and Ellsworth, and the cluster in southern coastal Maine, are all well characterized, as the towns in these areas are represented by many samples in the dataset, and arsenic has been well documented in past studies.

In eleven towns, over 40 percent of wells had concentrations over 10 µg/L. Because these towns had from 60 to 218 samples each, these towns could be considered well characterized. Many fewer towns had wells with arsenic concentrations exceeding 50, 100, or 500 µg/L. Only 19 towns had more than 10 percent of wells with concentrations exceeding 50 µg/L, and 44 towns had 1 percent or more exceeding 100 µg/L. Of these, in Surry, Hancock County, 23 percent of the 120 wells tested exceeded 100 µg/L of arsenic, which is a much higher rate than for other towns. Only four towns (Danforth in Washington County, Surry and Blue Hill in Hancock County, and Woolwich in Sagadahoc County) had 1 percent or more of wells with greater than 500 µg/L of arsenic during 2005–09. Earlier testing found other clusters of very high arsenic levels in Northport, the Buxton/Hollis area, and Waldoboro, but those samples were collected before 2005 and did not factor into this analysis.

The spatial distribution of the percentage of wells exceeding 10 µg/L was compared to a previously published logistic-regression model of the probability of finding elevated arsenic in bedrock wells in Maine. In some areas of the State, the model and the data distribution were in agreement, particularly in southern Oxford County/western Cumberland County and in Hancock County near Ellsworth and Blue Hill. However, in other areas the data and the model did not agree. As these data were not collected for the purposes of validating the model, and they use different concentration thresholds, it is difficult to draw specific conclusions from any differences between them.

Acknowledgments

Members of the staff at the ME-CDC were very accommodating during the data screening process. Dr. Andrew Smith, Maine State Toxicologist, and Dr. Christopher Paulu of the ME-CDC collaborated extensively in the treatment of filtered samples and replicates; Dr. Paulu was also instrumental in the data retrieval process. Charles Culbertson and Charles Schalk of the USGS provided data on the quality control/quality assurance aspects of the laboratory analyses.

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Appendix 1. Demographic data for towns in Maine.

[Plt, Plantation; UT, Unincorporated Territory; Twp, Township; NA, not available]

Town or county subdivision	Population[1], 2008	Population per household[2], 2000	Estimated number of households[3], 2008	Precentage of self-supplied households[4], 1990	Estimated number of self-supplied households[5], 2008
Androscoggin County					
Auburn	23,177	2.38	9,753	12.9	1,258
Durham	4,109	2.76	1,489	100	1,489
Greene	4,473	2.73	1,639	97.3	1,594
Leeds	2,135	2.72	785	98.6	774
Lewiston	35,131	2.33	15,050	3.0	451
Lisbon	9,316	2.52	3,702	15.5	573
Livermore	2,204	2.50	881	97.6	859
Livermore Falls	3,134	2.44	1,283	23.5	301
Mechanic Falls	3,231	2.70	1,197	25.9	310
Minot	2,874	2.83	1,015	100	1,015
Poland	5,389	2.64	2,043	97.9	2,000
Sabattus	4,648	2.63	1,769	58.9	1,041
Turner	5,575	2.81	1,982	96.4	1,910
Wales	1,481	2.82	524	88.1	461
Aroostook County					
Allagash	269	1.98	135	97.6	131
Amity	206	2.58	79	100	79
Ashland	1,444	2.34	616	53.1	327
Bancroft	58	2.54	22	100	22
Blaine	795	2.58	308	60.4	186
Bridgewater	578	2.47	234	97.9	229
Caribou	8,093	2.36	3,424	40.6	1,390
Cary Plt	206	2.41	85	100	85
Castle Hill	437	2.49	175	100	175
Caswell	311	2.41	128	97.8	125
Central Aroostook UT (16 townships)	92	2.44	37	100	37
Chapman	491	2.63	186	98.9	183
Connor Twp	403	2.44	165	100	165
Crystal	271	2.54	106	100	106
Cyr Plt	111	2.79	39	87.0	33
Dyer Brook	207	2.52	82	100	82
Eagle Lake	785	2.47	317	49.8	157
Easton	1,185	2.38	497	95.1	472
Fort Fairfield	3,450	2.35	1,468	42.9	629
Fort Kent	4,182	2.44	1,714	51.6	884
Frenchville	1,198	2.56	467	98.5	459
Garfield Plt	82	2.32	35	100	35
Glenwood Plt	1	NA	NA	100	NA
Grand Isle	490	2.38	206	100	206
Hamlin	244	2.50	97	88.0	85
Hammond	94	2.97	31	100	31
Haynesville	121	2.71	44	100	44
Hersey	62	2.25	27	100	27
Hodgdon	1,248	2.68	464	100	464
Houlton	6,144	2.42	2,539	14.1	357
Island Falls	748	2.29	326	53.1	173

Appendix 1. Demographic data for towns in Maine.—Continued

[Plt, Plantation; UT, Unincorporated Territory; Twp, Township; NA, not available]

Town or county subdivision	Population[1], 2008	Population per household[2], 2000	Estimated number of households[3], 2008	Precentage of self-supplied households[4], 1990	Estimated number of self-supplied households[5], 2008
Aroostook County—Continued					
Limestone	2,262	2.95	767	16.9	129
Linneus	878	2.80	313	100	313
Littleton	968	2.57	376	100	376
Ludlow	385	2.68	143	98.9	141
Macwahoc Plt	93	2.33	39	100	39
Madawaska	4,336	2.27	1,905	33.1	630
Mapleton	1,986	2.52	787	93.9	738
Mars Hill	1,429	2.41	592	24.0	142
Masardis	243	2.45	99	100	99
Merrill	242	2.42	100	100	100
Monticello	778	2.43	320	100	320
Moro Plt	60	2.52	23	100	23
Nashville Plt	53	2.50	21	100	21
New Canada	315	2.83	111	100	111
New Limerick	501	2.35	213	100	213
New Sweden	658	2.51	261	92.2	240
Northwest Aroostook UT (70 townships)	28	2.44	11	98.1	10
Oakfield	694	2.31	300	100	300
Orient	136	2.38	57	100	57
Oxbow Plt	53	1.93	27	97.1	26
Perham	410	2.68	153	100	153
Portage Lake	387	2.13	181	100	181
Presque Isle	9,045	2.40	3,768	23.4	881
Reed Plt	197	2.80	70	100	70
Saint Agatha	795	2.29	346	94.7	327
Saint Francis	268	2.44	109	80.3	87
Saint John Plt	1,817	2.56	708	100	708
Sherman	888	2.51	354	100	354
Smyrna	439	2.68	163	54.9	89
South Aroostook UT (12 townships)	465	2.44	190	100	190
Square Lake UT (11 townships)	583	2.44	239	100	239
Stockholm	255	2.44	104	98.6	102
Van Buren	2,479	2.40	1,031	5.8	59
Wade	238	2.58	92	100	92
Wallagrass	567	2.59	219	96.2	210
Washburn	1,576	2.35	670	49.9	334
Westfield	538	2.56	209	94.3	197
Westmanland	67	2.15	31	100	31
Weston	193	2.28	84	100	84
Winterville Plt	186	2.48	74	93.4	69
Woodland	1,447	2.66	544	99.6	541
Cumberland County					
Baldwin	1,401	2.62	535	100	535
Bridgton	5,442	2.54	2,144	61.5	1,318
Brunswick	21,720	2.60	8,360	23.6	1,972
Cape Elizabeth	8,793	2.60	3,382	3.7	125

Appendix 1. Demographic data for towns in Maine.—Continued

[Plt, Plantation; UT, Unincorporated Territory; Twp, Township; NA, not available]

Town or county subdivision	Population[1], 2008	Population per household[2], 2000	Estimated number of households[3], 2008	Precentage of self-supplied households[4], 1990	Estimated number of self-supplied households[5], 2008
Cumberland County—Continued					
Casco	3,777	2.61	1,444	96.0	1,386
Cumberland	7,556	2.81	2,689	52.4	1,409
Falmouth	10,724	2.61	4,106	20.0	821
Freeport	8,195	2.54	3,220	60.3	1,941
Frye Island	1	NA	NA	NA	NA
Gorham	15,563	2.90	5,365	51.7	2,773
Gray	7,541	2.59	2,915	64.7	1,886
Harpswell	5,233	2.24	2,337	97.4	2,276
Harrison	2,414	2.52	959	86.9	833
Long Island	194	2.17	89	NA	NA
Naples	3,659	2.52	1,449	91.8	1,330
New Gloucester	5,461	2.73	2,002	98.9	1,979
North Yarmouth	3,570	2.87	1,243	71.1	883
Portland	62,561	2.16	28,933	1.8	520
Pownal	1,623	2.66	609	100	609
Raymond	4,648	2.66	1,747	99.6	1,740
Scarborough	19,054	2.63	7,255	16.1	1,168
Sebago	1,540	2.45	627	99.5	623
South Portland	23,803	2.32	10,253	0.2	20
Standish	9,895	2.90	3,415	82.3	2,810
Westbrook	16,534	2.35	7,029	2.2	154
Windham	16,715	2.70	6,192	47.0	2,910
Yarmouth	8,097	2.44	3,324	9.6	319
Franklin County					
Avon	483	2.50	193	65.1	125
Carrabassett Valley	470	2.23	210	37.0	77
Carthage	499	2.63	190	100	190
Chesterville	1,259	2.51	502	93.1	467
Coplin Plt	131	2.33	56	35.0	19
Dallas Plt	240	2.27	105	94.2	98
East Central Franklin UT (4 townships)	661	2.50	264	97.4	257
Eustis	749	2.27	330	67.8	223
Farmington	7,545	2.63	2,864	23.3	667
Industry	779	2.58	301	100	301
Jay	4,772	2.47	1,932	32.9	635
Kingfield	1,146	2.43	471	31.9	150
Madrid	NA	2.40	NA	100	NA
New Sharon	1,415	2.50	565	82.5	466
New Vineyard	790	2.60	304	100	304
North Franklin UT (15 townships)	40	2.50	16	54.6	8
Phillips	1,022	2.43	420	59.4	249
Rangeley	1,174	2.25	522	66.9	349
Rangeley Plt	118	2.16	54	86.8	46
Sandy River Plt	89	2.33	38	97.5	37
South Franklin UT (2 townships)	67	2.50	26	100	26

Appendix 1. Demographic data for towns in Maine.—Continued

[Plt, Plantation; UT, Unincorporated Territory; Twp, Township; NA, not available]

Town or county subdivision	Population[1], 2008	Population per household[2], 2000	Estimated number of households[3], 2008	Precentage of self-supplied households[4], 1990	Estimated number of self-supplied households[5], 2008
Franklin County—Continued					
Strong	1,202	2.53	475	51.3	243
Temple	561	2.51	223	82.8	184
Weld	407	2.28	178	98.9	176
West Central Franklin UT (3 townships)	NA	2.50	NA	100	NA
Wilton	4,171	2.47	1,686	38.5	649
Wyman Twp	66	2.50	26	87.4	22
Hancock County					
Amherst	227	2.15	105	98.5	103
Aurora	110	2.42	45	100	45
Bar Harbor	5,129	2.25	2,279	31.7	722
Blue Hill	2,216	2.23	995	94.7	942
Brooklin	777	2.27	342	100	342
Brooksville	842	2.21	380	100	380
Bucksport	4,893	2.40	2,042	58.5	1,194
Castine	1,457	3.61	403	44.7	180
Central Hancock UT (T8 SD)	129	2.37	54	100	54
Cranberry Isles	118	2.13	55	98.7	54
Dedham	1,460	2.52	579	100	579
Deer Isle	1,905	2.40	793	98.2	778
East Hancock UT (13 townships)	68	2.37	28	94.3	26
Eastbrook	353	2.37	148	99.5	147
Ellsworth	7,103	2.34	3,031	50.6	1,533
Franklin	1,444	2.37	610	70.7	431
Frenchboro	41	2.11	19	100	19
Gouldsboro	1,993	2.42	822	99.1	814
Great Pond	49	2.47	19	100	19
Hancock	2,294	2.32	990	96.7	957
Lamoine	1,681	2.47	680	93.4	635
Mariaville	515	2.78	185	99.1	183
Mount Desert	2,163	2.19	986	56.2	554
Northwest Hancock UT (T32 MD)	4	2.37	1	100	1
Orland	1,991	2.43	821	99.3	815
Osborn	64	2.30	27	100	27
Otis	502	2.37	211	100	211
Penobscot	1,308	2.52	518	98.9	512
Sedgwick	1,021	2.34	435	96.6	420
Sorrento	268	2.27	118	58.2	68
Southwest Harbor	1,942	2.19	888	20.1	178
Stonington	1,144	2.29	498	72.6	361
Sullivan	1,241	2.47	502	95.8	480
Surry	1,495	2.47	605	98.7	597
Swans Island	303	2.30	131	97.4	127
Tremont	1,622	2.31	702	95.9	673
Trenton	1,446	2.39	605	96.4	583
Verona	571	2.39	238	100	238

Appendix 1. Demographic data for towns in Maine.—Continued

[Plt, Plantation; UT, Unincorporated Territory; Twp, Township; NA, not available]

Town or county subdivision	Population[1], 2008	Population per household[2], 2000	Estimated number of households[3], 2008	Precentage of self-supplied households[4], 1990	Estimated number of self-supplied households[5], 2008
Hancock County—Continued					
Waltham	284	2.76	103	100	103
Winter Harbor	963	2.46	391	33.4	130
Kennebec County					
Albion	2,155	2.71	796	99.0	788
Augusta	18,282	2.17	8,436	17.4	1,467
Belgrade	3,213	2.53	1,270	96.8	1,229
Benton	2,685	2.52	1,063	68.6	729
Chelsea	2,638	2.67	988	97.7	965
China	4,431	2.65	1,671	96.3	1,609
Clinton	3,315	2.61	1,268	63.2	801
Farmingdale	2,884	2.33	1,236	21.4	264
Fayette	1,178	2.49	472	98.9	466
Gardiner	6,100	2.47	2,470	7.9	195
Hallowell	2,437	2.15	1,131	11.9	134
Litchfield	3,455	2.61	1,322	94.3	1,246
Manchester	2,561	2.52	1,015	67.1	681
Monmouth	3,855	2.64	1,461	78.8	1,151
Mount Vernon	1,667	2.53	659	98.1	646
Oakland	6,184	2.53	2,440	52.4	1,278
Pittston	2,629	2.52	1,042	90.1	938
Randolph	1,855	2.31	804	0.9	7
Readfield	2,570	2.72	944	96.9	914
Rome	1,121	2.54	441	99.4	438
Sidney	4,008	2.67	1,498	96.4	1,444
Unity Twp	30	2.46	12	100	12
Vassalboro	4,481	2.61	1,715	75.5	1,294
Vienna	573	2.46	232	100	232
Waterville	16,016	2.51	6,381	2.6	165
Wayne	1,180	2.39	493	100	493
West Gardiner	2,813	2.60	1,080	98.2	1,060
Windsor	2,369	2.61	909	97.4	885
Winslow	7,845	2.37	3,311	27.6	913
Winthrop	6,429	2.50	2,573	45.5	1,170
Knox County					
Appleton	1,306	2.65	493	99.8	492
Camden	5,220	2.20	2,374	28.0	664
Cushing	1,244	2.44	509	100	509
Friendship	1,194	2.37	503	96.3	484
Hope	1,447	2.55	566	99.6	563
Isle Au Haut	74	2.47	29	75.0	21
Matinicus Isle Plt	47	1.96	23	100	23
North Haven	380	2.35	161	39.9	64
Owls Head	1,632	2.21	736	81.6	600
Rockland	7,436	2.22	3,355	2.8	93
Rockport	3,518	2.34	1,505	41.2	620
Saint George	2,693	2.31	1,168	93.4	1,090

Appendix 1. Demographic data for towns in Maine.—Continued

[Plt, Plantation; UT, Unincorporated Territory; Twp, Township; NA, not available]

Town or county subdivision	Population[1], 2008	Population per household[2], 2000	Estimated number of households[3], 2008	Precentage of self-supplied households[4], 1990	Estimated number of self-supplied households[5], 2008
Knox County—Continued					
South Thomaston	1,536	2.38	644	99.6	641
Thomaston	3,656	2.61	1,400	12.7	177
Union	2,358	2.56	921	86.6	797
Vinalhaven	1,334	2.25	594	51.9	308
Warren	4,217	2.82	1,496	81.3	1,216
Washington	1,392	2.60	536	100	536
Lincoln County					
Alna	678	2.54	267	100	267
Boothbay	3,211	2.35	1,367	63.4	866
Boothbay Harbor	2,251	2.13	1,057	16.2	171
Bremen	809	2.39	338	100	338
Bristol	2,778	2.20	1,263	95.5	1,206
Damariscotta	1,914	2.17	883	49.8	439
Dresden	1,693	2.53	668	99.1	661
Edgecomb	1,271	2.34	543	99.0	537
Jefferson	2,541	2.53	1,005	99.8	1,002
Monhegan Island Plt	70	1.63	42	76.6	32
Newcastle	1,952	2.41	808	78.4	633
Nobleboro	1,657	2.40	690	95.9	661
Somerville	546	2.52	216	100	216
South Bristol	840	2.19	383	100	383
Southport	684	2.07	331	80.5	266
Waldoboro	5,004	2.48	2,018	73.1	1,475
Westport	812	2.34	346	100	346
Whitefield	2,162	2.69	802	100	802
Wiscasset	3,752	2.45	1,532	71.8	1,099
Oxford County					
Andover	914	2.41	379	70.7	267
Bethel	2,659	2.33	1,140	48.7	555
Brownfield	1,468	2.44	600	98.7	592
Buckfield	1,973	2.58	764	67.3	514
Byron	117	2.42	48	100	48
Canton	1,134	2.80	404	64.3	259
Denmark	1,121	2.41	465	99.3	461
Dixfield	2,530	2.49	1,017	39.1	397
Fryeburg	3,335	2.48	1,346	46.6	627
Gilead	179	2.23	80	96.6	77
Greenwood	773	2.51	308	89.0	274
Hanover	328	2.37	138	89.1	122
Hartford	1,065	2.65	402	100	402
Hebron	1,071	2.71	395	82.0	323
Hiram	1,574	2.66	590	94.5	557
Lincoln Plt	45	1.92	23	54.4	12
Lovell	1,040	2.48	419	100	419
Magalloway Plt	36	2.47	14	96.3	13
Mexico	2,866	2.28	1,257	11.2	140

Appendix 1. Demographic data for towns in Maine.—Continued

[Plt, Plantation; UT, Unincorporated Territory; Twp, Township; NA, not available]

Town or county subdivision	Population[1], 2008	Population per household[2], 2000	Estimated number of households[3], 2008	Precentage of self-supplied households[4], 1990	Estimated number of self-supplied households[5], 2008
Oxford County—Continued					
Milton Twp	114	2.45	46	100	46
Newry	389	2.42	160	28.9	46
North Oxford UT (15 townships)	17	2.45	6	66.2	3
Norway	4,762	2.34	2,036	47.7	971
Otisfield	1,692	2.62	645	100	645
Oxford	3,926	2.66	1,474	71.5	1,053
Paris	4,962	2.43	2,044	34.6	707
Peru	1,537	2.59	593	99.8	591
Porter	1,490	2.56	582	69.5	404
Roxbury	373	2.33	160	99.5	159
Rumford	6,310	2.25	2,804	16.7	468
South Oxford UT (3 townships)	496	2.45	202	100	202
Stoneham	276	2.26	122	79.7	97
Stow	371	2.50	148	100	148
Sumner	821	2.59	317	99.3	314
Sweden	370	2.45	150	97.4	146
Upton	61	1.88	32	100	32
Waterford	1,507	2.47	611	100	611
West Paris	1,665	2.67	624	57.7	360
Woodstock	1,374	2.49	551	98.4	542
Penobscot County					
Alton	859	2.64	325	100	325
Argyle Twp	242	2.49	97	100	97
Bangor	31,756	2.30	13,836	4.0	553
Bradford	1,266	2.73	463	98.9	457
Bradley	1,339	2.42	554	32.4	179
Brewer	9,035	2.34	3,862	9.0	347
Burlington	384	2.51	153	100	153
Carmel	2,645	2.59	1,020	98.4	1,003
Carroll Plt	138	2.44	56	100	56
Charleston	1,365	3.24	421	95.2	400
Chester	504	2.61	192	100	192
Clifton	790	2.45	322	98.9	318
Corinna	2,303	2.55	904	96.3	870
Corinth	2,706	2.62	1,033	95.4	985
Dexter	3,687	2.41	1,530	38.6	590
Dixmont	1,043	2.59	402	100	402
Drew Plt	55	3.35	16	100	16
East Central Penobscot UT (3 townships)	312	2.49	125	100	125
East Millinocket	1,723	2.34	735	0.9	6
Eddington	2,231	2.49	896	54.2	485
Edinburg	94	2.23	42	100	42
Enfield	1,541	2.64	583	98.9	576
Etna	971	2.58	376	100	376
Exeter	1,005	2.56	392	98.9	387
Garland	947	2.61	362	100	362

Appendix 1. Demographic data for towns in Maine.—Continued

[Plt, Plantation; UT, Unincorporated Territory; Twp, Township; NA, not available]

Town or county subdivision	Population[1], 2008	Population per household[2], 2000	Estimated number of households[3], 2008	Precentage of self-supplied households[4], 1990	Estimated number of self-supplied households[5], 2008
Penobscot County—Continued					
Glenburn	4,447	2.68	1,659	97.2	1,612
Greenbush	1,411	2.72	518	96.8	501
Hampden	6,914	2.60	2,658	32.4	861
Hermon	5,314	2.66	1,995	95.5	1,905
Holden	2,988	2.45	1,218	74.5	907
Howland	1,326	2.47	537	18.4	98
Hudson	1,440	2.74	525	100	525
Indian Island	545	2.63	207	5.0	10
Kenduskeag	1,228	2.49	492	93.6	460
Kingman Twp	203	2.49	81	100	81
Lagrange	716	2.61	274	98.6	270
Lakeville	60	1.91	31	100	31
Lee	814	2.84	287	100	287
Levant	2,640	2.77	953	98.4	937
Lincoln	5,258	2.48	2,122	43.0	912
Lowell	304	2.43	125	100	125
Mattawamkeag	790	2.44	323	97.1	313
Maxfield	92	2.23	41	100	41
Medway	1,449	2.54	571	91.3	521
Milford	2,980	2.50	1,192	31.8	379
Millinocket	4,902	2.27	2,162	0.9	19
Mount Chase	236	2.38	99	64.1	63
Newburgh	1,503	2.50	600	91.7	550
Newport	3,104	2.38	1,305	42.0	548
North Penobscot UT (32 townships)	426	2.49	170	99.4	168
Old Town	7,709	2.37	3,248	12.5	406
Orono	9,670	3.39	2,855	17.8	508
Orrington	3,694	2.53	1,462	92.5	1,352
Passadumkeag	431	2.56	168	93.9	157
Patten	1,084	2.37	456	57.9	264
Plymouth	1,317	2.68	491	100	491
Prentiss Twp	205	2.48	82	100	82
Seboeis Plt	39	2.41	16	80.3	12
Springfield	371	2.53	146	100	146
Stacyville	385	2.50	154	99.0	152
Stetson	1,073	2.56	418	100	418
Veazie	1,891	2.42	782	6.8	53
Webster Plt	79	3.04	26	100	26
Winn	393	2.47	159	100	159
Woodville	276	2.78	99	100	99
Piscataquis County					
Abbot	596	2.32	257	97.7	251
Atkinson	312	2.45	127	100	127
Beaver Cove	87	1.98	43	74.2	31
Blanchard Twp	78	2.37	32	98.5	31
Bowerbank	148	2.28	64	100	64

Appendix 1. Demographic data for towns in Maine.—Continued

[Plt, Plantation; UT, Unincorporated Territory; Twp, Township; NA, not available]

Town or county subdivision	Population[1], 2008	Population per household[2], 2000	Estimated number of households[3], 2008	Precentage of self-supplied households[4], 1990	Estimated number of self-supplied households[5], 2008
Piscataquis County—Continued					
Brownville	1,289	2.27	568	34.7	197
Dover-Foxcroft	4,220	2.54	1,661	45.8	760
Greenville	1,712	2.22	771	53.7	414
Guilford	1,438	2.35	612	34.8	212
Kingsbury Plt	8	1.50	5	100	5
Lake View Plt	41	1.72	23	100	23
Medford	219	2.63	83	98.3	81
Milo	2,320	2.33	994	21.1	209
Monson	655	2.26	290	69.4	201
Northeast Piscataquis UT (53 townships)	331	2.37	139	97.2	135
Northwest Piscataquis UT (48 townships)	152	2.37	64	60.8	38
Parkman	768	2.61	294	98.7	290
Sangerville	1,192	2.29	519	100	519
Sebec	576	2.46	234	96.6	226
Shirley	202	2.26	89	98.8	87
Southeast Piscataquis UT (Orneville Twp)	239	2.37	100	66.9	66
Wellington	250	2.28	109	100	109
Willimantic	128	2.45	52	89.5	46
Sagadahoc County					
Arrowsic	505	2.43	207	100	207
Bath	8,885	2.29	3,875	5.0	193
Bowdoin	2,969	2.76	1,074	90.4	970
Bowdoinham	2,753	2.54	1,082	71.9	777
Georgetown	1,114	2.31	481	93.8	451
Phippsburg	2,161	2.45	881	96.3	848
Richmond	3,415	2.56	1,335	48.6	648
Topsham	9,827	2.66	3,697	26.3	972
West Bath	1,761	2.40	734	88.7	651
Woolwich	2,941	2.55	1,152	85.9	989
Somerset County					
Anson	2,542	2.51	1,014	34.9	353
Athens	835	2.59	322	98.6	317
Bingham	971	2.35	412	12.0	49
Brighton Plt	85	2.61	32	100	32
Cambridge	526	2.55	206	100	206
Canaan	1,992	2.60	767	100	767
Caratunk	109	2.57	42	94.6	39
Central Somerset UT (2 townships)	329	2.48	132	66.4	87
Cornville	1,340	2.69	498	98.5	490
Dennis -Plt	30	3.00	10	100	10
Detroit	881	2.49	354	97.1	343
Embden	1,000	2.41	414	70.8	293
Fairfield	6,703	2.54	2,637	34.6	912
Harmony	943	2.46	383	97.8	374
Hartland	1,892	2.57	736	54.1	398
Highland Plt	52	2.17	24	100	24

Appendix 1. Demographic data for towns in Maine.—Continued

[Plt, Plantation; UT, Unincorporated Territory; Twp, Township; NA, not available]

Town or county subdivision	Population[1], 2008	Population per household[2], 2000	Estimated number of households[3], 2008	Precentage of self-supplied households[4], 1990	Estimated number of self-supplied households[5], 2008
Somerset County—Continued					
Jackman	706	2.32	304	15.1	45
Madison	4,570	2.39	1,909	42.8	817
Mercer	638	2.53	252	97.5	245
Moose River	215	2.70	79	76.8	60
Moscow	632	2.60	243	48.1	116
New Portland	773	2.39	323	58.2	187
Norridgewock	3,248	2.56	1,267	86.6	1,097
Northeast Somerset UT (21 townships)	349	2.48	140	64.7	90
Northwest Somerset UT (20 townships)	46	2.48	18	57.8	10
Palmyra	2,059	2.54	809	94.3	762
Pittsfield	4,217	2.59	1,628	28.0	455
Pleasant Ridge Plt	82	2.13	38	100	38
Ripley	485	2.48	195	100	195
Saint Albans	549	2.56	214	99.4	212
Seboomook Lake UT (43 townships)	46	2.48	18	8.9	1
Skowhegan	8,679	2.37	3,654	27.4	1,001
Smithfield	926	2.50	370	100	370
Solon	999	2.36	422	100	422
Starks	579	2.58	224	87.8	196
The Forks Plt	35	2.06	17	13.9	2
West Forks Plt	46	2.04	22	100	22
Waldo County					
Belfast	6,721	2.31	2,912	27.6	803
Belmont	893	2.44	365	97.5	355
Brooks	1,002	2.49	401	94.2	377
Burnham	1,118	2.58	432	99.8	431
Frankfort	1,021	2.60	392	100	392
Freedom	630	2.49	252	100	252
Islesboro	653	2.15	303	98.3	297
Jackson	497	2.48	200	100	200
Knox	762	2.64	288	100	288
Liberty	906	2.56	353	100	353
Lincolnville	2,187	2.41	906	96.6	875
Monroe	862	2.48	346	100	346
Montville	978	2.56	381	100	381
Morrill	912	2.59	352	80.2	282
Northport	1,596	2.35	678	70.5	477
Palermo	1,337	2.48	538	99.4	534
Prospect	627	2.54	247	99.2	245
Searsmont	1,361	2.46	554	97.7	541
Searsport	2,584	2.34	1,105	48.1	531
Stockton Springs	1,613	2.36	683	54.1	369
Swanville	1,437	2.60	552	97.7	539
Thorndike	789	2.55	309	93.1	287
Troy	1,058	2.64	401	100	401
Unity	2,120	2.65	800	91.4	731

Appendix 1. Demographic data for towns in Maine.—Continued

[Plt, Plantation; UT, Unincorporated Territory; Twp, Township; NA, not available]

Town or county subdivision	Population[1], 2008	Population per household[2], 2000	Estimated number of households[3], 2008	Precentage of self-supplied households[4], 1990	Estimated number of self-supplied households[5], 2008
Waldo County—Continued					
Waldo	1,151	2.53	455	100	455
Winterport	3,527	2.61	1,350	71.3	962
Washington County					
Addison	1,226	2.47	495	89.4	442
Alexander	523	2.62	199	100	199
Baileyville	1,554	2.32	669	27.3	182
Baring Plt	250	2.42	103	100	103
Beals	606	2.61	232	100	232
Beddington	27	1.81	14	96.0	13
Calais	3,184	2.32	1,372	15.8	216
Centerville	NA	2.17	NA	100	NA
Charlotte	297	2.42	122	100	122
Cherryfield	1,091	2.35	464	100	464
Codyville Plt	18	2.11	8	100	8
Columbia	421	2.42	174	100	174
Columbia Falls	566	2.39	237	85.1	201
Cooper	134	2.59	51	100	51
Crawford	111	2.63	42	100	42
Cutler	670	2.62	255	86.1	219
Danforth	587	2.39	245	60.4	147
Deblois	52	2.45	21	100	21
Dennysville	303	2.28	132	83.3	109
East Central Washington UT (8 townships)	687	2.40	285	100	285
East Machias	1,264	2.40	525	99.2	520
Eastport	1,536	2.19	702	11.0	77
Grand Lake Stream Plt	137	1.97	69	100	69
Harrington	901	2.42	371	64.9	240
Indian Twp Reservation	642	2.91	220	10.8	23
Jonesboro	612	2.31	264	100	264
Jonesport	1,434	2.36	608	97.6	593
Lubec	1,528	2.19	698	23.2	161
Machias	2,134	2.51	851	29.5	251
Machiasport	1,088	2.81	387	99.6	385
Marshfield	497	2.52	197	100	197
Meddybemps	148	2.24	66	100	66
Milbridge	1,309	2.33	561	69.2	388
North Washington UT (27 townships)	508	2.40	211	98.4	207
Northfield	126	2.15	58	100	58
Pembroke	828	2.34	354	100	354
Perry	922	2.56	360	97.2	349
Pleasant Point Indian Reservation	594	2.75	216	4.2	9
Princeton	817	2.41	338	95.1	321
Robbinston	502	2.61	192	98.1	188
Roque Bluffs	280	2.24	125	100	125
Steuben	1,096	2.45	446	100	446
Talmadge	64	2.26	28	100	28

Appendix 1. Demographic data for towns in Maine.—Continued

[Plt, Plantation; UT, Unincorporated Territory; Twp, Township; NA, not available]

Town or county subdivision	Population[1], 2008	Population per household[2], 2000	Estimated number of households[3], 2008	Precentage of self-supplied households[4], 1990	Estimated number of self-supplied households[5], 2008
Washington County—Continued					
Topsfield	206	2.45	84	100	84
Vanceboro	133	2.16	61	92.3	56
Waite	97	2.14	45	100	45
Wesley	104	2.24	46	96.2	44
Whiting	447	2.38	188	100	188
Whitneyville	238	2.50	95	100	95
York County					
Acton	2,259	2.51	900	94.3	848
Alfred	2,858	2.51	1,139	62.2	708
Arundel	4,065	2.62	1,551	90.3	1,400
Berwick	7,542	2.74	2,753	55.9	1,538
Biddeford	21,435	2.42	8,839	5.7	503
Buxton	8,072	2.66	3,037	100	3,037
Cornish	1,385	2.44	568	50.2	285
Dayton	2,016	2.83	712	97.2	692
Eliot	6,304	2.58	2,442	53.6	1,308
Hollis	4,630	2.73	1,696	96.3	1,633
Kennebunk	11,448	2.48	4,621	16.7	771
Kennebunkport	3,984	2.30	1,729	29.5	510
Kittery	10,427	2.34	4,455	10.7	476
Lebanon	5,620	2.79	2,015	90.6	1,825
Limerick	2,578	2.64	978	57.9	566
Limington	3,876	2.98	1,299	100	1,299
Lyman	4,234	2.78	1,524	96.7	1,473
Newfield	1,499	2.68	559	98.6	551
North Berwick	4,832	2.71	1,786	62.1	1,109
Ogunquit	1,263	1.84	688	6.9	47
Old Orchard Beach	9,395	2.06	4,555	3.2	145
Parsonsfield	1,729	2.50	692	69.4	480
Saco	18,125	2.47	7,327	12.9	945
Sanford	21,156	2.52	8,409	16.4	1,379
Shapleigh	2,522	2.55	988	96.8	956
South Berwick	7,156	2.78	2,577	41.8	1,077
Waterboro	7,317	2.81	2,603	82.8	2,155
Wells	9,895	2.35	4,214	35.9	1,512
York	14,064	2.46	5,727	26.2	1,500

[1] U.S. Census Bureau, 2008, Census Bureau annual estimates of population of Maine towns and counties, April 2000–July 2008 Table 5: Annual estimates of the resident population for Minor Civil Divisions in Maine, listed alphabetically within county: April 1, 2000 to July 1, 2008 (SUB-EST2008-05-23). Source: Population Division, U.S. Census Bureau. Release date: July 1, 2009, accessed November 20, 2009, at http://www.maine.gov/spo/economics/docs/townlevel-data/mcdpop2000-08.xls.

[2] U.S. Census Bureau, 2000, Demographic Profiles: 100-percent and sample data, Table DP-1. Profile of general demographic characteristics: 2000. Data accessed from Maine State Planning Office, March 1, 2010, at http://maine.gov/spo/economics/docs/census/prof1_4datame.xls.

[3] Calculated by dividing the population in 2008 by the number of persons per household in 2000.

[4] U.S. Census Bureau, 1990, 1990 Summary tape file 3 (STF-3) sample data, Table DP-5. Housing characteristics: 1990.

[5] Calculated by multiplying the estimated number of households in 2008 by the percentage of self-supplied households in 1990.

Appendix 2. Numbers of samples and wells with samples, by town, in Maine, and minimum, maximum, and median arsenic concentrations in each town with samples in the Maine Health and Environmental Testing Laboratory database, 2005–09.

[Statistics are calculated on wells, not total number of samples. See text for explanation of the treatment of multiple samples per well; µg/L, micrograms per liter; <, less than; Twp, township; Plt, plantation; UT, unincorporated territory]

Town	Number of samples	Number of wells with samples	Town arsenic concentrations		
			Minimum (µg/L)	Maximum (µg/L)	Median (µg/L)
Androscoggin County					
Auburn	49	37	< 0.5	190	3.2
Durham	50	43	< .5	9.0	< .5
Greene	62	43	< .5	110	4.6
Leeds	41	27	< .5	130	2.1
Lewiston	22	19	< .5	94.0	.6
Lisbon	41	38	< .5	16.0	1.5
Livermore	27	20	< .5	4.3	< .5
Livermore Falls	15	12	< .5	12.0	1.1
Mechanic Falls	8	5	< .5	1.0	.6
Minot	36	32	< .5	150	2.3
Poland	78	69	< .5	35.0	.6
Sabattus	68	62	< .5	89.0	2.3
Turner	122	95	< .5	84.0	< .5
Wales	16	15	< .5	130	1.5
Aroostook County					
Allagash	3	3	< 0.5	18.0	5.0
Amity	3	3	< .5	1.7	.7
Ashland	4	4	< .5	< .5	< .5
Benedicta Twp	3	2	< .5	< .5	< .5
Blaine	4	4	< .5	< .5	< .5
Bridgewater	4	3	< .5	< .5	< .5
Caribou	18	15	< .5	3.9	< .5
Cary Plt	4	3	< .5	< .5	< .5
Castle Hill	3	3	< .5	.7	< .5
Caswell	1	1	< .5	< .5	< .5
Connor Twp	2	2	< .5	< .5	< .5
Crystal	5	5	< .5	.8	< .5
Cyr Plt	2	2	< .5	< .5	< .5
Dyer Brook	1	1	22.0	22.0	22.0
Eagle Lake	10	8	< .5	6.6	< .5
Easton	12	12	< .5	3.6	< .5
Fort Fairfield	16	11	< .5	10.0	< .5
Fort Kent	19	17	< .5	5.1	.8
Frenchville	4	3	< .5	6.9	.7
Garfield Plt	2	1	< .5	< .5	< .5
Grand Isle	2	2	< .5	< .5	< .5
Hamlin	6	6	< .5	< .5	< .5
Hammond	1	1	9.1	9.1	9.1
Haynesville	2	1	1.1	1.1	1.1

Appendix 2. Numbers of samples and wells with samples, by town, in Maine, and minimum, maximum, and median arsenic concentrations in each town with samples in the Maine Health and Environmental Testing Laboratory database, 2005–09.—Continued

[Statistics are calculated on wells, not total number of samples. See text for explanation of the treatment of multiple samples per well; µg/L, micrograms per liter; <, less than; Twp, township; Plt, plantation; UT, unincorporated territory]

Town	Number of samples	Number of wells with samples	Town arsenic concentrations		
			Minimum (µg/L)	Maximum (µg/L)	Median (µg/L)
Aroostook County—Continued					
Hersey	5	4	< 0.5	< 0.5	< 0.5
Hodgdon	6	5	< .5	.6	< .5
Houlton	20	18	< .5	5.9	< .5
Island Falls	12	9	< .5	17.0	2.2
Limestone	9	7	< .5	< .5	< .5
Linneus	9	8	< .5	17.0	1.1
Littleton	12	6	< .5	.5	< .5
Ludlow	1	1	< .5	< .5	< .5
Macwahoc Plt	1	1	< .5	< .5	< .5
Madawaska	6	6	< .5	1.0	< .5
Mapleton	13	11	< .5	< .5	< .5
Mars Hill	9	7	< .5	.9	< .5
Masardis	2	2	.5	1.0	.7
Molunkus Twp	1	1	1.7	1.7	1.7
Monticello	3	3	< .5	< .5	< .5
Nashville Plt	1	1	4.3	4.3	4.3
New Canada	1	1	.7	.7	.7
New Limerick	5	5	< .5	22.0	1.2
New Sweden	1	1	1.3	1.3	1.3
Oakfield	8	7	< .5	4.1	< .5
Orient	4	4	< .5	38.0	12.2
Perham	1	1	< .5	< .5	< .5
Portage Lake	5	5	< .5	1.0	< .5
Presque Isle	28	27	< .5	.8	< .5
Reed Plt	1	1	< .5	< .5	< .5
Saint Agatha	3	3	< .5	.7	< .5
Saint Francis	9	7	< .5	5.7	< .5
Saint John Plt	4	2	.7	.7	.7
Sherman	9	8	< .5	.8	< .5
Silver Ridge Twp	1	1	3.0	3.0	3.0
Smyrna	14	11	< .5	1.1	< .5
Squapan Twp	1	1	1.9	1.9	1.9
Stockholm	2	2	< .5	< .5	< .5
T11 R14 WELS	1	1	< .5	< .5	< .5
T17 R4 WELS	1	1	< .5	< .5	< .5
T17 R5 WELS	2	1	.7	.7	.7
Van Buren	9	7	< .5	10.0	.5
Wade	2	2	< .5	< .5	< .5
Wallagrass	14	14	< .5	.7	< .5

Appendix 2. Numbers of samples and wells with samples, by town, in Maine, and minimum, maximum, and median arsenic concentrations in each town with samples in the Maine Health and Environmental Testing Laboratory database, 2005–09.—Continued

[Statistics are calculated on wells, not total number of samples. See text for explanation of the treatment of multiple samples per well; µg/L, micrograms per liter; <, less than; Twp, township; Plt, plantation; UT, unincorporated territory]

Town	Number of samples	Number of wells with samples	Town arsenic concentrations		
			Minimum (µg/L)	Maximum (µg/L)	Median (µg/L)
Aroostook County—Continued					
Washburn	7	5	< 0.5	1.4	< 0.5
Westfield	1	1	< .5	< .5	< .5
Westmanland	1	1	< .5	< .5	< .5
Weston	18	15	< .5	70.0	5.7
Winterville Plt	3	2	< .5	< .5	< .5
Woodland	9	7	< .5	2.7	< .5
Cumberland County					
Baldwin	16	14	< 0.5	20.0	1.5
Bridgton	49	43	< .5	1.5	< .5
Brunswick	108	93	< .5	55.0	.5
Cape Elizabeth	1	1	< .5	< .5	< .5
Casco	52	36	< .5	7.3	< .5
Cumberland	91	84	< .5	87.0	1.0
Falmouth	62	53	< .5	22.0	2.3
Freeport	65	61	< .5	110	.7
Gorham	287	218	< .5	280	14.0
Gray	141	111	< .5	260	3.9
Harpswell	99	87	< .5	16.0	< .5
Harrison	39	29	< .5	2.4	< .5
Long Island	15	14	< .5	36.0	1.9
Naples	104	79	< .5	4.7	< .5
New Gloucester	100	75	< .5	66.0	.9
North Yarmouth	47	44	< .5	25.0	1.6
Portland	23	22	< .5	34.0	< .5
Pownal	19	16	< .5	2.9	< .5
Raymond	63	52	< .5	13.0	< .5
Scarborough	84	61	< .5	220	8.6
Sebago	29	26	< .5	5.1	< .5
South Portland	3	3	< .5	.6	< .5
Standish	149	120	< .5	420	2.5
Westbrook	7	6	< .5	42.0	3.6
Windham	92	81	< .5	150	2.3
Yarmouth	21	17	< .5	39.0	2.9
Franklin County					
Avon	6	6	< 0.5	1.2	0.5
Carrabassett Valley	26	20	< .5	36.0	2.4
Carthage	7	6	< .5	1.3	< .5
Chain of Ponds Twp	1	1	< .5	< .5	< .5
Chesterville	20	16	< .5	10.0	1.3

Appendix 2. Numbers of samples and wells with samples, by town, in Maine, and minimum, maximum, and median arsenic concentrations in each town with samples in the Maine Health and Environmental Testing Laboratory database, 2005–09.—Continued

[Statistics are calculated on wells, not total number of samples. See text for explanation of the treatment of multiple samples per well; µg/L, micrograms per liter; <, less than; Twp, township; Plt, plantation; UT, unincorporated territory]

Town	Number of samples	Number of wells with samples	Town arsenic concentrations		
			Minimum (µg/L)	Maximum (µg/L)	Median (µg/L)
Franklin County—Continued					
Coburn Gore	1	1	< 0.5	< 0.5	< 0.5
Dallas Plt	3	3	< .5	4.8	< .5
Eustis	9	9	< .5	3.7	< .5
Farmington	39	35	< .5	8.3	.6
Freeman Twp	3	3	< .5	.6	< .5
Industry	8	7	< .5	8.0	< .5
Jay	14	13	< .5	11.0	< .5
Kingfield	9	8	.5	11.0	2.4
Madrid Twp	6	4	< .5	13.0	3.7
New Sharon	28	24	< .5	30.0	.5
New Vineyard	16	15	< .5	21.0	.7
Phillips	21	19	< .5	6.9	< .5
Rangeley	49	37	< .5	460	1.0
Rangeley Plt	3	3	< .5	< .5	< .5
Salem Twp	2	2	< .5	< .5	< .5
Sandy River Plt	1	1	.9	.9	.9
Stetsontown Twp	2	2	1.8	1.9	1.9
Strong	10	9	< .5	12.0	.6
Temple	5	5	< .5	.6	< .5
Washington Twp	1	1	< .5	< .5	< .5
Weld	7	7	< .5	.8	< .5
Wilton	20	16	< .5	2.1	< .5
Wyman Twp	2	2	1.0	2.4	1.7
Hancock County					
Amherst	8	8	1.5	9.4	4.9
Bar Harbor	69	57	< .5	180	.7
Blue Hill	107	75	< .5	930	14.0
Brooklin	36	32	< .5	12.0	1.1
Brooksville	45	40	< .5	73.0	.7
Bucksport	42	31	< .5	84.0	2.5
Castine	16	13	< .5	22.0	< .5
Cranberry Isles	12	11	< .5	2.8	1.3
Dedham	45	40	< .5	47.0	3.6
Deer Isle	66	56	< .5	40.0	.9
Eastbrook	9	9	< .5	41.0	1.1
Ellsworth	272	219	< .5	470	4.1
Franklin	36	31	< .5	220	.9
Frenchboro	2	1	3.1	3.1	3.1
Gouldsboro	91	82	< .5	13.0	< .5

Appendix 2. Numbers of samples and wells with samples, by town, in Maine, and minimum, maximum, and median arsenic concentrations in each town with samples in the Maine Health and Environmental Testing Laboratory database, 2005–09.—Continued

[Statistics are calculated on wells, not total number of samples. See text for explanation of the treatment of multiple samples per well; µg/L, micrograms per liter; <, less than; Twp, township; Plt, plantation; UT, unincorporated territory]

Town	Number of samples	Number of wells with samples	Town arsenic concentrations		
			Minimum (µg/L)	Maximum (µg/L)	Median (µg/L)
Hancock County—Continued					
Great Pond	1	1	0.9	0.9	0.9
Hancock	57	45	< .5	76.0	2.0
Lamoine	50	44	< .5	23.0	1.2
Mariaville	20	14	< .5	65.0	7.0
Mount Desert	39	35	< .5	4.0	< .5
Mount Desert	1	1	< .5	< .5	< .5
Orland	46	40	< .5	160	5.2
Osborn	3	3	6.5	30.0	15.0
Otis	18	14	< .5	85.0	12.7
Penobscot	43	31	< .5	230	4.2
Sedgwick	41	33	< .5	470	4.0
Sorrento	11	6	< .5	8.4	1.2
Southwest Harbor	8	8	< .5	1.4	< .5
Stonington	35	21	< .5	3.8	< .5
Sullivan	110	94	< .5	130	1.5
Surry	141	120	< .5	660	11.0
Swans Island	22	18	< .5	5.0	< .5
T10 SD	1	1	< .5	< .5	< .5
T28 MD	1	1	27.0	27.0	27.0
T32 MD	1	1	< .5	< .5	< .5
T40 MD	1	1	1.7	1.7	1.7
Tremont	30	24	< .5	12.0	< .5
Trenton	53	44	< .5	97.0	7.1
Verona	8	8	< .5	40.0	1.5
Waltham	8	6	< .5	58.0	.7
Winter Harbor	11	9	< .5	< .5	< .5
Kennebec County					
Albion	33	24	< 0.5	33.0	2.4
Augusta	183	151	< .5	120	2.6
Belgrade	126	95	< .5	220	6.1
Benton	20	16	< .5	11.0	1.1
Chelsea	84	75	< .5	220	1.2
China	104	80	< .5	65.0	1.8
Clinton	22	14	< .5	81.0	2.4
Farmingdale	41	31	< .5	60.0	3.2
Fayette	57	44	< .5	51.0	2.5
Gardiner	31	28	< .5	67.0	< .5
Hallowell	18	15	.7	120	10.0
Litchfield	156	110	< .5	400	5.5

Appendix 2. Numbers of samples and wells with samples, by town, in Maine, and minimum, maximum, and median arsenic concentrations in each town with samples in the Maine Health and Environmental Testing Laboratory database, 2005–09.—Continued

[Statistics are calculated on wells, not total number of samples. See text for explanation of the treatment of multiple samples per well; µg/L, micrograms per liter; <, less than; Twp, township; Plt, plantation; UT, unincorporated territory]

Town	Number of samples	Number of wells with samples	Town arsenic concentrations		
			Minimum (µg/L)	Maximum (µg/L)	Median (µg/L)
Kennebec County—Continued					
Manchester	175	111	< 0.5	200	15.0
Monmouth	127	111	< .5	300	7.0
Mount Vernon	106	86	< .5	160	4.5
Oakland	95	71	< .5	86.0	3.0
Pittston	113	95	< .5	11.0	< .5
Randolph	8	8	< .5	65.0	2.2
Readfield	179	129	< .5	280	9.7
Rome	24	22	< .5	48.0	5.2
Sidney	190	123	< .5	96.0	3.1
Vassalboro	75	60	< .5	370	6.8
Vienna	22	18	< .5	12.0	.6
Waterville	9	8	< .5	14.0	1.4
Wayne	56	50	< .5	32.0	1.4
West Gardiner	154	123	< .5	80.0	3.0
Windsor	77	67	< .5	40.0	.9
Winslow	26	21	< .5	37.0	.8
Winthrop	173	130	< .5	250	8.8
Knox County					
Appleton	22	18	< 0.5	180	0.6
Camden	31	18	< .5	120	22.0
Cushing	20	15	< .5	13.0	< .5
Friendship	19	17	< .5	15.0	< .5
Hope	22	15	< .5	29.0	1.6
Isle Au Haut	10	7	< .5	30.0	6.9
Matinicus Isle Plt	3	1	57.0	57.0	57.0
North Haven	3	3	< .5	.7	< .5
Owls Head	32	19	< .5	160	2.3
Rockland	4	3	.5	.9	.7
Rockport	35	22	< .5	310	5.3
Saint George	30	27	< .5	1.7	< .5
South Thomaston	28	21	< .5	81.0	1.5
Thomaston	14	10	< .5	93.0	4.9
Union	50	36	< .5	230	2.9
Vinalhaven	12	8	< .5	6.0	.6
Warren	23	19	< .5	65.0	< .5
Washington	40	39	< .5	5.3	< .5
Lincoln County					
Alna	29	24	< 0.5	12.0	< 0.5
Boothbay	61	52	< .5	17.0	< .5

Appendix 2. Numbers of samples and wells with samples, by town, in Maine, and minimum, maximum, and median arsenic concentrations in each town with samples in the Maine Health and Environmental Testing Laboratory database, 2005–09.—Continued

[Statistics are calculated on wells, not total number of samples. See text for explanation of the treatment of multiple samples per well; µg/L, micrograms per liter; <, less than; Twp, township; Plt, plantation; UT, unincorporated territory]

Town	Number of samples	Number of wells with samples	Town arsenic concentrations		
			Minimum (µg/L)	Maximum (µg/L)	Median (µg/L)
Lincoln County—Continued					
Boothbay Harbor	8	7	< 0.5	< 0.5	< 0.5
Bremen	19	15	< .5	6.1	.6
Bristol	52	48	< .5	21.0	< .5
Damariscotta	24	23	< .5	5.4	< .5
Dresden	61	57	< .5	22.0	.6
Edgecomb	36	35	< .5	4.8	< .5
Jefferson	91	76	< .5	53.0	1.0
Monhegan Island Plt	1	1	< .5	< .5	< .5
Newcastle	29	29	< .5	4.0	< .5
Nobleboro	35	30	< .5	11.0	< .5
Somerville	13	11	< .5	7.3	< .5
South Bristol	38	32	< .5	4.6	< .5
Southport	10	10	< .5	2.6	< .5
Waldoboro	37	32	< .5	19.0	1.2
Westport	12	11	< .5	1.1	< .5
Whitefield	117	91	< .5	84.0	< .5
Wiscasset	48	38	< .5	5.0	< .5
Oxford County					
Albany Twp	2	2	< 0.5	< 0.5	< 0.5
Andover	13	10	< .5	1.1	< .5
Bethel	19	19	< .5	2.5	< .5
Brownfield	5	5	< .5	14.0	1.2
Buckfield	47	36	< .5	330	3.2
Byron	3	3	< .5	< .5	< .5
Canton	12	10	< .5	3.7	< .5
Denmark	10	10	< .5	.7	< .5
Dixfield	24	23	< .5	1.4	< .5
Fryeburg	19	16	< .5	.7	< .5
Gilead	9	7	< .5	< .5	< .5
Greenwood	10	10	< .5	15.0	< .5
Hanover	1	1	< .5	< .5	< .5
Hartford	11	11	< .5	9.3	.7
Hebron	8	7	.5	58.0	2.0
Hiram	12	11	< .5	25.0	< .5
Lincoln Plt	2	1	< .5	< .5	< .5
Lovell	18	12	< .5	2.8	< .5
Lower Cupsuptic Twp	1	1	.5	.5	.5
Mason Twp	1	1	< .5	< .5	< .5
Mexico	16	14	< .5	.7	< .5

Appendix 2. Numbers of samples and wells with samples, by town, in Maine, and minimum, maximum, and median arsenic concentrations in each town with samples in the Maine Health and Environmental Testing Laboratory database, 2005–09.—Continued

[Statistics are calculated on wells, not total number of samples. See text for explanation of the treatment of multiple samples per well; µg/L, micrograms per liter; <, less than; Twp, township; Plt, plantation; UT, unincorporated territory]

Town	Number of samples	Number of wells with samples	Town arsenic concentrations		
			Minimum (µg/L)	Maximum (µg/L)	Median (µg/L)
Oxford County—Continued					
Milton Twp	2	1	0.8	0.8	0.8
Newry	14	12	< .5	4.7	< .5
Norway	39	32	< .5	10.0	.5
Otisfield	17	15	< .5	1.1	.6
Oxford	26	24	< .5	2.6	< .5
Paris	17	15	< .5	8.0	.8
Peru	22	20	< .5	25.0	< .5
Porter	14	11	< .5	6.6	.7
Richardsontown Twp	1	1	< .5	< .5	< .5
Roxbury	5	5	< .5	.5	< .5
Rumford	22	20	< .5	26.0	< .5
Stoneham	13	12	< .5	< .5	< .5
Stow	5	5	< .5	1.9	< .5
Sumner	13	11	< .5	8.1	.8
Sweden	7	6	< .5	< .5	< .5
Upton	4	4	< .5	1.1	< .5
Waterford	12	10	< .5	2.0	< .5
West Paris	22	18	< .5	12.0	< .5
Woodstock	27	20	< .5	12.0	< .5
Penobscot County					
Alton	13	10	0.6	11.0	3.7
Argyle Twp	4	4	2.3	14.0	6.2
Bangor	36	32	< .5	34.0	.7
Bradley	17	15	< .5	4.6	< .5
Brewer	15	10	< .5	3.8	1.0
Burlington	5	5	< .5	7.0	1.2
Carmel	29	23	< .5	34.0	.9
Carroll Plt	2	2	< .5	1.1	.6
Charleston	15	12	< .5	14.0	1.0
Chester	34	27	< .5	18.0	1.9
Clifton	9	8	< .5	30.0	2.4
Corinna	23	20	< .5	12.0	3.2
Corinth	60	37	< .5	25.0	.9
Dexter	12	10	< .5	51.0	.8
Dixmont	11	11	< .5	2.4	.9
Drew Plt	1	1	< .5	< .5	< .5
Eddington	27	25	< .5	9.7	.9
Edinburg	4	4	< .5	4.9	1.8
Enfield	27	23	< .5	130	3.8

Appendix 2. Numbers of samples and wells with samples, by town, in Maine, and minimum, maximum, and median arsenic concentrations in each town with samples in the Maine Health and Environmental Testing Laboratory database, 2005–09.—Continued

[Statistics are calculated on wells, not total number of samples. See text for explanation of the treatment of multiple samples per well; µg/L, micrograms per liter; <, less than; Twp, township; Plt, plantation; UT, unincorporated territory]

Town	Number of samples	Number of wells with samples	Town arsenic concentrations		
			Minimum (µg/L)	Maximum (µg/L)	Median (µg/L)
Penobscot County—Continued					
Etna	9	8	< 0.5	12.0	1.0
Exeter	15	13	< .5	6.5	< .5
Garland	13	12	< .5	9.2	< .5
Glenburn	61	50	< .5	30.0	1.1
Greenbush	25	17	< .5	67.0	3.5
Greenfield Twp	3	2	< .5	34.0	17.1
Hampden	50	47	< .5	24.0	.7
Hermon	70	60	< .5	37.0	1.0
Holden	61	55	< .5	19.0	1.4
Howland	8	6	< .5	6.2	2.1
Hudson	17	16	< .5	4.7	.5
Kenduskeag	18	16	< .5	8.6	1.6
Kingman Twp	1	1	< .5	< .5	< .5
Lagrange	32	25	< .5	36.0	.6
Lakeville	1	1	< .5	< .5	< .5
Lee	16	10	< .5	8.7	2.0
Levant	35	31	< .5	76.0	.6
Lincoln	48	40	< .5	22.0	1.4
Lowell	3	2	1.1	24.0	12.6
Mattawamkeag	6	5	< .5	2.7	.6
Maxfield	1	1	4.9	4.9	4.9
Medway	43	34	< .5	11.0	1.4
Milford	22	19	< .5	16.0	1.4
Millinocket	10	9	1.1	62.0	7.1
Mount Chase	4	4	< .5	4.8	2.6
Newburgh	20	19	< .5	7.0	.7
Newport	8	7	< .5	14.0	.6
Old Town	34	28	< .5	65.0	1.1
Orono	23	18	< .5	17.0	2.3
Orrington	35	31	< .5	9.0	< .5
Passadumkeag	9	6	< .5	35.0	12.4
Patten	10	8	< .5	49.0	< .5
Plymouth	47	44	< .5	37.0	.6
Prentiss Twp T7 R3 NBPP	4	2	< .5	.6	< .5
Seboeis Plt	17	9	.7	400	2.2
Springfield	16	9	< .5	2.7	< .5
Stacyville	6	6	< .5	.7	< .5
Stetson	17	15	< .5	39.0	< .5
T6 R8 WELS	1	1	3.0	3.0	3.0

Appendix 2. Numbers of samples and wells with samples, by town, in Maine, and minimum, maximum, and median arsenic concentrations in each town with samples in the Maine Health and Environmental Testing Laboratory database, 2005–09.—Continued

[Statistics are calculated on wells, not total number of samples. See text for explanation of the treatment of multiple samples per well; µg/L, micrograms per liter; <, less than; Twp, township; Plt, plantation; UT, unincorporated territory]

Town	Number of samples	Number of wells with samples	Town arsenic concentrations		
			Minimum (µg/L)	Maximum (µg/L)	Median (µg/L)
Penobscot County—Continued					
Veazie	3	3	< 0.5	2.7	< 0.5
Winn	6	5	< .5	5.7	2.2
Woodville	16	16	< .5	3.3	.7
Piscataquis County					
Abbot	4	4	2.3	12.0	4.4
Atkinson	5	5	< .5	290	.5
Barnard Twp	1	1	< .5	< .5	< .5
Beaver Cove	6	3	.8	84.0	15.0
Big Moose Twp	1	1	< .5	< .5	< .5
Blanchard Twp	5	3	1.0	6.2	5.4
Bowerbank	3	3	< .5	17.0	3.6
Brownville	22	19	< .5	69.0	5.6
Dover-Foxcroft	39	34	< .5	38.0	.9
Elliottsville Twp	5	4	< .5	90.0	< .5
Frenchtown Twp	8	4	.5	35.0	3.8
Greenville	15	14	< .5	26.0	2.0
Guilford	12	6	< .5	43.0	.8
Harfords Point Twp	1	1	6.0	6.0	6.0
Kingsbury Plt	1	1	12.0	12.0	12.0
Lake View Plt	11	10	3.7	18.0	9.6
Medford	4	4	1.6	12.0	4.3
Milo	11	10	< .5	3.4	.6
Monson	12	7	2.2	33.0	9.5
Northeast Carry Twp	1	1	< .5	< .5	< .5
Orneville Twp	7	5	< .5	24.0	4.9
Parkman	9	8	< .5	19.0	1.4
Sangerville	8	7	< .5	3.0	< .5
Sebec	5	4	< .5	3.5	.5
Shirley	3	2	< .5	11.0	5.6
T1 R9 WELS	2	2	< .5	8.9	4.5
T2 R10 WELS	1	1	< .5	< .5	< .5
T2 R13 WELS	1	1	1.0	1.0	1.0
T7 R14 WELS	1	1	2.2	2.2	2.2
T9 R9 WELS	1	1	4.0	4.0	4.0
Williamsburg Twp	1	1	< .5	< .5	< .5
Willimantic	5	4	2.8	33.0	16.9
Sagadahoc County					
Arrowsic	22	20	< 0.5	1.4	< 0.5
Bath	0	19	< .5	27.0	1.7

Appendix 2. Numbers of samples and wells with samples, by town, in Maine, and minimum, maximum, and median arsenic concentrations in each town with samples in the Maine Health and Environmental Testing Laboratory database, 2005–09.—Continued

[Statistics are calculated on wells, not total number of samples. See text for explanation of the treatment of multiple samples per well; µg/L, micrograms per liter; <, less than; Twp, township; Plt, plantation; UT, unincorporated territory]

Town	Number of samples	Number of wells with samples	Town arsenic concentrations		
			Minimum (µg/L)	Maximum (µg/L)	Median (µg/L)
Sagadahoc County—Continued					
Bowdoin	45	39	< 0.5	52.0	0.5
Bowdoinham	39	37	< .5	18.0	< .5
Georgetown	45	40	< .5	14.0	< .5
Phippsburg	78	69	< .5	46.0	.7
Richmond	55	47	< .5	7.9	< .5
Topsham	43	35	< .5	20.0	.7
West Bath	31	26	< .5	14.0	< .5
Woolwich	71	63	< .5	870	< .5
Somerset County					
Anson	8	6	< 0.5	24.0	9.6
Athens	12	11	< .5	42.0	3.0
Attean Twp	1	1	< .5	< .5	< .5
Bingham	6	4	.7	3.5	2.1
Brighton Plt	2	1	.8	.8	.8
Cambridge	5	5	< .5	2.7	1.6
Canaan	48	44	< .5	41.0	1.5
Caratunk	2	2	2.9	12.0	7.5
Carrying Place Twp	1	1	< .5	< .5	< .5
Cornville	12	12	< .5	27.0	3.4
Dennistown Plt	1	1	1.1	1.1	1.1
Detroit	12	12	< .5	28.0	2.2
Embden	19	17	< .5	8.7	1.2
Fairfield	29	24	< .5	42.0	2.1
Harmony	22	11	< .5	45.0	1.9
Hartland	6	5	< .5	11.0	.8
Highland Plt	1	1	.7	.7	.7
Jackman	17	13	< .5	27.0	.8
Lexington Twp	1	1	3.6	3.6	3.6
Long Pond Twp	3	3	1.1	11.0	1.5
Madison	75	65	< .5	44.0	.9
Mercer	8	7	< .5	18.0	< .5
Moose River	3	3	< .5	21.0	< .5
Moscow	4	4	< .5	3.2	1.0
New Portland	20	18	< .5	36.0	5.5
Norridgewock	21	19	< .5	30.0	4.5
Palmyra	25	20	< .5	14.0	1.2
Pittsfield	16	12	< .5	8.3	1.9
Pleasant Ridge Plt	3	2	< .5	.9	.5
Rockwood Strip T1 R1 NBKP	13	12	< .5	19.0	2.1

Appendix 2. Numbers of samples and wells with samples, by town, in Maine, and minimum, maximum, and median arsenic concentrations in each town with samples in the Maine Health and Environmental Testing Laboratory database, 2005–09.—Continued

[Statistics are calculated on wells, not total number of samples. See text for explanation of the treatment of multiple samples per well; µg/L, micrograms per liter; <, less than; Twp, township; Plt, plantation; UT, unincorporated territory]

Town	Number of samples	Number of wells with samples	Town arsenic concentrations		
			Minimum (µg/L)	Maximum (µg/L)	Median (µg/L)
Somerset County—Continued					
Saint Albans	13	11	< 0.5	20.0	1.1
Skowhegan	50	34	< .5	120	3.9
Smithfield	13	10	< .5	110	3.8
Solon	17	14	< .5	33.0	1.5
Starks	3	2	5.5	39.0	22.3
The Forks Plt	2	2	< .5	2.2	1.2
Tomhegan Twp	3	2	1.9	3.0	2.5
Upper Enchanted Twp	1	1	2.1	2.1	2.1
West Forks Plt	3	3	< .5	2.5	2.2
Waldo County					
Belfast	53	42	< 0.5	51.0	1.9
Belmont	11	11	< .5	16.0	3.5
Brooks	43	36	< .5	53.0	< .5
Burnham	8	8	< .5	12.0	1.0
Frankfort	11	9	< .5	11.0	< .5
Freedom	7	6	< .5	.7	< .5
Islesboro	10	7	.7	17.0	4.0
Jackson	12	12	< .5	7.1	< .5
Knox	22	16	< .5	6.2	< .5
Liberty	23	23	< .5	5.5	.6
Lincolnville	40	30	< .5	280	2.7
Monroe	21	17	< .5	5.3	< .5
Montville	32	26	< .5	6.5	< .5
Morrill	12	10	< .5	13.0	1.0
Northport	43	35	< .5	180	7.9
Palermo	35	28	< .5	13.0	< .5
Prospect	36	26	< .5	16.0	1.3
Searsmont	19	17	< .5	31.0	.7
Searsport	19	15	< .5	38.0	.5
Stockton Springs	28	23	< .5	24.0	1.0
Swanville	25	19	< .5	52.0	2.3
Thorndike	14	13	< .5	12.0	.7
Troy	3	2	< .5	.6	< .5
Unity	33	26	< .5	110	1.4
Waldo	18	14	< .5	16.0	.5
Winterport	47	41	< .5	20.0	< .5
Washington County					
Addison	22	21	< 0.5	30.0	1.6
Alexander	7	5	< .5	31.0	1.5

Appendix 2. Numbers of samples and wells with samples, by town, in Maine, and minimum, maximum, and median arsenic concentrations in each town with samples in the Maine Health and Environmental Testing Laboratory database, 2005–09.—Continued

[Statistics are calculated on wells, not total number of samples. See text for explanation of the treatment of multiple samples per well; µg/L, micrograms per liter; <, less than; Twp, township; Plt, plantation; UT, unincorporated territory]

Town	Number of samples	Number of wells with samples	Town arsenic concentrations		
			Minimum (µg/L)	Maximum (µg/L)	Median (µg/L)
Washington County—Continued					
Baileyville	7	7	0.5	17.0	2.4
Baring Plt	15	6	2.3	150	7.9
Beals	3	3	< .5	4.9	1.3
Beddington	2	2	< .5	12.0	6.1
Brookton Twp	3	2	1.0	21.0	11.0
Calais	19	14	< .5	5.7	1.3
Charlotte	4	4	< .5	18.0	3.4
Cherryfield	31	23	< .5	12.0	.9
Columbia	22	17	< .5	200	14.0
Columbia Falls	15	13	< .5	59.0	5.0
Cooper	2	2	2.7	3.0	2.9
Cutler	9	7	< .5	38.0	< .5
Danforth	123	71	< .5	3100	4.5
Deblois	2	1	7.2	7.2	7.2
Dennysville	14	9	< .5	12.0	1.1
East Machias	31	26	< .5	74.0	.9
Eastport	10	9	< .5	24.0	1.2
Edmunds Twp	8	7	< .5	12.0	2.5
Grand Lake Stream Plt	4	4	< .5	3.9	2.2
Harrington	12	9	< .5	3.4	.6
Indian Twp Res	1	1	1.9	1.9	1.9
Jonesboro	18	16	< .5	4.6	.7
Jonesport	35	24	< .5	7.8	1.3
Kossuth Twp	1	1	3.8	3.8	3.8
Lubec	7	7	< .5	2.6	.5
Machias	10	10	< .5	17.0	1.0
Machiasport	31	25	< .5	20.0	1.0
Marion Twp	1	1	2.2	2.2	2.2
Marshfield	16	12	< .5	6.6	1.7
Meddybemps	7	7	< .5	71.0	1.2
Milbridge	19	18	< .5	60.0	1.2
No 14 Twp	4	3	3.6	15.0	3.7
No 21 Twp	1	1	5.2	5.2	5.2
Northfield	12	11	< .5	100	1.3
Pembroke	42	32	< .5	120	3.1
Perry	78	74	< .5	80.0	2.2
Princeton	36	25	< .5	83.0	2.7
Robbinston	65	58	< .5	130	1.2
Roque Bluffs	6	5	< .5	4.9	2.8

Appendix 2. Numbers of samples and wells with samples, by town, in Maine, and minimum, maximum, and median arsenic concentrations in each town with samples in the Maine Health and Environmental Testing Laboratory database, 2005–09.—Continued

[Statistics are calculated on wells, not total number of samples. See text for explanation of the treatment of multiple samples per well; µg/L, micrograms per liter; <, less than; Twp, township; Plt, plantation; UT, unincorporated territory]

Town	Number of samples	Number of wells with samples	Town arsenic concentrations		
			Minimum (µg/L)	Maximum (µg/L)	Median (µg/L)
Washington County—Continued					
Steuben	27	22	< 0.5	3.2	< 0.5
T25 MD BPP	1	1	13.0	13.0	13.0
T31 MD BPP	1	1	< .5	< .5	< .5
Topsfield	5	2	1.0	1.1	1.1
Trescott Twp	7	6	< .5	130	1.1
Vanceboro	2	2	< .5	.9	.5
Wesley	7	7	< .5	170	.7
Whiting	17	16	< .5	3.9	.7
Whitneyville	4	4	< .5	5.2	< .5
York County					
Acton	12	11	< 0.5	2.4	< 0.5
Alfred	17	14	< .5	2.9	< .5
Arundel	43	33	< .5	37.0	4.7
Berwick	29	27	< .5	19.0	1.4
Biddeford	21	18	< .5	410	7.5
Buxton	144	114	< .5	270	5.2
Cornish	12	8	< .5	68.0	4.0
Dayton	34	27	< .5	84.0	1.2
Eliot	55	39	< .5	42.0	6.2
Hollis	65	49	< .5	260	2.1
Kennebunk	23	20	< .5	22.0	< .5
Kennebunkport	21	21	< .5	9.6	1.6
Kittery	15	14	< .5	22.0	2.4
Lebanon	20	19	< .5	7.9	.5
Limerick	18	16	< .5	36.0	1.3
Limington	33	26	< .5	85.0	1.4
Lyman	60	46	< .5	12.0	< .5
Newfield	18	16	< .5	28.0	9.0
North Berwick	15	14	< .5	45.0	5.1
Ogunquit	1	1	2.0	2.0	2.0
Old Orchard Beach	4	4	< .5	.7	< .5
Parsonsfield	27	20	< .5	17.0	1.4
Saco	84	63	< .5	350	3.2
Sanford	24	21	< .5	18.0	< .5
Shapleigh	11	10	< .5	31.0	2.1
South Berwick	17	16	< .5	24.0	1.1
Waterboro	57	35	< .5	51.0	.6
Wells	44	31	< .5	14.0	1.0
York	41	38	< .5	35.0	.6

Appendix 3. Exceedence percentages for towns with more than 20 wells sampled for arsenic, from samples in the Maine Health and Environmental Testing Laboratory database, 2005–09.

[µg/L, micrograms per liter; As, arsenic]

Town	Number of wells sampled	Percentage of wells exceeding 10 µg/L As	Percentage of wells exceeding 50 µg/L As	Percentage of wells exceeding 100 µg/L As	Percentage of wells exceeding 500 µg/L As
Androscoggin County					
Auburn	37	32	3	3	0
Durham	43	0	0	0	0
Greene	43	37	9	2	0
Leeds	27	26	4	4	0
Lisbon	38	11	0	0	0
Livermore	20	0	0	0	0
Minot	32	34	3	3	0
Poland	69	9	0	0	0
Sabattus	62	18	2	0	0
Turner	95	18	2	0	0
Aroostook County					
Presque Isle	27	0	0	0	0
Cumberland County					
Bridgton	43	0	0	0	0
Brunswick	93	9	1	0	0
Casco	36	0	0	0	0
Cumberland	84	8	1	0	0
Falmouth	53	11	0	0	0
Freeport	61	7	2	2	0
Gorham	218	57	22	8	0
Gray	111	27	5	1	0
Harpswell	87	5	0	0	0
Harrison	29	0	0	0	0
Naples	79	0	0	0	0
New Gloucester	75	16	1	0	0
North Yarmouth	44	9	0	0	0
Portland	22	14	0	0	0
Raymond	52	2	0	0	0
Scarborough	61	48	10	3	0
Sebago	26	0	0	0	0
Standish	120	23	8	6	0
Windham	81	19	6	1	0
Franklin County					
Carrabassett Valley	20	25	0	0	0
Farmington	35	0	0	0	0
New Sharon	24	8	0	0	0
Rangeley	37	35	8	5	0
Hancock County					
Bar Harbor	57	18	2	2	0
Blue Hill	75	57	15	11	3

Appendix 3. Exceedence percentages for towns with more than 20 wells sampled for arsenic, from samples in the Maine Health and Environmental Testing Laboratory database, 2005–09.—Continued

[µg/L, micrograms per liter; As, arsenic]

Town	Number of wells sampled	Percentage of wells exceeding 10 µg/L As	Percentage of wells exceeding 50 µg/L As	Percentage of wells exceeding 100 µg/L As	Percentage of wells exceeding 500 µg/L As
Hancock County—Continued					
Brooklin	32	3	0	0	0
Brooksville	40	15	3	0	0
Bucksport	31	10	3	0	0
Dedham	40	28	0	0	0
Deer Isle	56	5	0	0	0
Ellsworth	219	37	11	5	0
Franklin	31	16	3	3	0
Gouldsboro	82	1	0	0	0
Hancock	45	20	2	0	0
Lamoine	44	7	0	0	0
Mount Desert	35	0	0	0	0
Orland	40	35	3	3	0
Penobscot	31	32	6	3	0
Sedgwick	33	33	12	9	0
Stonington	21	0	0	0	0
Sullivan	94	15	2	1	0
Surry	120	51	33	23	2
Tremont	24	8	0	0	0
Trenton	44	39	5	0	0
Kennebec County					
Albion	24	33	0	0	0
Augusta	151	25	5	1	0
Belgrade	95	33	2	1	0
Chelsea	75	3	1	1	0
China	80	14	3	0	0
Farmingdale	31	16	3	0	0
Fayette	44	11	2	0	0
Gardiner	28	4	4	0	0
Litchfield	110	42	15	5	0
Manchester	111	62	19	3	0
Monmouth	111	45	14	6	0
Mount Vernon	86	35	5	1	0
Oakland	71	24	1	0	0
Pittston	95	1	0	0	0
Readfield	129	49	12	3	0
Rome	22	14	0	0	0
Sidney	123	30	6	0	0
Vassalboro	60	35	2	2	0
Wayne	50	8	0	0	0
West Gardiner	123	24	5	0	0

Appendix 3. Exceedence percentages for towns with more than 20 wells sampled for arsenic, from samples in the Maine Health and Environmental Testing Laboratory database, 2005–09.—Continued

[µg/L, micrograms per liter; As, arsenic]

Town	Number of wells sampled	Percentage of wells exceeding 10 µg/L As	Percentage of wells exceeding 50 µg/L As	Percentage of wells exceeding 100 µg/L As	Percentage of wells exceeding 500 µg/L As
Kennebec County—Continued					
Windsor	67	10	0	0	0
Winslow	21	10	0	0	0
Winthrop	130	46	12	2	0
Knox County					
Rockport	22	36	18	9	0
Saint George	27	0	0	0	0
South Thomaston	21	14	5	0	0
Union	36	33	8	3	0
Washington	39	0	0	0	0
Lincoln County					
Alna	24	8	0	0	0
Boothbay	52	4	0	0	0
Bristol	48	4	0	0	0
Damariscotta	23	0	0	0	0
Dresden	57	5	0	0	0
Edgecomb	35	0	0	0	0
Jefferson	76	22	3	0	0
Newcastle	29	0	0	0	0
Nobleboro	30	3	0	0	0
South Bristol	32	0	0	0	0
Waldoboro	32	13	0	0	0
Whitefield	91	8	1	0	0
Wiscasset	38	0	0	0	0
Oxford County					
Buckfield	36	25	3	3	0
Dixfield	23	0	0	0	0
Norway	32	0	0	0	0
Oxford	24	0	0	0	0
Peru	20	10	0	0	0
Rumford	20	5	0	0	0
Woodstock	20	5	0	0	0
Penobscot County					
Bangor	32	9	0	0	0
Carmel	23	13	0	0	0
Chester	27	4	0	0	0
Corinna	20	5	0	0	0
Corinth	37	8	0	0	0
Eddington	25	0	0	0	0
Enfield	23	22	4	4	0
Glenburn	50	12	0	0	0

Appendix 3. Exceedence percentages for towns with more than 20 wells sampled for arsenic, from samples in the Maine Health and Environmental Testing Laboratory database, 2005–09.—Continued

[µg/L, micrograms per liter; As, arsenic]

Town	Number of wells sampled	Percentage of wells exceeding 10 µg/L As	Percentage of wells exceeding 50 µg/L As	Percentage of wells exceeding 100 µg/L As	Percentage of wells exceeding 500 µg/L As
Penobscot County—Continued					
Hampden	47	4	0	0	0
Hermon	60	8	0	0	0
Holden	55	7	0	0	0
Lagrange	25	24	0	0	0
Levant	31	3	3	0	0
Lincoln	40	10	0	0	0
Medway	34	3	0	0	0
Old Town	28	7	4	0	0
Orrington	31	0	0	0	0
Plymouth	44	11	0	0	0
Piscataquis County					
Dover-Foxcroft	34	9	0	0	0
Sagadahoc County					
Arrowsic	20	0	0	0	0
Bowdoin	39	15	3	0	0
Bowdoinham	37	3	0	0	0
Georgetown	40	3	0	0	0
Phippsburg	69	6	0	0	0
Richmond	47	0	0	0	0
Topsham	35	6	0	0	0
West Bath	26	4	0	0	0
Woolwich	63	3	3	3	2
Somerset County					
Canaan	44	16	0	0	0
Fairfield	24	33	0	0	0
Madison	65	12	0	0	0
Palmyra	20	10	0	0	0
Skowhegan	34	32	12	6	0
Waldo County					
Belfast	42	17	2	0	0
Brooks	36	3	3	0	0
Liberty	23	0	0	0	0
Lincolnville	30	27	10	7	0
Montville	26	0	0	0	0
Northport	35	37	14	6	0
Palermo	28	4	0	0	0
Prospect	26	8	0	0	0
Stockton Springs	23	9	0	0	0
Unity	26	19	8	4	0
Winterport	41	2	0	0	0

Appendix 3. Exceedence percentages for towns with more than 20 wells sampled for arsenic, from samples in the Maine Health and Environmental Testing Laboratory database, 2005–09.—Continued

[µg/L, micrograms per liter; As, arsenic]

Town	Number of wells sampled	Percentage of wells exceeding 10 µg/L As	Percentage of wells exceeding 50 µg/L As	Percentage of wells exceeding 100 µg/L As	Percentage of wells exceeding 500 µg/L As
Washington County					
Addison	21	14	0	0	0
Cherryfield	23	4	0	0	0
Danforth	71	42	20	11	8
East Machias	26	12	8	0	0
Jonesport	24	0	0	0	0
Machiasport	25	12	0	0	0
Pembroke	32	28	6	3	0
Perry	74	20	3	0	0
Princeton	25	24	8	0	0
Robbinston	58	9	5	2	0
Steuben	22	0	0	0	0
York County					
Arundel	33	30	0	0	0
Berwick	27	7	0	0	0
Buxton	114	41	11	5	0
Dayton	27	33	11	0	0
Eliot	39	38	0	0	0
Hollis	49	35	16	6	0
Kennebunk	20	10	0	0	0
Kennebunkport	21	0	0	0	0
Limington	26	27	4	0	0
Lyman	46	2	0	0	0
Parsonsfield	20	10	0	0	0
Saco	63	30	10	5	0
Sanford	21	5	0	0	0
Waterboro	35	17	3	0	0
Wells	31	3	0	0	0
York	38	5	0	0	0

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