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# **MONITORING REQUIREMENTS for LEAD AND COPPER RULES**

## **WATER SYSTEMS SERVING 50,001 to 100,000 PERSONS**

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**Monitoring Requirements  
for Lead and Copper Rules**

**Water Systems Serving  
50,001 to 100,000 Persons**

**for**

**Office of Ground Water and Drinking Water  
U.S. Environmental Protection Agency  
Washington, D.C.**

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# Definitions Applicable to the Lead and Copper Rules

## §141.2

- **ACTION LEVEL (AL)** is the concentration of lead or copper in water specified in §141.80(c) which determines, in some cases, the treatment requirements contained in Subpart I of this part that a water system is required to complete.
- **BLDGs** means public or commercial buildings served by the PWS.
- **BLDG > 82** means a public or commercial building constructed after 1982 with copper plumbing using lead-based solder.
- **BLDG < 82** means a public or commercial building constructed before or in 1982 with copper plumbing using lead-based solder.
- **BLDG-LSL** means a public or commercial building served by a lead service line connection.
- **BLDG-Pb** means a public or commercial building which has lead interior plumbing.
- **CORROSION INHIBITOR** means a substance capable of reducing the corrosivity of water toward metal plumbing materials, especially lead and copper, by forming a protective film on the interior surface of those materials.
- **Cu** is the symbol for copper.
- **EFFECTIVE CORROSION INHIBITOR RESIDUAL** means a concentration sufficient to form a passivating film on the interior walls of a pipe.
- **FIRST DRAW SAMPLE** means a one-liter sample of tap water, collected in accordance with §141.86(b)(2), that has been standing in plumbing pipes at least 6 hours and is collected without flushing the tap.
- **LARGE WATER SYSTEM** means a water system that serves more than 50,000 persons.
- **LEAD SERVICE LINE (LSL)** means a service line made of lead which connects the water main to the building inlet and any lead pigtail, gooseneck or other fitting which is connected to such lead line.
- **MAXIMUM CONTAMINANT LEVEL (MCL)** means the maximum permissible level of a contaminant in water which is delivered to any user of a public water system.
- **MEDIUM-SIZE WATER SYSTEM** means a water system that serves greater than 3,300 and less than or equal to 50,000 persons.
- **MFR > 82** is the acronym for a multi-family residence constructed after 1982 with copper plumbing using lead-based solder.
- **MFR < 82** is the acronym for multi-family residences constructed before or in 1982 with copper plumbing using lead-based solder.
- **MFR-LSL** is the acronym for multi-family residences served by a lead service line connection.
- **MFR-Pb** is the acronym for multi-family residences which have lead interior plumbing.

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- **MFRs** is the acronym for multi-family residences.
  - **NRs** is the acronym for non-residential structures constructed as single-family residence.
  - **OPTIMAL CORROSION CONTROL TREATMENT** means the corrosion control treatment that minimizes the lead and copper concentrations at users' taps while insuring that the treatment does not cause the water system to violate any national primary drinking water regulations.
  - **NTNCWSs** is the acronym for Non-Transient, Non-Community Water Supplies
  - **Pb** is the symbol for lead.
  - **Pb/Cu-POE** means lead and copper samples collected at the points of entry to the distribution system representative of each source of supply after treatment.
  - **Pb/Cu-TAP** means lead and copper samples collected as first-draw tap samples from targeted sample sites.
  - **POE** is the acronym for points of entry to the distribution system representative of each source of supply after treatment.
  - **PQL** is the acronym for the Practical Quantitation Level
  - **PWS** is the acronym for a Public Water Supplier
  - **SERVICE LINE SAMPLE** means a one-liter sample of water, collected in accordance with §141.86(b)(3), that has been standing for at least 6 hours in a service line.
  - **SFRs** is the acronym for single family residences, which can include for purposes of identifying targeted sampling locations: (1) Non-Residential structures (NRs); and (2) Multi-Family Residences (MFRs) if they constitute more than 20% of the service connections within the PWS's service area.
  - **SFR > 82** is the acronym for a single-family residence constructed after 1982 with copper plumbing using lead-based solder.
  - **SFR < 82** is the acronym for a single-family residence constructed before or in 1982 with copper plumbing using lead-based solder.
  - **SFR-LSL** is the acronym for a single-family residence served by a lead service line connection.
  - **SFR-Pb** is the acronym for a single-family residence which have lead interior plumbing.
  - **SINGLE FAMILY STRUCTURE** means a building constructed as a single-family residence that is currently used as either a residence or a place of business.
  - **SMALL WATER SYSTEM** means a water system that serves 3,300 persons or fewer.
  - **90%TL** means the 90% lead and/or copper level.
  - **90%TL-POE** means the difference between the 90% lead level for first-draw tap samples collected at targeted sample sites and the highest respective lead level measured at the points of entry to the distribution system.
  - **WQP** means water quality parameters, which include pH, temperature, conductivity, alkalinity, calcium, orthophosphate, and silica.
  - **WQP-POE** means water quality parameters measured at the points of entry to the distribution system representative of each source of supply after treatment.
  - **WQP-DIS** means lead and copper measured at representative locations throughout the distribution system.

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# Monitoring Requirements

The U.S. Environmental Protection Agency promulgated National Primary Drinking Water Regulations (NPDWRs) for lead and copper on June 7, 1991 (56 FR 26460).

Three monitoring protocols are included in the final rule: (1) tap water monitoring for lead and copper; (2) water quality parameter (WQP) monitoring; and (3) source water monitoring for lead and copper. All large water systems must collect tap water samples for lead and copper and WQP samples.

The monitoring requirements for non-transient, non-community water systems (NTNCWS) are essentially the same as those for community water systems (CWS). Please refer to 40 CFR §141.86(a)(6) and (7) for the different targeting requirements for NTNCWSs.

## *Monitoring Protocols*

The tap water monitoring protocol for lead and copper is designed to identify the contributions of different sources of lead and copper corrosion by-products to drinking water. These sources include: lead service lines, lead and copper interior piping, lead solder, and fixtures and faucets. Tap water monitoring for lead and copper allows the water system to determine the lead and copper concentrations in drinking water to which their customers may be exposed, as well as the effectiveness of corrosion control treatment for reducing concentrations of those contaminants in water consumed by the public. Tap water samples for lead and copper are collected biannually. A large system that installs and properly operates optimal corrosion control treatment can collect lead and copper tap water samples annually and ultimately triennially. See pages 4 to 21 for a discussion of lead and copper tap water sampling.

Water quality parameter samples must be collected at each entry point to the distribution system (WQP-POE) and at a set of sites in the distribution system (WQP-DIS) that is representative of water quality throughout the distribution system.

Initially systems must collect samples for pH, alkalinity, calcium, conductivity, water temperature, and, if a corrosion inhibitor is being used, orthophosphate or silica, depending upon the inhibitor in use. After optimal corrosion control treatment has been installed, the WQP samples collected by a PWS depend upon the corrosion control treatment installed by that PWS. A PWS may have to collect samples for pH, alkalinity (if adjusted), calcium (if calcium carbonate stabilization is used) and an inhibitor residual (if inhibitors are used). These samples are used to monitor the effectiveness of corrosion control treatment and determine whether the PWS is operating in compliance with the rule.

Initially WQP samples are collected biannually at each entry point to the distribution system and at representative sites throughout the distribution system. After optimal corrosion control treatment is installed WQP samples are collected biweekly at each entry point to the distribution system and biannually at representative sites in the distribution system. Once a system reduces monitoring, WQP samples are collected biannually, and ultimately, annually at representative sites in the distribution system. A PWS may not reduce the frequency with which it collects WQP samples at entry points to the distribution system. See pages 22 to 28 for a discussion of WQP sampling.

Source water monitoring for lead and copper is only required of a PWS that exceeds the lead or copper action level in tap water samples. The purpose of requiring lead and copper sampling

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at the entry points to the distribution system is to: (1) determine the contribution from source water to total tap water lead and copper levels; (2) assist systems in designing an overall treatment plan for reducing lead and copper levels at the tap; and (3) assist the state in determining whether source water treatment is necessary to minimize lead and copper levels at the tap. Source water samples for lead and copper are collected biannually. A large system that maintains maximum permissible lead and/or copper levels in source water can collect lead and copper source water samples annually, triennially, and ultimately every nine years. See pages 29 to 31 for a discussion of lead and copper source water sampling.

### ***Additional Monitoring Data***

Any system which collects tap water or source water samples for lead, copper or any of the WQPs, in addition to the samples explicitly required in the rule, must report the results to the state by the end of the monitoring period during which the samples are collected.

### ***Demonstrating Optimal Control Treatment with Tap Water and Source Water Samples***

While a large PWS is not required to monitor lead and copper at entry points to the distribution system (Pb/Cu-POE) unless it exceeds an action level, a PWS that wishes to demonstrate that optimal corrosion control treatment has already been installed may do so by demonstrating that the difference between the 90th percentile tap water lead level and the highest source water lead level is less than 0.005 mg/L. To make this demonstration the system must collect tap water samples for lead at the required number of sites (60), and source water samples for lead at each entry point to the distribution system during each of two consecutive six month monitoring periods.

Once a large PWS makes this demonstration, the state will establish values for a set of water quality parameters (WQP-POE and WQP-DIS) for the system. The PWS must continue to operate in accordance with the state-specified WQPs to remain in compliance with the rules.



**Table 1. Timeframe for Large PWS Corrosion Control Submissions to the State**

<b>PWS Action</b>	<b>Deadline</b>	<b>Submission to State</b>
Justification for Insufficient Number of LSL Sites and/or Expansion to Tier II or Tier III Sites in Sample Plan	Jan. 1, 1992	LSL Site and/or Targeting Criteria Sections of Form 141-A
First Six-Month Initial Monitoring Period Results	July 11, 1992	Form 141-A and Monitoring Results: Pb/Cu-TAP; WQP-DIS; WQP-POE; Pb/Cu-POE submitted *
Second Six-Month Initial Monitoring Period Results	Jan. 11, 1993	Form 141-A and Monitoring Results: Pb/Cu-TAP; WQP-DIS; WQP-POE; Pb/Cu-POE submitted *
Corrosion Study and Treatment Recommendations	July 1, 1994	Treatment study report and results as discussed in Volume II
Certification that the State designated treatment has been installed	Jan. 1, 1997	Letter of Certification
First Six-Month Follow-Up Monitoring Period Results	July 11, 1997	Form 141-A and Monitoring Results: Pb/Cu-TAP; WQP-DIS; WQP-POE submitted
Second Six-Month Follow-Up Monitoring Period Results	Jan. 11, 1998	Form 141-A and Monitoring Results: Pb/Cu-TAP; WQP-DIS; WQP-POE submitted
<i>State Specifies Optimal Water Quality Parameters</i>	<i>July 1, 1998</i>	<i>Based on Follow-Up Monitoring Results</i>
First Six-Month Monitoring Period After State Specifies Optimal Water Quality Parameters—Routine Monitoring	Jan. 11, 1999	Form 141-A and Monitoring Results: Pb/Cu-TAP; WQP-DIS; WQP-POE submitted
Second Six-Month Monitoring Period After State Specifies Optimal Water Quality Parameters—Routine Monitoring	July 11, 1999	Form 141-A and Monitoring Results: Pb/Cu-TAP; WQP-DIS; WQP-POE submitted Form 141-B when state-specified WQPs have been maintained for two consecutive six-month monitoring periods
Reduced Monitoring	See Appendix A for Dates	Form 141-A and Monitoring Results: Pb/Cu-TAP; WQP-DIS; WQP-POE submitted Form 141-B when state-specified WQPs have been maintained for three consecutive years
Ultimate Reduced Monitoring	See Appendix A for Dates	Form 141-A and Monitoring Results: Pb/Cu-TAP; WQP-DIS; WQP-POE submitted

- \* Pb/Cu-POE samples are not required unless the action level is exceeded. However, large systems that wish to demonstrate optimization based upon the 90th percentile tap results and the entry point results must sample concurrently with the targeted tap monitoring. Systems that do not wish to demonstrate corrosion control optimization using this mechanism should follow the source water monitoring requirements in Appendix A.

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# Lead and Copper Tap Water Monitoring

§141.86

In establishing the tap water monitoring requirements, EPA sought to ensure that they would be stringent enough to identify water systems with significant lead and copper problems, while insuring that water systems could implement the monitoring protocol in the real world. While the monitoring requirements in this rule are significantly more comprehensive than requirements established for other drinking water contaminants, EPA believes the protocol is justified by the unique nature in which corrosion by-products enter drinking water and the significant risk that lead and copper pose to the public health.

The tap water monitoring requirements are presented in six sections: (1) conducting a materials evaluation; (2) identifying and certifying targeted sampling sites; (3) sample collection methods; (4) number and frequency of monitoring; (5) reduced monitoring; and (6) reporting.

## *Conducting a Materials Evaluation*

All large PWSs must complete a materials evaluation of their distribution system to identify a pool of targeted sampling sites. The purpose of the materials evaluation is to determine the location of lead and copper materials in a distribution system, and in structures served by the system, and to develop a pool of sampling sites from which lead and copper tap water samples can be drawn.

The sampling sites must meet the targeting criteria at 40 CFR §141.86(a)(3), (4), or (5), for community water systems (CWS), and at 40 CFR §141.86(a)(6) or (7), for non-transient, non-community water systems (NTNCWSs). To the extent a PWS has lead service lines, at least 50 percent of sites from which it collects

first draw samples must be served by a lead service line [40 CFR §141.86(a)(9)].

When conducting a materials evaluation, a PWS should review all written records that document the materials used in the construction and maintenance of the distribution system, and the structures connected to the distribution system. The records that a PWS must review according to the regulation, as well as the records EPA recommends a PWS review, are discussed below.

## *Identifying Interior Plumbing Materials*

The following is a list of potential resources which should be investigated to determine the materials used in interior plumbing. The rule requires that the first three sources be investigated if an insufficient number of Tier 1 sites are available.

### *Sources Required by Rule*

- A. *Plumbing Codes*—A review of historical and current local plumbing codes should be conducted to identify the array of interior plumbing materials expected within a PWS service area. Plumbing codes are generally available from either the building or public works department of the appropriate governmental body. In cases where there is multi-jurisdictional control within the PWS service area, an investigation of each jurisdiction's code is necessary. In selecting potential targeted sites for further investigation, it may be assumed that plumbing materials will conform to the code in effect at the time of construction.
- B. *Plumbing Permits*—Plumbing permits should show the type of materials used, location of construction, and the date of

the permit application. In many municipalities, construction permits for new construction and kitchen/bathroom remodeling are issued through the building department. Tracing the historical permits with the plumbing code provisions should indicate locations where copper plumbing with lead solder is likely to be found. The permits may also indicate those residences that have replaced lead- and/or copper-containing materials with other materials such as plastic.

- C. *Existing Water Quality Data*—Water quality data for lead and copper levels in home tap samples and service line samples can be used to indicate problem areas. They may also be used to confirm the presence of lead- and copper-containing materials in areas where insufficient information exists. Site visits and verification checks on individual sites should be performed to confirm the site's characterization.

### *Suggested Sources*

- D. *Historical Documentation of Service Area Development*—The PWS service area may be characterized by the age of various regions. Where detailed information is missing, housing developments within identifiable regions may be assumed to have been constructed using plumbing codes and typical practices of that time.
- E. *Interviews with Plumbers/Building Inspectors*—These personnel, particularly senior personnel and retirees, may have first hand knowledge of materials used for original and remodeled homes. This information can be used to supplement incomplete records or provide basic data for systems lacking records. Local contractors or developers may have reliable information on the construction materials used in sections of the service area.

- F. *Community Survey*—A community survey may be helpful in identifying plumbing materials and LSLs. A utility could perform this survey by mail using a standard questionnaire. Many PWSs have indicated a preference for the use of some form of a community survey to assist in identifying potential targeted sampling sites since these owners or residents may be predisposed to volunteering their participation in later sampling. Selective mailings to new billing units identified since 1982 and/or those residents located in sections of town where LSLs are anticipated (perhaps, organized by zip code area) could reduce the total number of surveys to be distributed as well as the effort's associated costs.

## *Identifying Distribution System and Service Line Materials*

The following is a list of potential resources which should be investigated to determine the materials used in the distribution system. The rule requires that the first two sources (A and B) be investigated if an insufficient number of lead service line sites are available.

### *Sources Required by Rule*

- A. *Utility Records*—Historic and current records maintained by PWSs can provide excellent information on the materials used in the distribution system for service lines and connections.
1. *Information collected on lead and copper as part of the monitoring for corrosivity required under Section 141.42 (d) of the Code of Federal Regulations*—This section refers to previous requirements set by the EPA, that all community water suppliers (1) determine corrosivity characteristics by measuring water quality parameters for corrosion indices, and (2) perform a

materials survey to identify lead, copper, galvanized iron, and asbestos cement as being present in the system.

2. *Distribution Maps and Record Drawings*—Maps and drawings of the distribution system should be a primary source for service line and connection information including materials, line sizes, and dates. Even with a lack of detail such sources may be useful in indicating the historical growth of the system. The maps would also provide a visual aid in developing the materials survey.
3. *Maintenance Records*—Maintenance records often identify such information as (1) existing materials; (2) replacement materials; (3) date of event; and (4) particular site conditions of note. LSLs may be specifically identified when encountered during maintenance activities.
4. *Historical Documentation*—Every utility has its own unique system of collecting and filing information. This documentation should be investigated to determine (1) the progressive growth of the distribution system; (2) dates and materials used for installation and replacement of distribution system components; and, (3) the construction practices throughout the development of the PWS service area.
5. *Meter Installation Records*—Meter installation records could provide information on service line materials and indicate the type and age of construction. Meter size is also an important element as it may be used as the basis for differentiating among structure types, i.e., SFRs, MFRs, and BLDGs.
6. *Existing Water Quality Data*—Water quality data obtained from utility and/or regulatory agency records can indicate areas that exhibit high or unusual lead and copper levels. This information could be used to confirm existing information on

materials or on areas where records are missing or incomplete. This data may also be useful to support justification claims, if necessary, for sample site selections.

7. *Capital Improvements and Master Plans*—Information regarding planned or executed improvements to portions of the distribution system may be provided by existing and/or historical Capital Improvement or Master Plans. In particular, base maps of the system may be available for use in tracking and recording the material survey information.
8. *Standard Operating Procedures (SOPs)*—SOPs will often list the type of materials to be used during the construction and/or repair of distribution system mains, lines, and connections.
9. *Operation & Maintenance Manuals (O&M)*—O&M manuals may also indicate the type of materials installed, the method for replacement as well as replacement materials to be used.
- B. *Permit Files*—Whether maintained by the PWS or other municipal agency, permit files should be reviewed to determine the presence and location of LSLs. Pre-1940 documents are especially important. Recent records should also be reviewed to ascertain service line replacements and/or repairs.

### *Suggested Sources*

- C. *Senior Personnel and Retirees*—PWS personnel or other agency staff experienced in the operation, maintenance, or material usages within the distribution system and/or home plumbing environments should be consulted. These personnel will often have first-hand knowledge regarding these matters which can supplement incomplete records or provide basic data when information is otherwise lacking. Additionally, local contractors or develop-

ers may have reliable information on the materials of construction for sections of the distribution system.

- D. *Community Survey*—A community survey may be helpful in identifying LSL connections. A utility could perform this survey by mail using a standard questionnaire. Many PWSs have indicated a preference for the use of some form of a community survey to assist in identifying potential targeted sampling sites where owners or residents may be predisposed to volunteering their participation. Selective mailings to new billing units identified since 1982 and/or those residents located in sections of town where LSLs are anticipated (perhaps, organized by zip code area) could reduce the total number of surveys to be distributed as well as the effort's associated costs.
- E. *Other Sources*—Any other sources that may be available to the utility that might be helpful in identifying the materials used in the system should be investigated. For example, piping suppliers may be able to fill in or confirm material supplied during a specific time period or to a specific development. Historical USGS maps and aerial photography records may be used to retrace the development of the service area over time. This is very useful in identifying those locations where LSLs are most likely to be found since the use of LSLs in many communities was discontinued after approximately 1940. In some areas, this generalization may not be applicable.

Each PWS should select a method for documenting the information obtained from these various sources. Methods could include: (1) updating information on service connections or billing units; (2) labeling detailed drawings of the distribution system; (3) listing permits for new construction and remodeling by service

areas; and (4) creating large-scale maps of areas with wide use of lead and copper materials or elevated lead and copper levels in tap water.

## *Organizing the Data*

While the rule does not require a PWS to identify all existing materials, EPA recommends that each PWS complete as comprehensive a survey as possible to identify as many sampling sites as possible. Such an evaluation will generate a substantial amount of data which must be organized so the PWS can develop an appropriate sampling pool.

The worksheets provided on pages 56 to 58 can be used by a PWS to organize its data and document the results of the materials evaluation. Worksheet #1 provides a PWS with a format for identifying and listing all possible sampling sites. EPA recommends that a large PWS identify five times the required number of sampling sites to insure it can locate the required number of sites once field verification and confirmation of participation in the monitoring program eliminates inappropriate and unavailable sites. Worksheet #2 provides a PWS with a format for identifying SFRs, MFRs, and BLDGs that contain lead soldered copper plumbing materials, interior lead piping, and are served by a lead service line. Worksheet #3 allows a PWS to summarize data gathered during the materials evaluation and identify the total number of sites meeting Tier 1, Tier 2, Tier 3, and LSL criteria. These worksheets should be used to complete Form 141-A.

EPA recommends that a PWS include more than the minimum number of sample sites in its sample pool to insure that a "sufficiently large" pool of high priority sites is available on an ongoing basis. A PWS should maintain a targeted sampling pool between one and one-half to two times the number of sample sites required during each monitoring period to insure alternative sites are available for repeat sampling. Once monitoring begins, the same

sample sites must be used unless a location has been dropped because it is inaccessible or no longer meets the targeting criteria.

Each PWS should conduct an in-field inspection of those residences identified as possibly meeting the targeting criteria, especially if records are incomplete or contradictory. Physical inspections should include inspection of the service lines to and from the water meter, identification of the piping materials within the plumbing system and scrapings for lead analysis of solder from the outside of joints or connections. Test kits are available to determine the presence of lead in solder materials. In cases where there appears to be mixed service line materials, the PWS should use their best judgement as to whether the predominant material is lead. Lead and copper concentrations in tap or service line samples may be used to assess the materials present and support the judgement of the PWS in service line identification. Meter readers can be trained to perform on-site inspections and sample collections.

## ***Identifying and Certifying Targeted Sampling Sites***

Community water systems (CWSs) must collect lead and copper tap water samples from sites that meet either Tier 1, 2, or 3 targeting criteria.

### **Tier 1:**

- SFRs (which includes any NR structures constructed as a SFR structure, and MFRs if they comprise more than 20% of the PWS service connections) with lead soldered copper pipe installed after 1982, or interior lead piping; or SFRs served by a lead service line.

### **Tier 2:**

- MFRs or BLDGs with lead soldered copper pipe installed after 1982, or interior lead piping; or serviced by a lead service line.

### **Tier 3:**

- SFRs (which includes any NR structures constructed as a SFR structure) with lead soldered copper pipe installed prior to 1983.

Non-transient, non-community water systems (NTNCWSs) must collect lead and copper tap water samples from sites that meet either Tier 1 or 2 targeting criteria.

### **Tier 1:**

- BLDGs with lead soldered copper pipe installed after 1982, or interior lead piping; or BLDGs served by a lead service line.

### **Tier 2:**

- BLDGs with lead soldered copper pipe installed prior to 1983.

The highest priority sites are Tier 1. For CWSs this means single family residences (SFRs) or certain non-residential (NRs) locations which meet the Tier 1 targeting criteria. Non-residential structures are those constructed in similar style and fashion as single-family residences, but used for commercial purposes, such as small insurance agencies, law offices, or boutiques. Multifamily residences (MFRs), including apartments, can be considered Tier 1 sites when such housing constitutes more than 20 percent of the total service connections in the community. For NTNCWS Tier 1 sites are BLDGs with lead soldered copper pipes installed after 1982.

## ***When Tier 1 or Tier 2 Sites Cannot Be Found***

In cases where a sufficient number of Tier 1 sites do not exist or are unavailable, CWSs must complete the sampling pool with Tier 2 sites. In cases where a sufficient number of Tier 1 and Tier 2 sample sites do not exist or are unavailable, CWSs must complete the sampling pool with Tier 3 sites.

In cases where a sufficient number of Tier 1 sites do not exist or are unavailable, NTNCWS must complete the sampling pools with Tier 2 sites.

It is the responsibility of CWSs and NTNCWSs to demonstrate to the state that a sufficient number of high priority sites (Tier 1 sites) do not exist, or are inaccessible, and as a consequence the sample pool must be completed using lower priority sites (Tier 2 or 3 sites). Those systems which supplement their sampling pool with lower priority sites, and collect samples from those sites, must explain why they could not identify a sufficient number of Tier 1 sites before initial monitoring begins on January 1, 1992. Form 141-A on page 52 should be submitted to the state to justify the use of Tier 2 and/or 3 sites.

### *Illegally Installed Lead Plumbing Materials*

The rule does not require PWSs to target sites with illegally installed lead solder (i.e., installed after the effective date of the State or local lead ban). If a system locates a site with illegally installed lead solder, such a site would qualify as Tier 1 since it was installed after 1982. If one of these sites is sampled during a monitoring period, and then found to be in violation of the lead ban, the results must be included for that monitoring period. Systems are not required by the rule to conduct extensive investigations to determine whether buildings built after the effective date of the state or local lead ban contain illegally installed lead solder. Such situations should be rare, and finding these sites would be time consuming and delay implementation of the rule. To initially identify targeted sites, PWSs should identify those SFRs constructed after 1982 and before the effective date of their state's lead ban.

### *When Lead Service Line Sites Cannot Be Found*

Both CWSs and NTNCWSs are required to develop sampling pools with at least 50 percent of the sites served by lead service lines. In cases where a sufficient number of lead service line sites do not exist or are unavailable, the system must explain why it could not identify the necessary number of sites, and submit the information to the state before initial monitoring begins. All such systems must collect first draw tap water samples from all sites identified as being served by a lead service line. For example, if a PWS serving 50,001 to 100,000 people can only confirm 20 specific SFRs served by LSLs willing to participate in the monitoring program, then this system would have to submit to the State the reasons for not having at least 30 LSL sites. While EPA expects PWSs to conduct a thorough review of their distribution system to identify the location of lead service lines, PWSs are not expected to excavate their distribution systems to identify lead service line locations.

### *Prioritizing Sampling Sites*

After completing a review of all written and oral records of materials used to construct and maintain the distribution system (as well as the structures connected to the system) each PWS should make the following decisions in order to identify the highest priority sites in its distribution system:

- *Whether MFRs make up over 20 percent of the total connections served by the PWS, and if so, include them in the definition of a SFR.*
- *Where SFRs served by LSLs are located in the distribution system.*
- *Which SFRs installed copper pipe with lead solder after 1982. Consider the date that the lead ban went into effect in the PWS*

*service area. PWSs may want to bracket their targeted sampling pool by SFRs built after 1982 and before the lead ban implementation date.*

- *Where potential SFRs with lead interior piping are located.*
- *Where any MFRs or BLDGs which installed copper pipe with lead solder after 1982 are located. Consider the date that the lead ban went into effect in the PWS service area. PWSs may want to bracket their targeted sampling pool by MFRs or BLDGs constructed after 1982 and before the lead ban implementation date.*
- *Where any MFRs/BLDGs with lead interior plumbing still in place are located.*
- *Where SFRs built prior to 1983 which have copper pipe with lead solder are located.*

The results of the materials survey can then be used to determine the Sample Pool Category most appropriate for the PWS. The sampling sites are to be selected on the basis of high priority materials; those sites which have the greatest likelihood of experiencing high lead and copper levels. Six possible configurations of a sample pool may result based on the highest to the lowest desirability of the type of sites and the possibility of exceptional cases. The six configurations are labeled as Sample Pool Categories A through F, where Category A is the most desirable configuration of sample sites, Category E is the least desirable configuration, and Category F represents the exceptional cases (see page 12).

### **TIER 1**

#### **Category A**

All sample sites in Category A and B are considered high priority sites to lead and/or copper contamination. They consist of SFRs with lead interior piping or copper pipe with lead solder installed after 1982. For those communities where MFRs make up over 20 percent of the total service connections in the PWS service area, these structures may be

included in the definition of SFRs for purposes of the targeted sample pool. Only one sample point (one unit) per multi-family residence should be selected. Any SFR receiving potable water through a lead service line (LSL) is considered a high priority site and should be included. For those systems with a sufficient number of sites, 50% of their sample pool shall be SFRs with LSLs and the remaining 50% should contain lead interior plumbing or copper pipe with lead solder installed after 1982.

#### **Category B**

If a PWS cannot identify enough SFRs with LSLs to fill 50% of the sample pool, then all of the available LSL sites from SFRs and MFRs meeting Tier 1 criteria should be included in the sample pool. The remainder should consist of SFRs with lead interior plumbing or copper pipe with lead solder installed after 1982.

#### **Category C**

If a PWS cannot identify any SFRs with LSLs but does have a sufficient number of SFRs with lead interior plumbing or copper pipe with lead solder installed after 1982, then the entire sample pool should consist of these sites.

### **TIER 2**

#### **Category D**

If a PWS cannot identify enough SFRs with LSLs to fill 50% of the sample pool, and does not have enough SFRs meeting the criteria in Categories A through C to fill the sample pool, then the MFRs and/or public or commercial buildings (BLDGs) having lead interior pipe, copper pipe with lead solder installed after 1982, and/or LSL connections may be used to supplement the sample pool.

### **TIER 3**

#### **Category E**

If a PWS cannot meet the conditions of the above categories, then it must fill any outstanding requirements with SFRs having copper pipe with lead solder installed prior to 1983.



## EXCEPTIONAL CASES

### Category F-1

PWSs that only have plastic plumbing, but cannot demonstrate that the system is "lead-free" because of the presence of brass faucets should monitor at SFRs with brass faucets.

### Category F-2

PWSs where all available sites have water softeners should select the highest risk sites (SFR > 82, SFR-Pb, SFR-LSL) and monitor at these locations even though the water softener is present.

## Sample Collection Methods

### Tap Water Samples

All lead and copper tap water samples must be collected in accordance with the following criteria:

- *first draw*
- *one-liter volume*
- *standing time at least six hours*
- *CWSs must collect samples from the kitchen or bathroom tap*
- *NTNCWS must collect samples from an interior tap from which water is consumed*

EPA believes a one-liter sample provides the best representation of typical drinking water consumption and a more accurate portrayal of an individual's exposure to lead and copper in drinking water. A one-liter sample represents the concentrations of lead and/or copper throughout the distribution system, and is useful when evaluating the effectiveness of corrosion control. A smaller volume of water would only be representative of a small portion of the household plumbing and would not indicate if corrosion control treatment is effective.

EPA believes the 6-hour standing time requirement is essential because the standing

time of the water in plumbing pipes is one of the most important determinants of lead and copper levels found at the tap and because a significant portion of a person's drinking water consumption comes from standing water. Controlling the standing time of the water in the pipes also is important for reducing the variability in tap water lead levels. Lead levels show a rapid increase within the first few hours of standing in the pipes and then a slower increase as equilibrium solubility is approached.

First-draw samples need not be collected in the morning. The water utility personnel can arrange with the customer to meet them at their home at a pre-arranged time to collect the sample.

First-draw samples may be collected by the water system or the system may allow residents to collect these samples. EPA believes customers can be easily instructed on how to properly collect samples and place them outside for the water utility personnel. This should reduce the potential inconvenience of entering homes. If a PWS chooses to allow homeowners to collect lead and copper samples, statements of permission or agreement to participate in the sampling program should be obtained from the owners of the property being considered. With each sampling event, if residents are collecting the first-draw samples, they will be required to certify that they were informed about sample collection procedures. An example of the instruction sheet with resident certification statement included is provided on page 14. This information should be kept on file, but the PWS need only submit a statement that each tap sample collected by residents was taken after the water system informed them of proper sampling procedures (see Form 141-A on page 52).

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**Figure 1. Preferred Sampling Pool Categories for  
Targeted Sampling Sites**

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**Figure 1. Preferred Sampling Pool Categories for  
Targeted Sampling Sites (Continued)**

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## Suggested Directions for Homeowner Tap Sample Collection Procedures.

These samples are being collected to determine the contribution of faucet fixtures and household pipes and/or solder to the lead and copper levels in tap water. This sampling effort is required by the Environmental Protection Agency, and is being accomplished through the cooperation of homeowners and residents.

A sample is to be collected after an extended period of stagnant water conditions (i.e., no water use during this period) within the interior piping. Due to this requirement, either early mornings or evenings upon returning from work are the best times for collecting samples. The collection procedure is described in more detail below.

1. Prior arrangements will be made with the customer to coordinate the sample collection event. Dates will be set for sample kit delivery and pick-up by water department staff.
2. A minimum of 6-8 hour period during which there is no water use must be achieved prior to sampling. The water department recommends that either early mornings or evenings upon returning home are the best sampling times to ensure that the necessary stagnant water conditions exist.
3. A kitchen or bathroom cold-water faucet is to be used for sampling. Place the sample bottle (open) below the faucet and gently open the cold water tap. Fill the sample bottle to the line marked "1000-mL" and turn off the water.
4. Tightly cap the sample bottle and place in the sample kit provided. Please review the sample kit label at this time to ensure that all information contained on the label is correct.
5. IF ANY PLUMBING REPAIRS OR REPLACEMENT HAS BEEN DONE IN THE HOME SINCE THE PREVIOUS SAMPLING EVENT, NOTE THIS INFORMATION ON THE LABEL AS PROVIDED.
6. Place the sample kit outside of the residence in the location of the kit's delivery in order that department staff may pick up the sample kit.
7. Results from this monitoring effort will be provided to participating customers when reports are generated for the State unless excessive lead and/or copper levels are found. In those cases, immediate notification will be provided (usually 10 working days from the time of sample collection).

Call \_\_\_\_\_ at \_\_\_\_\_ if you have any questions regarding these instructions.

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### TO BE COMPLETED BY RESIDENT

Water was last used: Time \_\_\_\_\_ Date \_\_\_\_\_

Sample was collected: Time \_\_\_\_\_ Date \_\_\_\_\_

I have read the above directions and have taken a tap sample in accordance with these directions.

\_\_\_\_\_  
Signature Date \_\_\_\_\_

The procedure for collecting samples is simple. A clean, plastic, one-liter sample bottle should be placed below the spout of the cold water tap in the kitchen (or bathroom). The cold water tap should be turned on gently to maintain low flow conditions during the sample collection. It should take approximately 45 seconds to fill the bottle. The sample bottle should be filled to the one-liter level marked on the container, and then capped. To avoid problems of residents handling nitric acid, acidification of first draw samples may be done by laboratory personnel up to 14 days after the sample is collected. Neither the homeowners nor the sample collectors should handle nitric acid used for sample acidification. For those systems that do not use disposable sample bottles, care must be taken to assure that the glassware used in each of the sample handling steps is free of trace amounts of lead and copper since it can introduce a significant degree of analytic error. To reduce errors, especially in cases where very low lead concentrations are expected, acid soak all appropriate glassware for 2 hours prior to use. The recommended acid-soaking procedure is one part nitric acid, two parts hydrochloric acid, and nine parts good quality laboratory water, such as deionized water.

EPA understands the concern with ensuring that customers have properly collected the samples, but anticipates that customers willing to participate will collect the samples correctly when given proper instruction. EPA believes most consumers are concerned with tap water lead and copper levels to which they may be exposed and, consequently, will want to participate. Systems allowing residents to collect samples may not challenge the accuracy of the sampling results in any subsequent administrative or civil enforcement proceedings or citizen suit on the grounds that errors were committed by the customer during sampling.

Each PWS must collect first-draw samples for lead and copper from the same sampling site from which it collected all previous samples. If the system cannot gain entry to a sampling site to collect a follow-up tap sample, the system may collect the follow-up sample from another sampling site. When reporting these samples the system must explain why the site has been changed and why the new site was selected. The new site must meet the same targeting criteria and be within reasonable proximity of the original sampling site.

The lead and copper action levels are based on total lead and copper. Metals can be present in several forms in a sample of water: soluble, particulate, or as a dissolved constituent but adsorbed onto a particle. The analyses for total metals include steps which make each form of the metal available for measurement. This is accomplished by first acidifying the sample to approximately a pH 2 through the addition of nitric acid (see third footnote of Table 5). Particulate lead and copper dissolve and enter solution under these low pH conditions. The sample is then subjected to a digestion step which applies elevated temperatures and agitation to further dissolve particulate and adsorbed lead and copper and to concentrate their presence in a smaller volume of sample for analysis. Digestion is required.

PWSs finding unusually high lead or copper levels in any samples should consider performing filtered lead and copper analyses in the future in addition to the total analyses. Sample collection can cause particulates to be sheared from the pipe walls causing sporadic spikes in lead and copper levels found in the monitoring program. Results from recent corrosion control studies have confirmed that lead solder can become 'flaky' and release particulates into first-draw tap samples (Neukrug, 1991). Identifying elevated metal levels as particulates may assist PWSs and States in targeting appropriate actions and assessing treatment performance. Filtered

**Table 2. Sample Handling Requirements for Lead,  
Copper, and Water Quality Parameters**

Contaminant or Parameters	Preservative	Container <sup>1</sup>	Maximum Holding Time <sup>2</sup>
Lead	Conc. HNO <sub>3</sub> to pH < 2 <sup>3</sup>	P or G	6 months
Copper	Conc. HNO <sub>3</sub> to pH < 2 <sup>3</sup>	P or G	6 months
pH	None	P or G	Test Immediately <sup>4</sup>
Conductivity	Cool, 4°C	P or G	28 days
Calcium	Conc. HNO <sub>3</sub> to pH < 2 <sup>5</sup>	P or G	6 months
Alkalinity	Cool, 4°C	P or G	14 days
Orthophosphate	Cool, 4°C	P or G	48 hours
Silica	Cool, 4°C	P only	28 days
Temperature	None	P or G	Test Immediately <sup>4</sup>

<sup>1</sup> P = Plastic, hard or soft; G = Glass, hard or soft.

<sup>2</sup> In all cases, samples should be analyzed as soon after collection as possible.

<sup>3</sup> If HNO<sub>3</sub> cannot be used because of shipping restrictions or is not used because homeowners are collecting samples, the sample for analysis can be shipped to a laboratory where it must be acidified (generally to pH < 2) with concentrated HNO<sub>3</sub> as soon as possible but not later than 14 days after sample collection. Sample must stand in the original container used for sampling for at least 28 hours after acidification. Laboratories should match the acid matrix of their samples, quality control, and calibration standards for accurate results. The latter two sets of solutions will have the same, fixed concentration of acid. It is recommended that good laboratory practice would be to determine by prior tests the amount of acid necessary to achieve some pH < 2, and make it consistent with the standards used. For instance, for most waters, the previous EPA recommendation of 0.15% v/v of HNO<sub>3</sub> will result in a pH < 2. Therefore, all samples can be automatically preserved with 1.5 mL of the acid, and all standards can be made with the same acid concentration. In some extreme, high-alkalinity cases, more acid may be necessary.

<sup>4</sup> "Test Immediately" generally means within 15 minutes of sample collection. In the case of pH, the sample should be measured as soon as the sample is taken and should be measured under closes system conditions, particularly if the water is poorly buffered.

<sup>5</sup> If HNO<sub>3</sub> cannot be used because of shipping restrictions or safety concerns for sampling personnel, the sample for analysis may be initially preserved by icing and immediately shipping it to the laboratory. Upon receipt in the laboratory, the sample must be acidified with concentrated HNO<sub>3</sub> to pH < 2.

metal analysis requires the use of special procedures. [References for dissolved metal analysis are: Schock and Gardels, 1983, *JAWWA*, 75(2):87; Harrison, R.M. & P.H. Laxen, 1980, *Nature* (August 21):791-793; deMora, S.J. et al., 1987, *Water Res.* 21(1):83-94; Brach, R.A., et al., 1991, *Proc. AWWA Annual Conf.* (Philadelphia); Hulsmann, A.D., 1990, *IWEM* (Feb.):19-25.] Split-sampling must be used to generate filtered and total metal analyses. Regardless of the filtered analysis results, the total metal content measured must be reported to the State.

### *Lead Service Line Samples*

A one-liter sample representing water from the service line which has been standing for at least six hours may be collected by those systems required to implement a LSL replacement program. In cases where LSLs are sampled, LSLs which do not exceed the lead AL need not be replaced. Three methods are available for collecting LSL samples: (1) flushing a specified volume from the kitchen tap; (2) direct sampling of the service line; and, (3) flushing the kitchen tap until a change in temperature is noted. Acidification of the sample should be completed by the laboratory personnel upon receipt of the sample, but in no case later than 14 days after sample collection. Neither the homeowners nor the sample collector should handle the nitric acid used for sample acidification.

#### *Flushing a Specified Volume*

After completing a field inspection of the site, the length and diameter of piping from the kitchen tap to the service connection and the length and diameter of the service connection itself should be estimated. Flushing the estimated volume is necessary to receive service connection water at the kitchen tap. Open the tap and flush the estimated volume into a graduated beaker or cylinder, then close the tap. Collect a one-liter sample from the sampling tap by filling the sample bottle to the one-liter mark, then cap immediately. EPA believes that

utility personnel should collect samples when using this approach due to the potential difficulties in accurately estimating the volume necessary to collect the LSL sample.

### *Direct Service Line Samples*

If the LSL is accessible, or can be made accessible, a tap could be installed directly into the line for sample collection purposes. The sample tap should be constructed of all lead-free materials, definitely avoiding brass. A copper or plastic fitting with plastic piping to the tap would be lead-free.

The installation of a tap directly into the LSL could disturb the pipe conditions and induce additional corrosion activity by destroying established, protective layers or by introducing galvanic reactions. The expense of installing taps into service lines could make this option infeasible. It would make little sense to dig up service lines to install a sample tap, when the line itself may need to be replaced due to the results of the sampling effort. This option is not recommended unless existing taps to the service line are in place.

Where a tap is installed, the line should be flushed for several hours to ensure that any debris caused by installation is removed so as to not effect sampling results. After flushing, the water must stand in contact with the LSL for at least six hours before sampling. In those communities where the meters are located outside the buildings (or unmetered areas) taps may already exist on the service lines. When samples are to be collected, the water should be run initially to flush the pipe connecting the faucet and the service line. That is, the faucet may be located some distance from the service line and connected by a length of pipe which should be flushed prior to collecting the LSL sample. For example, exterior faucets often tap directly into the service line, but a short distance of piping connects the faucet to the service line.

**Table 3. Pipe Volume Table (Volumes Listed in Liters)**

Pipe Length (Feet)	Pipe Diameter (In.)					
	3/8	1/2	5/8	3/4	1	1-1/4
2	.06	.09	.14	.19	.32	.50
3	.09	.14	.21	.29	.49	.74
4	.11	.18	.27	.38	.65	.99
5	.14	.23	.34	.48	.81	1.24
6	.17	.27	.41	.57	.97	1.48
7	.20	.32	.48	.67	1.14	1.73
8	.23	.36	.55	.76	1.30	1.98
9	.26	.41	.62	.86	1.46	2.22
10	.28	.45	.69	.95	1.62	2.47
11	.31	.50	.75	1.05	1.78	2.72
12	.34	.55	.82	1.14	1.95	2.96
13	.37	.59	.89	1.24	2.11	3.21
14	.40	.64	.96	1.33	2.26	3.46
15	.43	.68	1.03	1.43	2.43	3.71
16	.46	.73	1.10	1.52	2.60	3.95
17	.49	.78	1.16	1.62	2.76	4.20
18	.51	.82	1.23	1.71	2.92	4.45
19	.54	.86	1.30	1.81	3.08	4.70
20	.57	.91	1.37	1.90	3.24	4.94
25	.71	1.14	1.71	2.38	4.06	6.18
30	.86	1.36	2.06	2.85	4.87	7.41
35	1.00	1.59	2.40	3.33	5.68	8.65
40	1.14	1.82	2.74	3.80	6.49	9.88
60	1.43	2.27	3.43	4.76	8.11	12.36
Notes: 1. Volumes can be added together for pipe lengths not listed. 2. Liters can be converted to gallons by dividing by 3.785.						



### *Temperature Variation*

This method for collecting a LSL sample is recommended for those cases when a clear delineation in LSL and interior piping temperatures can be discerned. During winter months, water held in the interior plumbing of a heated home will be significantly warmer than the water standing in a service line. There are, however, some locations where this method should not be relied upon for LSL sampling. In temperate climates the difference in water temperatures may not be distinguishable. Homes with a crawl space instead of a basement may have colder water in the crawl space than in the interior plumbing. For temperature variation sampling, the sample collector should gently open the kitchen tap and run the water at a normal flowrate, keeping a hand/finger under the flowing water. When a change in water temperature is detected, a one-liter sample should be collected by filling the sample bottle to the appropriate level and capping.

### *Data Analysis and Interpretation*

The concentration of lead and copper in consumers' tap water exhibits a log-normal distribution. The interpretation of the monitoring results must consider the skewed nature of typical results. If a frequency distribution of lead and copper levels found from tap monitoring were to be developed, most systems would find a large number of samples with low concentrations. Some systems might find that they also experience extremely high concentrations of lead, but only at a limited number of sites and the behavior of the high lead levels is inconsistent. The nature of lead and copper monitoring results does not lend itself to the typical data analyses used by utilities. Consequently, the average concentration is not a very useful measurement of the behavior of lead and copper levels experienced in the

distribution system because it can be overly influenced by a large number of low concentrations and a few extremely high concentrations. For this reason, distribution frequency or the percent of samples below or above a specified value proves most useful in analyzing lead and copper data. This is the basis for the ALs being based on a certain frequency of samples which have lead and copper levels less than 0.015 mg/L and 1.3 mg/L, respectively.

Action levels are exceeded if the "90th percentile" value is greater than 0.015 mg/L for lead and 1.3 mg/L for copper. To determine whether the monitoring results meet the action levels stipulated for lead and copper, list the collected data from the highest value recorded to the lowest value recorded. The 90th percentile values for lead and copper can be determined by multiplying the number of samples taken by 0.9. This number is the position of the 90th percentile value. Starting from the bottom (lowest value) count up until the calculated number ( $0.9 \times \# \text{ samples}$ ) is reached. The sample value in this number position is the 90th percentile value. The 90th percentile values for lead and copper can be determined by moving down the listed values the number of positions indicated in Table 4 for each water system size.

Interpolation of lead and copper levels may be necessary in some cases to determine system performance at the desired frequency. If the 90th percentile value is represented by a sample position other than an integer, (e.g.  $0.9 \times \# \text{ samples} = 17.3$ ), then the 90th percentile value must be found by interpolating the results of the lower and higher samples (e.g., the 17th and 18th results in this case). The rounding convention to be used when interpolating between two analytical results is as follows: all results greater than or equal to 0.5 units round to the next unit, and results less than 0.5 units round down.

**Table 4. Determination of 90th Percentile Values  
for Lead and Copper Monitoring Results**

System Size	Minimum No. Samples Required		90% Value Position from Bottom of List	
	Initial, Follow-Up, and Routine Monitoring	Reduced Monitoring	Initial, Follow-Up, and Routine Monitoring	Reduced Monitoring
50,001 to 100,000	60	30	54	27

## *Number and Frequency of Sampling*

### *Initial Monitoring*

Initial monitoring for large PWSs begins January 1, 1992 and ends on January 1, 1993. Initial monitoring consists of two consecutive six-month monitoring periods. During each monitoring period each large PWS must collect at least 60 tap samples for lead and copper (Pb/Cu-TAP) at targeted sampling sites. A large PWS will also collect WQP samples at representative sites in the distribution system and at each entry point. After completing initial monitoring (January 1, 1992 to January 1, 1993) all large PWSs will conduct corrosion control treatment studies (January 1, 1993 to July 1, 1994). See page 35.

### *Follow-Up Monitoring*

Follow-up monitoring for large water systems begins on January 1, 1997 and ends on January 1, 1998. Follow-up monitoring consists of two consecutive six-month monitoring periods. During each monitoring period a large water system must collect at least 60 tap samples for lead and copper (Pb/Cu-TAP) at targeted sampling sites. A large water system will also

collect WQP samples at representative sites in the distribution system and at each entry point.

### *Routine Monitoring*

Routine lead and copper tap water sampling is conducted by each large PWS after the state specifies the water quality parameter values that reflect optimal corrosion control treatment (WQP-DIS and WQP-POE). The lead and copper tap water samples are collected to measure the lead and copper concentration to which consumers may be exposed after optimal corrosion control treatment is installed. The WQP-DIS and WQP-POE samples are collected to insure a water system is continuing to operate with optimal corrosion control treatment in place. Routine lead and copper tap water samples are collected biannually. Routine WQP-DIS samples are collected biannually. Routine WQP-POE samples are collected biweekly. Each PWS must continue to meet all water quality parameters established by the state during subsequent monitoring periods to remain in compliance with the rule. After a system complies with state specified WQPs for two consecutive six month monitoring periods it may request the state to reduce lead and copper tap water sampling.

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## ***Reduced Monitoring***

A large PWS that operates in accordance with state specified water quality parameters during each of two consecutive six-month monitoring periods may request the state to reduce the required number of lead and copper samples from 60 to 30, and reduce the frequency for collection from biannual to annual. A large water system that operates in accordance with state specified water quality parameters for three years (six consecutive six-month monitoring periods) may request the state to reduce the frequency for collecting 30 lead and copper tap water samples from annually to triennially. A water system sampling less frequently than once every six months must collect tap water samples for lead and copper during the months of June, July, August, or September. Form 141-B on page 55 provides water systems with an easy way of requesting a reduction in lead and copper tap water monitoring.

The state must respond in writing to a water system's request to reduce the number and frequency of lead and copper tap water monitoring.

## ***Reporting Samples***

All large PWSs must report several pieces of information for all lead and copper tap water samples within the first 10 days of the end of

each monitoring period (i.e., semiannually, annually, triennially).

Each PWS must report the results of all tap water samples for lead and copper, the location of each site, and the targeting criteria under which the site was selected for the system's sampling pool.

Each PWS must report the 90th percentile lead and copper concentrations measured from among all lead and copper tap water samples collected during each monitoring period.

Each PWS must certify that each first draw sample that has been collected is one-liter in volume and to the best of its knowledge, has stood motionless in the service line, or in the interior plumbing of a sampling site, for at least six hours.

Each PWS must, where residents collect samples, certify that each tap sample collected by the residents has been taken after the water system informed them of proper sampling procedures.

With the exception of tap samples collected during each water system's first monitoring period, each PWS must designate any site which was not sampled during previous monitoring periods, and include an explanation of why the sampling site(s) has changed. Form 141-A on page 52 provides water systems with a simple and concise way of reporting this information to the state.

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# Water Quality Parameter Monitoring

§141.87

Water quality parameters (WQP-DIS and WQP-POE), such as pH, alkalinity, calcium and inhibitor residuals are important to measure when identifying optimal corrosion control treatment, evaluating the effectiveness of the treatment, and determining a system's compliance with the rule. WQPs are measured at representative sites in the distribution system (WQP-DIS) and at each entry point to the distribution system (WQP-POE) for several reasons.

First, measuring WQPs provides baseline data on current corrosion control treatment. Without WQP data, PWSs will have no information on which to base comparative corrosion control treatment evaluations. States will have no way of evaluating existing water quality conditions, which will be limited in their ability to evaluate the effectiveness of alternative treatments.

Second, the WQPs are needed to assess the effectiveness of corrosion control treatment. After installing optimal treatment, states are required to designate values, or ranges of values, for applicable WQPs measured at taps in the distribution system, and concentrations or dosage rates, measured at the entry points to the distribution system for chemicals used to maintain optimal corrosion control. The purpose of sampling at both locations is for a system and the state to have an indication of water quality changes as water travels throughout the system. If the difference in the values between the plant and the field is small, it is a good indication that the levels for the parameters are being maintained throughout the system. If there is a large difference in the values or if they are volatile over time, this could indicate

that the system may need to adjust its treatment to stabilize water quality or maintain higher values for parameters at the treatment plant.

Third, the WQP measurements collected in the distribution system and at each entry point are needed to determine compliance with the corrosion control treatment requirements. The most reliable indicator of whether a water system is continually operating with optimal corrosion control treatment in place, and thereby complying with the requirements of the rule, is to measure the set of WQPs (both DIS and POE) established by the state. Systems maintaining state-specified values in the distribution system and at each entry point to the system remain in compliance with the rule. Systems that do not maintain these values are in violation of the rule.

The WQP monitoring requirements are presented in five sections: (1) selecting representative sampling sites; (2) sample collection methods; (3) number and frequency of monitoring; (4) reduced monitoring; and (5) reporting.

## *Selecting Representative Sampling Sites*

When identifying representative sampling sites throughout the distribution system a water supplier must consider: (1) the size of the population served; (2) the different sources of water from which the supplier draws water; (3) the different treatment methods used by the supplier; and (4) the effect of seasonal variability on treatment.

Samples collected at entry points to the distribution system must be collected from

locations representative of each source of water after treatment. If a system draws water from more than one source and the sources are combined before distribution, the system must sample at points in the distribution system where the water is representative of all sources being used.

Tap sampling for WQP-DIS is not required at sampling sites targeted for lead and copper. The Agency recommends that systems collect WQP-DIS samples at coliform sites because they should be representative of water quality throughout the distribution system and be easy to access. The advantages associated with using these sites are (1) access is available since the PWS is currently using the sampling locations; (2) personnel are already in place to perform monitoring at these sites; and (3) the locations should be representative of the distribution system conditions as required by the Total Coliform Rule.

## ***Sample Collection Methods***

Distribution system samples for alkalinity, calcium, conductivity, orthophosphate, and silica will require two samples of approximately 500 mL each to be collected. Fully flush the sample tap prior to collection of the sample. If the PWS collects these samples from the same location as coliform and disinfectant residual samples, then samples should be collected in the following manner:

- *Fully flush the sample tap and collect the coliform sample;*
- *Collect a sample to measure disinfectant residual;*
- *Collect and analyze a sample for temperature and pH;*
- *Collect the samples for the other water quality parameter analyses.*

The water quality parameter samples to be brought back to the laboratory for analysis

should be stored separately from the coliform samples to prevent contamination. In all cases, store in a cool environment until analyzed.

To reduce any sampling error or site-specific influences on WQP-DIS monitoring results, several general steps and conditions should be considered when sampling. First, avoid areas of the distribution system where maintenance or flushing is being conducted as water quality upsets are likely to be encountered. Since the purpose of WQP-DIS monitoring is to identify the typical conditions existing in the distribution system, introducing anomalous data would only add confusion and error to data analyses and interpretations.

Second, select distribution system sites which are distributed throughout the entire service area to include locations representing the distribution system characteristics as follows, ranked by relative importance to site-selection decisions: (1) in the vicinity of targeted tap monitoring sites, (2) detention time within the distribution system, (3) within distinct pressure zone, (4) distribution system materials, (5) relationship to supplemental chlorination feed points, and (6) ground or elevated storage locations.

Third, if fire hydrants or other distribution system fixtures are in the vicinity of a sampling site, fully flush the sample tap prior to collecting the sample.

Fourth, samplers should always record their observations about color, suspended solids, and the flushing time required prior to achieving acceptable sampling conditions to assist in the interpretation of the analytical results and overall distribution system behavior.

## ***Water Quality Parameter Analyses***

pH and water temperature analyses can be performed in the field. Conductivity may be performed either in the field or laboratory.

Temperature may be measured either by a hand-held thermometer or by a combined temperature/pH electrode and meter. In all cases, pH measurements must use a pH electrode and meter. All of the remaining WQP analyses should be performed by a laboratory.

EPA believes that pH and temperature measurements should be collected on-site for the following reasons. First, temperature variations during transport do occur, invalidating any laboratory measurements of temperature and introducing error into the pH analysis. Temperature differentials of 5 to 10°C can introduce substantial shifts in pH. Since correcting for such error is difficult, EPA believes that taking field measurements for pH and temperature simplifies the efforts for PWSs and provides higher confidence in the data. Second, chemical changes may occur within the sample during transport which could introduce variability in the pH measurements. The loss and/or gain of carbon dioxide from solution can result in pH increases and/or decreases, respectively. Additionally, continued disinfectant residual reactions can induce pH shifts.

Colorimetric analyses for pH do not produce sufficiently accurate results, and as such, are not approved analytic methods for pH analysis. These methods are subject to several shortcomings: (1) each field sampler subjectively judges the results, such that large variability in the data can be found among sample sites and sampling events; (2) the reagents used in the analysis degrade over time, increasing the likelihood of error being introduced into the results; and (3) under ideal conditions, the accuracy of the method is only  $\pm 0.2$  pH units.

The minimum sample volumes recommended for the water quality parameters in "Methods for Chemical Analysis of Water and Wastes" [USEPA, 1983, "Methods for Chemical Analysis of Water and Wastes". EPA 600/4-79-020] are presented below.

Water Quality Parameter	Minimum Sample Volume
Conductivity	50 mL
pH	25 mL
Temperature	1000 mL
Calcium	100 mL
Orthophosphate	50 mL
Silica	50 mL
Alkalinity	100 mL

Since temperature and pH are to be measured in the field, a single sample may be used for their analysis. PWSs with poorly buffered water supplies may consider performing pH analyses under a "closed system" to reduce measurement shift and increase the accuracy of the pH analyses [Schock, M., et al., 1980, *JAWWA*, 72(5):304; Schock, M. and S.C. Schock, 1982, *Water Research*, 16:1455]. Under no circumstances should the pH electrodes, conductivity probes, or thermometers be placed in samples that are to be analyzed for the other water quality parameters.

Plastic or glass containers can be used when collecting WQP samples except if silica analyses are required, where only plastic may be used. Since temperature and pH measurements are performed in the field, the other water quality parameters will require two samples of approximately 500 mL each to be collected (this assumes that either orthophosphate or silica is included). These volumes are based upon the recommendation that at least twice this minimum volume be collected, permitting replicate analyses if desired. Two samples are required because calcium analysis is to be performed using a separate sample in order to acidify the sample prior to measurement. It is further recommended that the sample acidification step for calcium be performed in the laboratory by trained personnel upon receipt of the sample. It should be noted that if orthophosphate is to be measured, this analysis must be performed within 48 hours of sample collection.

Before beginning the distribution system sampling, the pH electrode should be calibrated at pH 7.0 and a second pH level, either 4.0 or 10.0, depending on the pH range typically found within the distribution system. For most systems, the second pH level for calibration should be pH 10.0. For more accurate results, the pH standard solution used for calibration should be near the temperature anticipated for the water in the distribution system even if the pH meter is temperature compensated. In most cases, the temperature of the finished water will be representative of the temperature found in the distribution system. To attain the desired temperature, a small amount of buffer solution could be placed in a closed container in a flow-through water bath overnight.

During transport, the pH probe should be placed in a sample bottle and secured in the vehicle. The pH probe membranes are very delicate, and they should not come in contact with hard surfaces or be allowed to dry out. It may be a good idea to pack a replacement probe (calibrated prior to leaving) in case problems are experienced with the primary probe.

During sample collection for the water quality parameters, care should be taken to avoid over-agitation of the water sample. Remove the faucet aerator, and run the water gently to flush the line prior to sample collection. Fill the sample bottle to slightly overflowing. A closed-system sample bottle, designed to insert the thermometer and/or pH probe, should be used to reduce measurement error. If using a hand-held thermometer, insert it in the sample and record the reading when it stabilizes. After removing the thermometer, insert the pH electrode immediately. If using a combined electrode, insert it into the sample bottle directly after filling it and measure the sample temperature. After recording the temperature, change the meter to reading pH levels. Gently rotate the bottle with the probe inside until the pH reading

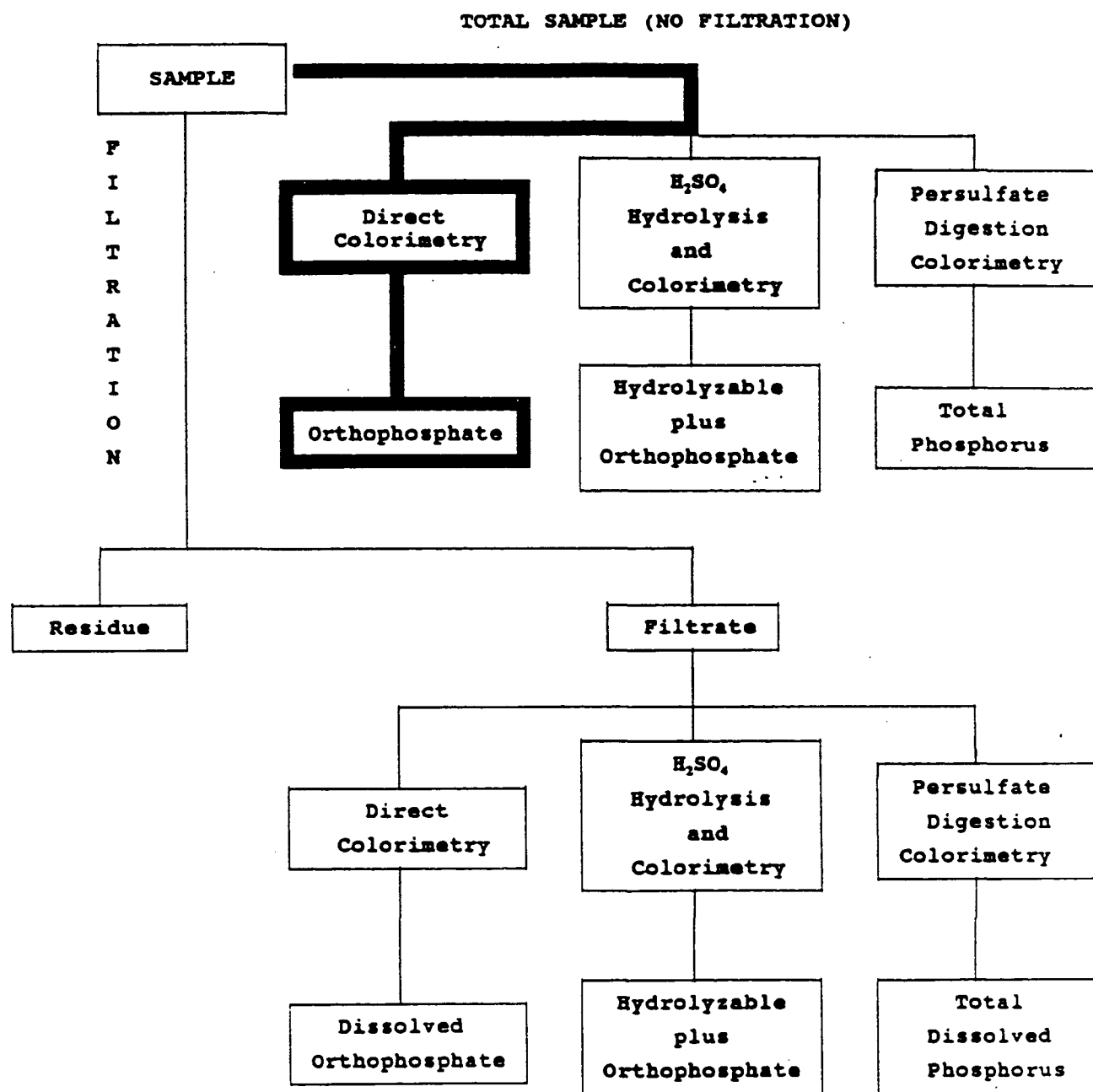
stabilizes; this could take several minutes. When stable, record the measurement, rinse the electrode with deionized water and replace it in its holding bottle. When the temperature and pH measurements are completed, discard the sample. Recalibrate the pH probe if not used over an extended period of time to adjust any measurement shift which may have occurred and record this information.

While small changes in the levels of conductivity, alkalinity, calcium, orthophosphate, and silica may occur between the time of a sample's original collection and its analysis in the laboratory, the error introduced by the delay should be negligible as long as the sample bottles are fully filled, kept cool throughout the day, and the handling practices summarized in Table 2 are followed. If these parameters are measured as part of the normal operating practices of the utility, then the distribution system and entry point water samples should be analyzed in exactly the same fashion and by the same personnel. This will allow the data collected to be directly comparable to water quality data collected throughout the water treatment plant.

For those PWSs which apply a phosphate-based corrosion inhibitor, measurement of orthophosphate is required. These samples must be unfiltered with no digestion or hydrolysis step performed. The direct colorimetric approach as highlighted in Figure 2 is required. This method prevents the conversion of polyphosphate constituents to the orthophosphate form prior to measurement. However, polyphosphates which have converted to orthophosphate in the distribution system will be detected by this scheme. The inclusion of polyphosphates in the measurement of orthophosphate would overestimate the active corrosion protection being provided.

The water quality parameter data, including pH data, collected from distribution system monitoring should be organized and stored in

Figure 2. Analytical Scheme for Differentiation of Phosphorus Forms





a permanent data file by sampling location so that they can be directly compared with lead and copper results from nearby locations. The average, maximum and minimum values found for each water quality parameter should be determined for each site over time as well as for the distribution system overall for each monitoring period.

Storing water quality data on a computer database would be extremely helpful and efficient for large and medium PWSs. If the water quality data is stored on a computer database, long-term trend analysis of the water quality data could be performed. Such an analysis might include an assessment of the relative changes in water quality parameters before and after treatment modifications; changes experienced between segments of the service area; and the relationship between source water quality and distribution system water quality in terms of the stability of water quality parameters within the service area.

## ***Number and Frequency of WQP Sampling***

### ***WQP Sampling Before Installing Optimal Corrosion Control Treatment***

During initial monitoring (January 1, 1992 to January 1, 1993), a large PWS must collect two samples for each of the following WQPs at 10 sampling sites in the distribution system and at each entry point to the distribution system:

- *pH*
- *alkalinity*
- *calcium*
- *conductivity*
- *water temperature*
- *orthophosphate, when a phosphate inhibitor is used*
- *silica, when a silicate inhibitor is used*

The number of samples required for the WQPs are fewer than for lead and copper because these parameters do not vary to the same extent as lead and copper as such, fewer samples are required to accurately characterize the values throughout the distribution system. Systems should attempt to collect the two samples in the distribution system as far apart in time as possible to capture any seasonal changes that may occur. Water systems should also collect tap samples and entry point samples at the same approximate time within the monitoring period so that correlations can be drawn that are not distorted by seasonal effects.

### ***WQP Sampling After Installing Optimal Corrosion Control Treatment and After the State Specifies Numerical Values***

Each large PWS must collect two samples for each of the following WQPs at 10 sampling sites in the distribution system during each six-month monitoring period:

- *pH*
- *alkalinity*
- *calcium, when calcium carbonate stabilization is used*
- *orthophosphate, when a phosphate inhibitor is used*
- *silica, when a silicate inhibitor is used*

EPA believes that these samples, collected in conjunction with the lead and copper samples, are necessary to determine the effectiveness of corrosion control treatment and to determine whether additional adjustments in treatment are necessary or feasible. States have the discretion to require systems to measure additional WQPs.

Each large PWS must collect one sample for each of the following WQPs at each entry point to the distribution system every two weeks:

- *pH*
- *the dosage rate of the chemical used to adjust alkalinity and the alkalinity concentration, when alkalinity is adjusted*
- *the dosage rate of the inhibitor used and the concentration of orthophosphate or silica (whichever is used) when an inhibitor is used*

EPA believes requiring biweekly measurements at each entry point to the distribution system is important to evaluate fluctuations in these parameters and to assist in establishing operational targets for water systems to maintain optimal treatment. To reduce the burden of collecting daily measurements, EPA recommends that systems install a continuous pH monitoring device and dosage meter for alkalinity and inhibitors. The devices can be mounted to provide easy access and produce accurate and reliable results for an extended period of time.

A system may take a confirmation sample for any WQP value within three days after receiving the results of the first sample. If a confirmation sample is collected the result must be averaged for the purpose of determining compliance with the state-specified parameter.

## ***Reduced WQP Sampling***

Each large PWS that maintains the range of values for each state-specified WQP for two consecutive six-month monitoring periods must continue to collect two WQP samples during each six-month monitoring period, but may reduce the number of sites from which samples are collected from 10 to 7.

Any water system that maintains the range of values for state-specified WQPs for six consecutive six-month monitoring periods may

reduce the frequency with which it collects WQP samples in the distribution system from biannual to annual. Any water system that collects WQP samples annually must collect these samples throughout the year so as to reflect the seasonal variability to which corrosion control treatment is subject. Water systems may not reduce the number or frequency of WQP samples collected at entry points to the distribution system. A water system that fails to operate within the range of values established by the state for any WQP must resume monitoring in accordance with the initial number and frequency requirements.

States are required to review and revise water quality parameter determinations when a system submits new monitoring or treatment data, or when other data relevant to the number and frequency of tap sampling becomes available.

## ***Reporting WQP Samples***

All large PWSs must report several pieces of information for all WQP samples within the first 10 days following the end of each monitoring period (i.e., semi-annually, annually, triennially).

Each PWS must report the results of all tap water samples collected at representative sites in the distribution system for all applicable WQPs.

Each PWS must report the results of all source water samples collected at the entry point(s) to the distribution system for all applicable WQPs.

With the exception of tap samples collected during each water system's first monitoring period, each PWS must identify any site(s) which was not sampled during previous monitoring periods, and include an explanation of why the sampling site(s) has changed.

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# Lead and Copper Source Water Monitoring

§141.88

The final rule requires all water systems that exceed the lead or copper action level to collect source water samples at each entry point to the distribution system. The purpose of monitoring for lead and copper at each entry point to the distribution system is to assist systems in designing an overall treatment plan for reducing the concentrations of each contaminant in tap water. These samples will also be used by the states to determine whether a system must install treatment to minimize tap water lead and copper levels, and to determine whether a system is maintaining maximum permissible lead and copper levels in source water.

In those instances where the state requires a water system to install source water treatment, the system has 24 months to complete installation and an additional 12 months to collect follow-up samples to determine the effectiveness of that treatment. Once treatment is installed and follow-up samples are submitted, the state will establish maximum permissible lead and copper levels. From that point on, the system must monitor in accordance with the standardized monitoring framework (SMF) established for inorganic contaminants to insure lead and copper levels are maintained below the state-specified contaminant levels.

In those instances where the state does not require a water system to install source water treatment, the state will simply establish maximum permissible lead and copper levels with which the system must continue to comply. These systems, like those that installed source water treatment, must monitor in accordance with the SMF established for inorganic contaminants to insure lead and copper levels are maintained below state-specified levels.

The lead and copper source water monitoring requirements are presented in five sections: (1) sample collection methods; (2) number and frequency of monitoring; (3) reduced monitoring; (4) reporting; and (5) cessation of source water monitoring.

## *Sample Collection Methods*

Groundwater systems must collect at least one sample at each entry point to the distribution system which is representative of each well. For groundwater systems with separate entrances to the distribution system from either individual wells or wellfields, a sample must be collected from each discrete entrance point. If new sampling taps to wells are required, it would be best not to use brass. If brass taps are installed, then the line should be adequately flushed prior to sampling to ensure the sample is representative of the source. States have the discretion to identify an individual well for monitoring (when there is no treatment or blending) for those PWSs using multiple wells that draw from the same aquifer.

Surface water systems must collect at least one sample at each entry point to the distribution system which is representative of each water source. For surface water systems, source water samples may be collected after storage or at the high service pumps. Groundwater and surface water systems must take each repeat sample at the same sampling point unless conditions make sampling at another point more representative of each source or treatment plant. Any water system that draws water from multiple sources that are combined before distribution must sample at entry points to the distribution system that are representative of the quality of water in all sources being used. All water systems

must report the results of all lead and copper source water samples within the first 10 days of the end of each monitoring period (i.e., biannually, annually, per compliance period, per compliance cycle).

The state may reduce the total number of samples that must be analyzed by allowing systems to composite. Systems may composite as many as five samples. Compositing must be conducted in the laboratory. If the concentration in the composite sample is greater than or equal to the detection limit for lead (0.001 mg/L) or copper (0.001 mg/L, or 0.020 mg/L when atomic absorption direct aspiration is used), then the system must collect follow-up samples from each point included in the composite. The system must collect these samples within 14 days of determining the detection limit is exceeded. Systems serving > 3,300 persons may only composite with samples from a single system.

### ***Number and Frequency of Lead and Copper Sampling***

#### ***Lead and Copper Sampling After System Exceeds an Action Level***

Any water system that meets both the lead and copper action levels in tap water sampling is not required to collect source water samples for lead and copper.

Within six months of exceeding the lead or copper action level, a system must collect one sample at each entry point to the distribution system and submit the results to the state. In addition to the results of source water monitoring, the systems must submit a source water treatment recommendation to the state for review and approval. On the basis of the results of source water monitoring, the state will either approve the water system's treatment recommen-

dation, require the system to install an alternative treatment, or allow the system to forego source water treatment altogether. In cases where the state believes that more information would be useful, it may require the water system to collect additional source water samples.

### ***Lead and Copper Sampling After System Installs Source Water Treatment***

Any water system that is required to install source water treatment must collect one lead and copper sample from each entry point to the distribution system during two consecutive six month monitoring periods after treatment has been installed and is being operated. The system must submit the monitoring results to the state, and the state must establish maximum permissible source water levels for lead and copper.

### ***Lead and Copper Sampling After State Specifies Maximum Permissible Lead and Copper Levels***

Once the state has specified maximum permissible lead and copper concentrations, a water system must monitor in accordance with the SMF.

Groundwater systems must collect lead and copper samples once during the three year compliance period in effect when the state specifies maximum permissible lead and copper concentrations or determines that no treatment is needed. These systems are required to collect samples once during each subsequent three year compliance period.

Surface water systems (or groundwater systems under the influence of surface water) must collect lead and copper samples annually beginning when the state specifies maximum

permissible lead and copper concentrations or determines that no treatment is needed. These systems are required to continue collecting samples annually.

### ***Reduced Monitoring***

Groundwater systems that demonstrate to the state that lead and copper levels have been maintained below the maximum permissible levels for lead and/or copper for three consecutive three year compliance periods (nine years) may collect lead and copper samples once during each nine-year compliance cycle.

Surface water systems that demonstrate to the state that maximum permissible lead and/or copper levels have been maintained below the maximum permissible levels for three consecutive years may collect lead and copper samples once during each nine-year compliance cycle.

A system using new water sources may not reduce source water monitoring until the systems meets the maximum permissible lead and copper concentrations set by the state for three consecutive monitoring periods.

### ***Reporting Source Water Samples***

Each large PWS must report the results of all source water samples within 10 days of the end of each source water monitoring period (i.e., annually, per compliance period, per compliance cycle).

Any large PWS requesting that the State reduce the frequency of source water monitoring

must submit several pieces of information to the state. For those large PWSs that have not installed source water treatment, each system must submit the results of all source water samples demonstrating that source water does not contribute in excess of the maximum permissible lead and copper levels set by the state. For those large PWSs that have installed source water treatment, each system must submit the results of all source water samples demonstrating that source water does not contribute in excess of the maximum permissible lead and copper levels set by the state.

Except for the first source water monitoring period, a water system must inform the state of any site which was not sampled during the previous monitoring period, and include an explanation of why the sampling point has changed.

### ***Cessation of Lead and Copper Source Water Sampling***

A water system can stop collecting lead and copper source water samples if the system meets the lead and copper action levels during an entire source water sampling period applicable to the system (i.e., annually, triennially, or every nine years). If a system exceeds the lead or copper action level measured at the tap in a future sampling period, the system is required to recommence monitoring lead and copper in source water.

## Analytical Methods

§141.89

The approved analytical methods for lead, copper, and all water quality parameters (pH, calcium, alkalinity, silica, orthophosphate, conductivity, and temperature) are shown in Table 5. A summary of the preservation protocols, sample containers, and maximum holding times for analysis is provided in Table 2.

Laboratory certification will only be required for lead and copper analyses, and is based on the performance requirements included with the method detection limits. In cases where sample compositing is done, laboratories must achieve the method detection limits found below using the procedure described in Appendix B to Part 136 of the Code of Federal Regulations.

The use of the approved analytical methods for all of the water quality parameters as well as lead and copper is necessary to assure consistent results and high quality data. However, sample collection and analysis procedures in the field can contribute to errors in measurement. A quality assurance/quality control program for field sampling/analysis and laboratory analysis should be developed and implemented by all PWSs. If a commercial or State laboratory performs the laboratory analyses, it is still important that quality control measures be taken for the field sampling portion of the monitoring program.

Analyte and Method	Method Detection Limit (mg/L)	Practical Quantitation Level (mg/L)	Minimum Accuracy
<b>Copper</b>			
Atomic Absorption, furnace	0.001	0.050	± 10% at ≥ 0.050 mg/L
Atomic Absorption, direct aspiration	0.020		
Atomic Absorption, platform furnace	0.001		
Inductively Coupled Plasma	0.002**		
Inductively Coupled Plasma, Mass Spectrometry	0.001		
<b>Lead</b>			
Atomic Absorption, furnace	0.001	0.005	± 30% at ≥ 0.005 mg/L
Atomic Absorption, platform furnace	0.001		
Inductively Coupled Plasma, Mass Spectrometry	0.001		

\*\* Using the 4X concentration technique which would not be required because the copper AL is much higher than the detection limits.

### *Quality Assurance/ Quality Control Programs*

A complete Quality Assurance/Quality Control (QA/QC) program should contain components at each step in the data collection process, including sample collection and methods, laboratory sample handling and

analysis, and recording/reporting of the results. An important element in implementing a successful QA/QC program is the ability to properly track a sample from its collection through analysis and ultimate recording in either the state or PWS database. The QA/QC program requirements for sample tracking include: (1) sample identification; (2) complete sample

labeling; (3) training sample collectors and field data collectors; (4) parallel construction of laboratory recordkeeping and database format to sample labelling and identification; and, (5) periodic self-audits of the QA/QC procedures.

Significant benefits could be gained by the implementation of a program to properly label and identify samples to track their collection, analysis, and results. Minimally, the data fields (i.e., variables defined within the laboratory and/or PWS database) needed to fully identify a sample are:

1. *PWS Identification Number*
2. *Applicable PWS Entry Point Identification Numbers (There may be multiple entry points to a distribution system which should be identified for each sample collected within it.)*
3. *Sample Identification Number*
4. *Sample Type Identifier: (2 Fields)*
  - (a) *First-draw Tap, Distribution System, Source Water for Lead and Copper, Source Water for Water Quality Parameters, or LSL.*
  - (b) *Initial, Follow-Up, Routine, Reduced, Ultimate Reduced, or LSL Replacement Program.*
5. *Sample Site Identifier: (3 Fields)*
  - (a) *Region of Distribution System (Suggest that Region 0 be assigned for each entry point location.)*
  - (b) *Subregion of Distribution System (Suggest that Subregion 0 be assigned for each entry point location.)*
  - (c) *Sample Site Specific Identifier*
6. *Sample Collection Date*
7. *Sample Collection Time*
8. *Sample Period*

9. *Sample Collector Identifier: PWS Staff, Resident, State, or Other.*
10. *Parameters for Analysis: Lead, Copper, Water Quality Parameters or pH and Temperature (field measurements).*
11. *Sample Site Street Address - for PWS use*
12. *Sample Collection Route - for PWS use*
13. *PWS Name*
14. *PWS Contact Person and telephone number*

The PWS should include data fields to identify those samples delivered to the laboratory representing travel blanks and blind spikes. As part of a PWS's routine QA/QC program for analytical results, travel blanks should be included in at least 10 percent of the sampling kits delivered to and returned from homeowners performing tap monitoring. For lead and copper analyses, at least three blind spike samples should be included during every six-month monitoring period for medium and large PWSs, and at least one such sample for small PWSs.

When first-draw tap samples are to be collected, the sample bottles must be properly labelled prior to distribution if residents are collecting the samples. In addition to the sample bottles, PWSs must supply the residents with instructions as to the sample collection procedures. The PWS must certify that residents were informed of the sampling procedures prior to collecting the samples. If PWS staff are collecting the first-draw tap samples, then they are required to certify that to the best of their knowledge, each sample represents first-draw samples. PWSs will be required to submit a statement to the state at the end of each six-month monitoring period that these certificates were obtained (see Form 141-A on page 52).

**Table 5. Summary of Approved Analytical Methods for the Lead and Copper Rule**

Parameter	Methodology <sup>8</sup>	Reference (Method Number)			
		EPA <sup>1</sup>	ASTM <sup>2</sup>	SM <sup>3</sup>	USGS <sup>4</sup>
Lead	Atomic absorption; furnace technique Inductively-coupled plasma; Mass spectrometry Atomic absorption; Platform furnace technique	239.2 200.8 <sup>6</sup> 200.9 <sup>7</sup>	D3559-85D	3113	
Copper	Atomic absorption; furnace technique Atomic absorption; direct aspiration Inductively-coupled plasma Inductively-coupled plasma; Mass spectrometry Atomic absorption; Platform furnace technique	220.2 220.1 200.7 <sup>b</sup> 200.8 <sup>6</sup> 200.9 <sup>7</sup>	D1688-90C D1688-90A	3113 3111-B 3120	
pH	Electrometric	150.1 150.2	D1293-84B	4500-H <sup>5</sup>	
Conductivity	Conductance	120.1	D1125-82B	2510	
Calcium	EDTA titrimetric Atomic absorption; direct aspiration Inductively-coupled plasma	215.2 215.1 200.7 <sup>b</sup>	D511-88A D511-88B	3500-Ca-D 3111-B 3120	
Alkalinity	Titrimetric Electrometric titration	310.1	D1067-88B	2320	
Orthophosphate, unfiltered, no digestion or hydrolysis	Colorimetric, automated ascorbic acid Colorimetric, ascorbic acid, two reagent Colorimetric, ascorbic acid, single reagent Colorimetric, phosphomolybdate; automated-segmented flow; automated discrete Ion chromatography	365.1 365.3 365.2  300.0 <sup>6</sup>	  D515-88A  D4327-88	4500-P-F  4500-P-E  4110	   I-1601-85 I-2601-85 I-2598-85
Silica	Colorimetric, molybdate blue; automated segmented flow Colorimetric Molybdosilicate Heteropoly blue Automated method for molybdate-reactive silica Inductively-coupled plasma	  370.1   200.7 <sup>b</sup>	  D859-88	   4500-Si-D 4500-Si-E 4500-Si-F 3120	    I-1700-85 I-2700-85
Temperature	Thermometric			2550	

<sup>1</sup> "Methods of Chemical Analysis of Water and Wastes," EPA Environmental Monitoring and Support Laboratory, Cincinnati, OH (EPA-600/4-79-020), Revised March 1983. Available from ORD Publications, CERL, EPA, Cincinnati, OH 45268.

<sup>2</sup> Annual Book of ASTM Standards, Vol. 11.01, American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

<sup>3</sup> "Standard Methods for the Examination of Water and Wastewater," 17th Edition, American Public Health Association, American Water Works Association, Water Pollution Control Federation, 1989.

<sup>4</sup> "Methods for Determination of Inorganic Substances in Water and Fluvial Sediments," 3rd edition, U.S. Geological Survey, 1989.

<sup>5</sup> "Determination of Metals and Trace Elements in Water and Wastes by Inductively-Coupled Plasma Atomic Emission Spectrometry," Revision 3.2, August 1990, U.S. EPA, EMSL, Cincinnati, OH 45268.

<sup>6</sup> "Determination of Trace Elements in Water and Wastes by Inductively-Coupled Plasma-Mass Spectrometry," Revision 4.3, August 1990, U.S. EPA, EMSL, EMSL, Cincinnati, OH 45268.

<sup>7</sup> "Determination of Trace Elements by Stabilized Temperature Graphite Furnace Atomic Absorption Spectrometry," August 1990, U.S. EPA, EMSL, Cincinnati, OH 45268.

<sup>8</sup> "Determination of Inorganic Ions in Water by Ion Chromatography," December 1989, U.S. EPA, EMSL, Cincinnati, OH 45268.

<sup>9</sup> Analyzing lead and copper, the technique applicable to total metals must be used. Samples cannot be filtered.



## TIMELINE

# **INITIAL MONITORING REQUIREMENTS FOR SYSTEMS SERVING 50,001 TO 100,000 PERSONS**

1992

**FIRST MONITORING PERIOD**      *January 1, 1992 to July 1, 1992*

**SECOND MONITORING PERIOD**      *July 1, 1992 to January 1, 1993*

## **LEAD AND COPPER TAP WATER SAMPLING**

### **COLLECTION METHODS NEVER CHANGE**

- One liter
- First draw
- 6-hour standing time

### **NUMBER AND FREQUENCY OF SAMPLING**

- 1 sample at 60 sites during each of 2 consecutive 6-month monitoring periods

## **WATER QUALITY PARAMETER (WQP) SAMPLING**

### **WQP SAMPLES COLLECTED AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM AND AT EACH ENTRY POINT**

- pH
- Alkalinity
- Calcium
- Conductivity
- Temperature
- Orthophosphate, when phosphate-based inhibitor used
- Silica, when silicate-based inhibitor used

### **NUMBER OF WQP SAMPLES COLLECTED AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**

- 2 samples at 10 sites during each of 2 consecutive 6-month monitoring periods

### **NUMBER OF WQP SAMPLES COLLECTED AT EACH ENTRY POINT**

- 2 samples at each entry point during each of 2 consecutive 6-month monitoring periods

## **MONITORING PERIODS**

### **FIRST MONITORING PERIOD**

- January 1, 1992 to July 1, 1992 (submit by July 11, 1992)

### **SECOND MONITORING PERIOD**

- July 1, 1992 to January 1, 1993 (submit by January 11, 1993)

# **FOLLOW-UP MONITORING REQUIREMENTS FOR SYSTEMS SERVING 50,001 TO 100,000 PERSONS**

1997

**FIRST MONITORING PERIOD**      *January 1, 1997 to July 1, 1997*

**SECOND MONITORING PERIOD**      *July 1, 1997 to January 1, 1998*

## **LEAD AND COPPER TAP WATER SAMPLING**

### **NUMBER AND FREQUENCY OF SAMPLING**

- 1 sample at 60 sites during each of 2 consecutive 6-month monitoring periods

## **WATER QUALITY PARAMETER (WQP) SAMPLING**

### **AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**

- PARAMETERS SAMPLED
  - pH
  - Alkalinity
  - Calcium, when calcium carbonate stabilization used
  - Orthophosphate, when phosphate-based inhibitor used
  - Silica, when silicate-based inhibitor used
- NUMBER AND FREQUENCY OF SAMPLING
  - 2 samples at 10 sites during each of 2 consecutive 6-month monitoring periods

### **AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**

- PARAMETERS SAMPLED
  - pH
  - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
  - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
- NUMBER AND FREQUENCY OF SAMPLING
  - 1 sample at each entry point every 2 weeks

## **MONITORING PERIODS**

### **FIRST MONITORING PERIOD**

- January 1, 1997 to July 1, 1997 (submit by July 11, 1997)

### **SECOND MONITORING PERIOD**

- July 1, 1997 to January 1, 1998 (submit by January 11, 1998)

## **STATE REVIEWS RESULTS OF FOLLOW-UP SAMPLES**

1998

**STATE REVIEW**

*January 1, 1998 to July 1, 1998*

### **STATE ESTABLISHES WQPs**

State establishes WQP values measured at representative sites in the distribution system:

- pH level
- Alkalinity concentration, when alkalinity adjusted
- Calcium concentration, when calcium adjusted
- Orthophosphate concentration, when a phosphate-based inhibitor is used
- Silica concentration, when a silicate-based inhibitor is used

State establishes chemical dosage rates measured at entry points to the distribution system:

- Chemical used to adjust pH, when pH adjusted
- Dosage rate of the chemical used to adjust alkalinity, when alkalinity adjusted
- Dosage rate of chemical used to adjust calcium, when calcium adjusted
- Dosage rate of inhibitor used, when inhibitor used

### **STATE REVIEW PERIOD**

State must establish WQP values that must be met at sampling sites in the distribution system and chemical dosages that must be maintained at each entry point to the distribution system

State must inform the system of these WQP values in writing by July 1, 1998

**MONITORING REQUIREMENTS FOR SYSTEMS  
SERVING 50,001 TO 100,000 PERSONS  
AFTER STATE ESTABLISHES WQPs**

**FIRST MONITORING PERIOD**      *July 1, 1998 to January 1, 1999*

**SECOND MONITORING PERIOD**      *January 1, 1999 to July 1, 1999*

**LEAD AND COPPER TAP WATER SAMPLING**

**NUMBER AND FREQUENCY OF SAMPLING**

- 1 sample at 60 sites every 6 months

**WATER QUALITY PARAMETER (WQP) SAMPLING**

**AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**

- PARAMETERS SAMPLED
  - pH
  - Alkalinity
  - Calcium, when calcium carbonate stabilization used
  - Orthophosphate, when phosphate-based inhibitor used
  - Silica, when silicate-based inhibitor used
- NUMBER AND FREQUENCY OF SAMPLING
  - 2 samples at 10 sites every 6 months

**AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**

- PARAMETERS SAMPLED
  - pH
  - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
  - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
- NUMBER AND FREQUENCY OF SAMPLING
  - 1 sample at each entry point every 2 weeks

**MONITORING PERIODS**

**FIRST MONITORING PERIOD**

- July 1, 1998 to January 1, 1999 (submit by January 11, 1999)

**SECOND MONITORING PERIOD**

- January 1, 1999 to July 1, 1999 (submit by July 11, 1999)

## **REDUCED MONITORING REQUIREMENTS FOR SYSTEMS SERVING 50,001 TO 100,000 PERSONS**

*Beginning July 1, 1999*

System maintaining values for WQPs at representative sites in the distribution system for 2 consecutive 6-month monitoring periods, and at each entry point to the distribution system for 1 year, may reduce sampling as follows:

### **LEAD AND COPPER TAP WATER SAMPLING**

#### **NUMBER AND FREQUENCY OF SAMPLING**

- 1 sample at 30 sites annually

#### **REQUESTING REDUCED SAMPLING**

- System must submit written request asking the state to reduce the number and frequency of lead and copper tap water sampling (see Form 141-B on page 55)
- State must review lead and copper data submitted by the system and provide a written response

### **WATER QUALITY PARAMETER (WQP) SAMPLING**

#### **AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**

- PARAMETERS SAMPLED
  - pH
  - Alkalinity
  - Calcium, when calcium carbonate stabilization used
  - Orthophosphate, when phosphate-based inhibitor used
  - Silica, when silicate-based inhibitor used
- NUMBER AND FREQUENCY OF SAMPLING
  - 2 samples at 7 sites every 6 months

#### **AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**

- PARAMETERS SAMPLED
  - pH
  - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
  - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
- NUMBER AND FREQUENCY OF SAMPLING
  - 1 sample at each entry point every 2 weeks

### ***REDUCED MONITORING PERIODS***

#### **Lead and Copper Must Be Sampled Annually**

- July 1, 2000 (submit by July 11, 2000)
- July 1, 2001 (submit by July 11, 2001)
- July 1, 2002 (submit by July 11, 2002)

#### **WQPs Must Be Sampled at Representative Sites in the Distribution System Every 6 Months**

- January 1, 2000 (submit by January 11, 2000)
- July 1, 2000 (submit by July 11, 2000)
- January 1, 2001 (submit by January 11, 2001)
- July 1, 2001 (submit by July 11, 2001)
- January 1, 2002 (submit by January 11, 2002)
- July 1, 2002 (submit by July 11, 2002)

#### **WQPs Must Be Sampled at Each Entry Point to the Distribution System Every 2 Weeks**

## **REDUCED MONITORING REQUIREMENTS FOR SYSTEMS SERVING 50,001 TO 100,000 PERSONS**

*Beginning July 1, 2002*

System maintaining values for WQPs at representative sites in the distribution system for 6 consecutive 6-month monitoring periods, and at each entry point to the distribution system for 3 years, may reduce sampling as follows:

### **LEAD AND COPPER TAP WATER SAMPLING**

#### **NUMBER AND FREQUENCY OF SAMPLING**

- 1 sample at 30 sites every 3 years

#### **REQUESTING REDUCED SAMPLING**

- System must submit written request asking the state to reduce the number and frequency of lead and copper tap water sampling (see Form 141-B on page 55)
- State must review lead and copper data submitted by the system and provide a written response

### **WATER QUALITY PARAMETER (WQP) SAMPLING**

#### **AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**

- PARAMETERS SAMPLED
  - pH
  - Alkalinity
  - Calcium, when calcium carbonate stabilization used
  - Orthophosphate, when phosphate-based inhibitor used
  - Silica, when silicate-based inhibitor used
- NUMBER AND FREQUENCY OF SAMPLING
  - 2 samples at 7 sites annually

#### **AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**

- PARAMETERS SAMPLED
  - pH
  - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
  - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
- NUMBER AND FREQUENCY OF SAMPLING
  - 1 sample at each entry point every 2 weeks



### ***REDUCED MONITORING PERIODS***

#### **Lead and Copper Must Be Sampled Every 3 Years**

- July 1, 2005 (submit by July 11, 2005)
- July 1, 2008 (submit by July 11, 2008)
- July 1, 2011 (submit by July 11, 2011)
- Every 3 years thereafter

#### **WQPs Must Be Sampled at Representative Sites in the Distribution System Annually**

- July 1, 2003 (submit by July 11, 2003)
- July 1, 2004 (submit by July 11, 2004)
- July 1, 2005 (submit by July 11, 2005)
- Annually thereafter

#### **WQPs Must Be Sampled at Each Entry Point to the Distribution System Every 2 Weeks**

## Timeline

## Timeline

# **INITIAL SOURCE WATER MONITORING REQUIREMENTS FOR LARGE SYSTEMS**

1992

**FIRST MONITORING PERIOD**      *July 1, 1992 to January 1, 1993*

The schedule discussed in this section assumes the water system exceeds an action level in the first monitoring period.

## **LEAD AND COPPER SOURCE WATER SAMPLING**

If the lead or copper action level is exceeded in tap water samples the system must collect 1 sample at each entry point to the distribution system in accordance with the collection methods specified in §141.23(a)(1) to (4)

## **MONITORING PERIODS**

### **FIRST SOURCE WATER MONITORING PERIOD**

- July 1, 1992 to January 1, 1993 (submit by January 11, 1993)
- System must submit source water treatment recommendation with lead and copper source water samples

# SOURCE WATER MONITORING REQUIREMENT AFTER THE STATE SETS MAXIMUM PERMISSIBLE LEAD AND COPPER LEVELS FOR SYSTEMS NOT INSTALLING SOURCE WATER TREATMENT

## PERIOD FOR

### STATE DETERMINATION

*January 1, 1993 to July 1, 1993*

If a system is not required to install source water treatment the state will establish maximum permissible lead and copper levels with which the system must continue to comply.

The system must continue to deliver finished water to each entry point to the distribution system with lead and copper concentrations below those levels set by the state.

## **LEAD AND COPPER SOURCE WATER MONITORING**

### GROUNDWATER SYSTEMS

- System must collect 1 sample at each entry point to the distribution system during the 3-year compliance period in effect when the state determines treatment is not needed, and it sets maximum permissible lead and copper levels
- System must collect 1 sample at each entry point to the distribution system during each subsequent 3-year compliance period

### SURFACE WATER SYSTEMS

- System must collect 1 sample at each entry point to the distribution system annually
- The first year begins on the date the state determines treatment is not needed and it sets maximum permissible lead and copper levels

## **MONITORING PERIODS**

### GROUNDWATER SYSTEMS

- System must collect all source water samples and submit the results to the state by the following dates:
- |                       |                 |                  |
|-----------------------|-----------------|------------------|
| 1st Compliance Period | January 1, 1996 | January 11, 1996 |
| 2nd Compliance Period | January 1, 1999 | January 11, 1999 |
| 3rd Compliance Period | January 1, 2002 | January 11, 2002 |

### SURFACE WATER SYSTEMS

- System must collect all source water samples and submit the results to the state by the following dates:
- |          |                 |                  |
|----------|-----------------|------------------|
| 1st Year | January 1, 1994 | January 11, 1994 |
| 2nd Year | January 1, 1995 | January 11, 1995 |
| 3rd Year | January 1, 1996 | January 11, 1996 |

## FOLLOW-UP SOURCE WATER MONITORING FOR LARGE SYSTEMS INSTALLING SOURCE WATER TREATMENT

**FIRST MONITORING PERIOD**      *July 1, 1995 to January 1, 1996*

**SECOND MONITORING PERIOD**      *January 1, 1996 to July 1, 1996*

If a system is not required to install source water treatment, it has 24 months to install and operate the treatment and 12 months to collect and submit follow-up source water samples.

### LEAD AND COPPER SOURCE WATER MONITORING

#### NUMBER AND FREQUENCY

- System must collect 1 sample at each entry point to the distribution system during each of 2 consecutive 6-month monitoring periods

### MONITORING PERIODS

#### FIRST MONITORING PERIOD

- July 1, 1995 to January 1, 1996 (submit by January 11, 1996)

#### SECOND MONITORING PERIOD

- January 1, 1996 to July 1, 1996 (submit by July 11, 1996)

# SOURCE WATER MONITORING REQUIREMENT AFTER THE STATE SETS MAXIMUM PERMISSIBLE LEAD AND COPPER LEVELS FOR SYSTEMS INSTALLING SOURCE WATER TREATMENT

## PERIOD FOR

### STATE DETERMINATION

*July 1, 1996 to January 1, 1997*

After a system installs source water treatment, collects follow-up samples, and submits the results to the state, the state will set maximum permissible lead and copper levels.

System must continue delivering finished water to each entry point to the distribution system with lead and copper concentrations below the levels set by the state to remain in compliance.

## **LEAD AND COPPER SOURCE WATER MONITORING**

### GROUNDWATER SYSTEMS

- System must collect 1 sample at each entry point to the distribution system during the 3-year compliance period in effect when the state sets maximum permissible lead and copper levels
- System must collect 1 sample at each entry point to the distribution system during each subsequent 3-year compliance period

### SURFACE WATER SYSTEMS

- System must collect 1 sample at each entry point to the distribution system annually
- The first year begins on the date the state sets maximum permissible lead and copper levels

## **MONITORING PERIODS**

### GROUNDWATER SYSTEMS

- System must collect source water samples and submit the results to the state by the following dates:

1st Compliance Period	January 1, 1999	January 11, 1999
2nd Compliance Period	January 1, 2002	January 11, 2002
3rd Compliance Period	January 1, 2005	January 11, 2005

### SURFACE WATER SYSTEMS

- System must collect source water samples and submit the results to the state by the following dates:

1st Year	January 1, 1998	January 11, 1998
2nd Year	January 1, 1999	January 11, 1999
3rd Year	January 1, 2000	January 11, 2000

## **REDUCED MONITORING REQUIREMENTS FOR LARGE SYSTEMS NOT INSTALLING TREATMENT**

**GROUNDWATER SYSTEMS**

*Beginning January 1, 2002*

**SURFACE WATER SYSTEMS**

*Beginning January 1, 2002*

### **LEAD AND COPPER SOURCE WATER MONITORING**

#### **GROUNDWATER SYSTEMS**

- System that maintains lead and copper concentrations below the levels set by the state for 3 consecutive 3-year compliance periods may reduce source water monitoring to once per 9-year compliance cycle

#### **SURFACE WATER SYSTEMS**

- System that maintains lead and copper concentrations below the levels set by the state for 3 consecutive years may reduce source water monitoring to once per 9-year compliance cycle

### **REDUCED MONITORING PERIODS**

#### **GROUNDWATER AND SURFACE WATER SYSTEMS**

- Reduced monitoring would take place in the second 9-year compliance cycle, which begins January 1, 2002 and ends January 1, 2011
- System must collect 1 sample at each entry point to the distribution system and submit the results to the state by January 11, 2011



## **REDUCED MONITORING REQUIREMENTS FOR LARGE SYSTEMS INSTALLING TREATMENT**

**GROUNDWATER SYSTEMS**

*Beginning January 1, 2011*

**SURFACE WATER SYSTEMS**

*Beginning January 1, 2002*

### **LEAD AND COPPER SOURCE WATER MONITORING**

#### **GROUNDWATER SYSTEMS**

- System that maintains lead and copper concentrations below the levels set by the state for 3 consecutive 3-year compliance periods may reduce source water monitoring to once per 9-year compliance cycle

#### **SURFACE WATER SYSTEMS**

- System that maintains lead and copper concentrations below the levels set by the state for 3 consecutive years may reduce source water monitoring to once per 9-year compliance cycle

### **REDUCED MONITORING PERIODS**

#### **GROUNDWATER SYSTEMS**

- Reduced monitoring would take place in the third 9-year compliance cycle, which begins January 1, 2011 and ends January 1, 2020
- System must collect 1 sample at each entry point to the distribution system and submit the results to the state by January 11, 2020

#### **SURFACE WATER SYSTEMS**

- Reduced monitoring would take place in the second 9-year compliance cycle, which begins January 1, 2002 and ends January 1, 2011
- System must collect 1 sample at each entry point to the distribution system and submit the results to the state by January 11, 2011

## SAMPLE SITE IDENTIFICATION AND CERTIFICATION

System's Name: _____	Type: <input type="checkbox"/> CWS <input type="checkbox"/> NTNCWS
Address: _____ _____ _____	Size: <input type="checkbox"/> > 100,000 <input type="checkbox"/> 10,001 to 100,000 <input type="checkbox"/> 3,301 to 10,000 <input type="checkbox"/> 501 to 3,300 <input type="checkbox"/> 101 to 500 <input type="checkbox"/> ≤ 100
Telephone number: _____	
System ID #: _____	
Contact Person: _____	

### CERTIFICATION OF SAMPLING SITES

#### LEAD SOLDER SITES

# of single-family structures with copper pipes with lead solder installed after 1982 or lead pipes and/or lead service lines (Tier 1) \_\_\_\_\_

# of multi-family structures with copper pipes with lead solder installed after 1982 or lead pipes and/or lead service lines (Tier 1) \_\_\_\_\_

# of buildings containing copper pipes with lead solder installed after 1982 or lead pipes and/or lead service lines (Tier 2) \_\_\_\_\_

# of sites that contain copper pipes with lead solder installed before 1983 (to be used only if first condition has been exhausted) (Tier 3) \_\_\_\_\_

TOTAL \_\_\_\_\_

The following sources have been explored to determine the number of structures which have interior lead pipe or copper pipe with lead solder.

- \_\_\_\_\_ Plumbing and/or building codes
- \_\_\_\_\_ Plumbing and/or building permits
- \_\_\_\_\_ Contacts within the building department, municipal clerk's office, or state regulatory agencies for historical documentation of the service area development
- \_\_\_\_\_ Water Quality Data

#### Other Resources Which PWS May Utilize

- \_\_\_\_\_ Interviews with building inspectors
- \_\_\_\_\_ Survey of service area plumbers about when and where lead solder was used from 1982 to present
- \_\_\_\_\_ Survey residents in sections of the service area where lead pipe and/or copper pipe with lead solder is suspected to exist
- \_\_\_\_\_ Interviews with local contractors and developers

Explanation of Tier 2 and Tier 3 sites (attach additional pages if necessary)

\_\_\_\_\_

## SAMPLE SITE IDENTIFICATION AND CERTIFICATION

### CERTIFICATION OF SAMPLING SITES

#### LEAD SERVICE LINE SITES

# of samples required to be drawn from lead service line sites \_\_\_\_\_

# of samples actually drawn from lead service line sites \_\_\_\_\_

Difference (explain differences other than zero) \_\_\_\_\_

The following sources have been explored to determine the number of lead service lines in the distribution system.

- \_\_\_\_\_ Distribution system maps and record drawings
- \_\_\_\_\_ Information collected for the presence of lead and copper as required under §141.42 of the Code of Federal Regulations
- \_\_\_\_\_ Capital improvement plans and/or master plans for distribution system development
- \_\_\_\_\_ Current and historical standard operating procedures and/or operation and maintenance (O&M) manuals for the type of materials used for service connections
- \_\_\_\_\_ Utility records including meter installation records, customer complaint investigations and all historical documentation which indicate and/or confirm the location of lead service connections
- \_\_\_\_\_ Existing water quality data for indications of 'troubled areas'

#### Other Sources Which PWS Utilized

- \_\_\_\_\_ Interviews with senior personnel
- \_\_\_\_\_ Conduct service line sampling where lead service lines are suspected to exist but their presence is not confirmed
- \_\_\_\_\_ Review of permit files
- \_\_\_\_\_ Community survey
- \_\_\_\_\_ Review of USGS maps and records
- \_\_\_\_\_ Interviews with pipe suppliers, contractors, and/or developers

Explanation of fewer than 50% LSL sites identified (attach additional pages if necessary): \_\_\_\_\_

### CERTIFICATION OF COLLECTION METHODS

I certify that:

Each first draw tap sample for lead and copper is one liter in volume and has stood motionless in the plumbing system of each sampling site for at least six hours.

Each first draw sample collected from a single-family residence has been collected from the cold water kitchen tap or bathroom sink tap.

Each first draw sample collected from a non-residential building has been collected at an interior tap from which water is typically drawn for consumption.

Each first-draw sample collected during an annual or triennial monitoring period has been collected in the months of June, July, August or September.

Each resident who volunteered to collect tap water samples from his or her home has been properly instructed by [insert water system's name] \_\_\_\_\_ in the proper methods for collecting lead and copper samples. I do not challenge the accuracy of those sampling results. Enclosed is a copy of the material distributed to residents explaining the proper collection methods, and a list of the residents who performed sampling.

## SAMPLE SITE IDENTIFICATION AND CERTIFICATION

### RESULTS OF MONITORING

THE RESULTS OF LEAD AND COPPER TAP WATER SAMPLES MUST BE ATTACHED TO THIS DOCUMENT

# of samples required \_\_\_\_\_ # of samples submitted \_\_\_\_\_ 90th Percentile Pb \_\_\_\_\_  
90th Percentile Cu \_\_\_\_\_

THE RESULTS OF WATER QUALITY PARAMETER SAMPLES MUST BE ATTACHED TO THIS DOCUMENT

# of samples required \_\_\_\_\_ # of tap samples submitted \_\_\_\_\_  
# of entry point samples required \_\_\_\_\_ # of entry point samples submitted \_\_\_\_\_

### CHANGE OF SAMPLING SITES

Original site address:

\_\_\_\_\_  
\_\_\_\_\_

New site address:

\_\_\_\_\_  
\_\_\_\_\_

Distance between sites (approximately):

\_\_\_\_\_

Targeting Criteria: NEW:

OLD:

Reason for change (attach additional pages if necessary):

\_\_\_\_\_  
\_\_\_\_\_

SIGNATURE

\_\_\_\_\_

NAME

TITLE

DATE

# REQUEST FOR REDUCED LEAD AND COPPER TAP WATER

System's Name: \_\_\_\_\_ Type: ☐ CWS ☐ NTNCWS

Address: \_\_\_\_\_ Size: ☐ > 100,000  
 \_\_\_\_\_ ☐ 10,001 to 100,000  
 \_\_\_\_\_ ☐ 3,301 to 10,000  
 \_\_\_\_\_ ☐ 501 to 3,300  
 \_\_\_\_\_ ☐ 101 to 500  
 \_\_\_\_\_ ☐ ≤ 100

Telephone number: \_\_\_\_\_

System ID #: \_\_\_\_\_

Contact Person: \_\_\_\_\_

## REQUEST FOR REDUCTION

The \_\_\_\_\_ water system has:

- ☐ maintained tap water levels below the lead/copper action level(s); or
- ☐ operated in accordance with the state-specified water quality parameters during each of the following six-month monitoring periods:

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

The above named water system hereby requests that the state permit the system to reduce lead and copper tap water monitoring from:

- |  |                                    |
|--|------------------------------------|
| <input type="checkbox"/> Biannual to Annual  | <input type="checkbox"/> 100 to 50 |
|  | <input type="checkbox"/> 60 to 30  |
|  | <input type="checkbox"/> 40 to 20  |
| <input type="checkbox"/> Annual to Triennial | <input type="checkbox"/> 20 to 10  |
|  | <input type="checkbox"/> 10 to 5   |

The results of all water quality parameter samples and lead and copper tap water samples collected during each of the monitoring periods are summarized and attached.

SIGNATURE

\_\_\_\_\_

NAME

TITLE

DATE

\_\_\_\_\_

\_\_\_\_\_

[illegible]

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**MATERIALS SURVEY RESULTS BY NUMBER OF SERVICE CONNECTIONS  
FOR EACH PLUMBING MATERIALS TYPE**

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PWS FRDS NUMBER

POPULATION SERVED BY PWS

Type of Structure	Type of Plumbing Material				
	Interior Plumbing			Distribution System Piping	
	Lead Pipe	Copper > 1982	Copper < 1983	LSLs	
				Entire Line	Partial Line
	Number of Service Connections			Number of Service Connections	
SFRs					
MFRs					
BLDGs					
TOTAL					

## SUMMARY OF MATERIALS SURVEY RESULTS

PWS FRDS NUMBER

POPULATION SERVED BY PWS

Plumbing Material	Type of Structure		
	SFR	MFR	BLDG
	Number of Service Connections		
Interior Plumbing			
Lead Pipe			
Copper Pipe With Lead Solder > 1982			
Copper Pipe With Lead Solder < 1983			
Service Lines			
LSLs			
Entire Line			
Partial Line			
Total Available Sites			