

Addressing Lead in Drinking Water: The Lead and Copper Rule Revisions (LCRR)

May 17, 2021

Congressional Research Service

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R46794



R46794

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Lead's adverse health effects—especially for children, even at low levels of exposure—have driven continuing efforts to reduce lead exposure through drinking water. Primarily, lead enters drinking water after leaving the treatment plant, when lead may leach into water from plumbing materials or pipes. Accordingly, controlling corrosion of plumbing and pipes has been the principal method used to keep lead from entering public water supplies. Congress has used several approaches under the Safe Drinking Water Act (SDWA) to limit lead in drinking water. These approaches include limiting the lead content of plumbing materials and fixtures; establishing public notification and education requirements; authorizing the U.S. Environmental Protection Agency (EPA) to regulate contaminants in public water supplies; and authorizing grant programs for lead reduction projects, testing for lead in water at schools and child care programs, and removing lead-lined drinking water coolers from schools.

Using SDWA authorities, EPA developed the 1991 Lead and Copper Rule (LCR). The LCR is unlike most drinking water regulations. It does not include a health-based standard (i.e., maximum contaminant level [MCL]); rather, the rule established a treatment technique and *action levels*. The LCR specifies an action level of 15 ppb for lead (and 1,300 ppb for copper), based on the 90th percentile of a water system's tap water samples (i.e., 90% of samples collected as a part of tap water monitoring should provide water with lead and copper levels below 15 ppb and 1,300 ppb, respectively). The LCR's treatment technique includes (1) corrosion control treatment, (2) source water treatment, (3) lead service line (LSL) replacement, and (4) public education. Unlike an MCL, an action level is not an enforceable standard, but is instead a screening tool for determining whether treatment technique actions are required. Failure to implement the required actions is enforceable.

Since promulgation of the LCR, lead exposures from drinking water have declined in the United States. However, ongoing detections of lead in drinking water and issues with implementation and interpretation of the LCR, as well as scientific and technological advancements, have generated interest in its revision. EPA issued interim revisions in 2007, and has since worked with states, water systems, and other stakeholders to develop comprehensive, “long-term” revisions to the rule.

EPA published final Lead and Copper Rule Revisions, or LCRR, in the *Federal Register* on January 15, 2021, with an effective date of March 16, 2021. The LCRR revises the LCR. On January 20, 2021, the Biden Administration issued a letter directing executive agencies and departments to delay for 60 days the effective date of rules published in the *Federal Register* that had not yet entered into effect, to allow the Administration to review such rules. After the review, EPA announced the extension of the LCRR's effective date from March 16, 2021, until June 17, 2021, and proposed to delay the rule's effective date to December 16, 2021. In the preamble to the LCRR, EPA notes the need to modernize and improve the LCR by strengthening health protections and clarifying requirements to improve the rule's effectiveness and enforceability. The LCRR retains for certain purposes the 1991 LCR's 15 ppb lead action level. However, the LCRR also establishes a new lead “trigger level” at 10 ppb, based on the 90th percentile of tap water samples.

Because the trigger level is more stringent than the action level, the LCRR requires public water systems to take treatment technique actions at lower lead levels than those required by the LCR. The LCRR also requires water systems to identify LSLs within their distribution system and to test for lead at schools and child care programs within their service area to better target monitoring and, as required, LSL replacement. The LCRR requires water system operators to develop an LSL replacement plan and to replace its portion of an LSL within 45 days (or 180 days with state notification) of being notified of a customer's intent to replace their LSL portion. Further, the revisions make several changes to the sampling protocols for conducting tap water monitoring. The LCRR also includes the enhanced public notification requirements added by the Water Infrastructure Improvements for the Nation Act (WIIN; P.L. 114-322).

The revisions may result in implementation and enforcement challenges for public water systems and states with delegated enforcement responsibility for SDWA. Some systems may experience implementation challenges when complying with the revisions; for example, public water systems may need additional financial resources to meet the LSL replacement requirements. The revised rule's alternative compliance options for small water systems could pose particular challenges to states, as states may need additional resources to evaluate, approve, and track each system's implementation.

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Background

Reducing exposures to lead—particularly in children—has long been a public health priority. While primary sources of lead exposure for children continue to be lead-based paint, dust from deteriorated lead-based paint, and soil contaminated by lead, drinking water can also be a source of exposure across communities and households.¹ The federal regulation of lead in tap water and lead in pipes, plumbing materials, and fixtures²—combined with the phase out of leaded gasoline and lead-based paint, and other actions—has reduced exposures to lead in the United States. Since the late 1970s, overall U.S. blood lead levels have declined an estimated 94%.³ Among children aged one to five years, the percentage with blood lead levels of 10 micrograms per deciliter (ug/dL) or more has declined from 88.2% to less than 1%.

Regardless of this progress, elevated lead levels continue to be detected in tap water, particularly in communities with older service lines and older household plumbing containing lead. Given improved understanding of lead's toxicity, federal regulation of lead in drinking water continues to receive congressional attention.

Under the Safe Drinking Water Act (SDWA),⁴ Congress has utilized several policy approaches to mitigate lead in drinking water. These include limiting lead in plumbing materials and fixtures;⁵ and authorizing grant programs for testing for lead in drinking water in schools and child care programs, lead-reduction projects, and replacement of drinking water fountains with lead components.⁶ Further, SDWA authorizes the U.S. Environmental Protection Agency (EPA) to regulate contaminants, such as lead, in water served from public water systems. SDWA regulations apply to public water systems, which can be owned and operated by public entities (e.g., municipalities and local governments) or private entities (e.g., homeowner associations and investor-owned utilities).⁷ SDWA requires EPA to review and revise, as appropriate, each

¹ Agency for Toxic Substances and Disease Registry, *Draft Toxicological Profile for Lead*, Atlanta, GA, May 2019, pp. 2 and 330, <https://www.atsdr.cdc.gov/toxprofiles/tp13.pdf>. Lead in the environment is particularly accessible to children due to their hand-to-mouth behavior and the proximity of their breathing zone to leaded dust. Other sources of lead exposure may include lead smelting and battery recycling.

² In 1986 and several times since, Congress amended the Safe Drinking Water Act (SDWA) to address lead exposures through drinking water. These included (1) limiting lead in plumbing materials and fixtures (SDWA §1417) and (2) authorizing EPA to regulate contaminants, such as lead, in public water systems through national primary drinking water regulations (SDWA §1412). Further, Congress amended SDWA to address lead in child care programs and schools and establish a program to remove lead-lined drinking water coolers (SDWA Part F). Congress has not directly amended SDWA to direct EPA to revise the LCR.

³ Centers for Disease Control and Prevention, “National Health and Nutrition Examination Survey (NHANES): Blood Lead Levels in the U.S. Population,” July 30, 2019, <https://www.cdc.gov/nceh/lead/data/nhanes.htm>. The CDC reports that, from the late 1970s through 2016, the overall estimated geometric mean blood lead level (BLL) of the U.S. population aged 1 to 74 years decreased from 12.8 to 0.82 ug/dL, representing a decline of 93.6%. See also Adrienne S. Ettinger, Perri A. Ruckart, and Timothy Dignam, “Lead Poisoning Prevention: The Unfinished Agenda,” *Journal of Public Health Management and Practice*, vol. 25, no. 1 Supp (January/February 2019), p. S1.

⁴ Safe Drinking Water Act of 1974 (P.L. 93-523), enacted December 16, 1974.

⁵ SDWA §1417; 42 U.S.C. §300g-6. In September 2020, EPA issued regulations implementing the most recent amendments to these provisions. See U.S. Environmental Protection Agency (EPA), “Use of Lead Free Pipes, Fittings, Fixtures, Solder, and Flux for Drinking Water,” 85 *Federal Register* 54235-54259, September 1, 2020.

⁶ SDWA §1412; 42 U.S.C. §§300f et seq.

⁷ SDWA §1412; 42 U.S.C. §300g-1. Public water systems that are subject to LCR requirements include community water systems (CWSs) and nontransient, noncommunity water systems (NTNCWS).

drinking water regulation every six years, and requires that any revisions maintain or provide for increased public health protection.⁸

In 1991, EPA promulgated the Lead and Copper Rule (LCR) to regulate lead levels in tap water. EPA reports that drinking water exposures have declined significantly following the implementation of the 1991 LCR, resulting in major improvements to public health.⁹ However, the agency notes that “despite this progress, there is a compelling need to modernize and improve the rule by strengthening its public health protections and clarifying its implementation requirements to make it more effective and more readily enforceable.”¹⁰

Widely recognized issues associated with the LCR include (1) variability of tap-water monitoring protocols; (2) the clarity and effectiveness of corrosion control requirements to prevent lead in plumbing materials from leaching into water; (3) the adequacy of public notification and reporting requirements; (4) lead service line (LSL) replacement requirements, practices, and costs; and (5) the overall complexity of the rule, which may affect its implementation and enforcement. Among the LCR implementation challenges, EPA specifically noted “the degree of flexibility and discretion it affords systems and primacy states with regard to optimization of corrosion control treatment; compliance sampling practices, which in some cases, may not adequately protect from lead exposure; and limited specific focus on key areas of concern such as schools.”¹¹

Since 1991, EPA has made several revisions to the LCR. SDWA requires that any revisions to drinking water regulations maintain or provide for greater public health protection.¹² EPA initiated a comprehensive review of the LCR in 2004, after detection of widespread elevated lead levels in drinking water in Washington, DC, following a change in water treatment; the incident raised concerns over the LCR’s effectiveness and implementation.¹³ To determine whether the problem in Washington, DC, was more widespread and to evaluate the effectiveness of the lead rule, EPA undertook a national review, including a review of the results of lead monitoring conducted by water systems from 2000 through 2003. After the review, EPA did not find “a national problem comparable to the situation observed in the District of Columbia in 2004,” but did identify several changes to improve the rule’s clarity and implementation that were incorporated in the 2005 Drinking Water Lead Reduction Plan.¹⁴ This plan outlined both short- and long-term goals to improve the implementation of the LCR. EPA determined that short-term regulatory revisions were needed to address source water or treatment changes, monitoring, customer awareness, and LSL replacement. In 2007, EPA issued short-term and intermediate clarifications and revisions to the LCR. After promulgating these “short-term” revisions in 2007, EPA worked with states, water utilities, and other stakeholders to develop comprehensive, “long-term” revisions to the rule to address implementation issues, and to revise the rule based on an

⁸ SDWA §1412(b)(9); 42 U.S.C. §300g-1(b)(9).

⁹ U.S. Environmental Protection Agency (EPA), “National Primary Drinking Water Regulations: Lead and Copper Rule Revisions,” 86 *Federal Register* 4198-4200, January 15, 2021.

¹⁰ U.S. Environmental Protection Agency (EPA), “National Primary Drinking Water Regulations: Lead and Copper Rule Revisions,” 86 *Federal Register* 4198-4200, January 15, 2021.

¹¹ Office of Management and Budget, Office of Information and Regulatory Affairs, *Fall 2019 Unified Agenda of Regulatory and Deregulatory Actions*, National Primary Drinking Water Regulations for Lead and Copper: Regulatory Revisions, Fall 2019, <https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=201910&RIN=2040-AF15>.

¹² SDWA §1412(b)(9); 42 U.S.C. §300g-1(b)(9).

¹³ David Nakamura, “Water in D.C. Exceeds EPA Lead Limits,” *Washington Post*, January 31, 2004, pp. A1, A11.

¹⁴ EPA, *Drinking Water Lead Reduction Plan*, EPA 810-F-05-001, Washington, DC, March 2005, <http://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10051WL.txt>.

improved understanding of the health effects of lead exposures at low levels and advancements in corrosion control practices.

In 2013, Congress directed EPA to consult with and seek advice from the National Drinking Water Advisory Council (NDWAC) on potential revisions to the LCR.¹⁵ In 2015, NDWAC approved its working group's extensive set of recommendations for the long-term revisions to the LCR and submitted them to EPA.¹⁶ Among other recommendations, NDWAC urged EPA to revise the rule to

- establish a proactive LSL replacement program and encourage water systems to include such costs in their capital improvement programs;
- strengthen public education requirements;
- strengthen corrosion control requirements to include a requirement that water systems review updated EPA guidance;
- modify monitoring requirements to provide for consumer requested samples and to use samples to inform consumer actions, inform health agencies, and review corrosion control;
- establish a health-based household action level that triggers a report to the consumer and local health agency;
- increase water quality parameter monitoring; and
- establish appropriate compliance and enforcement mechanisms.¹⁷

In addition to making these recommendations, NDWAC cautioned that “reduction of exposures to lead in drinking water cannot be achieved by EPA regulation alone.”¹⁸ The council's report identifies shared responsibilities among federal, state, and local governments; utilities; and consumers. NDWAC urged EPA—in cooperation with other federal agencies—to lead a national effort to reduce lead in drinking water. In support of these objectives, the President's Task Force on Environmental Health Risks and Safety Risks to Children, which is jointly led by EPA and the Department of Health and Human Services, issued the *Federal Action Plan to Reduce Childhood Lead Exposures and Associated Health Impacts* in December 2018 to coordinate federal agency efforts on lead.¹⁹

¹⁵ 42 U.S.C. §300g-6 note, P.L. 113-64, §3.

¹⁶ National Drinking Water Advisory Council (NDWAC) Lead and Copper Rule Working Group, *Report of the Lead and Copper Rule Working Group To the National Drinking Water Advisory Council*, August 24, 2015, <https://www.epa.gov/sites/production/files/2017-01/documents/ndwaclcrwgfinalreportaug2015.pdf>. Letter from NDWAC to Gina McCarthy, EPA Administrator, December 15, 2015, https://www.epa.gov/sites/production/files/2017-01/documents/ndwacrecommtoadmin121515_0.pdf.

¹⁷ Letter from NDWAC to Gina McCarthy, EPA Administrator, December 15, 2015, https://www.epa.gov/sites/production/files/2017-01/documents/ndwacrecommtoadmin121515_0.pdf.

¹⁸ NDWAC Lead and Copper Rule Working Group, *Report of the Lead and Copper Rule Working Group to the National Drinking Water Advisory Council*, p. 6.

¹⁹ President's Task Force on Environmental Health Risks and Safety Risks to Children, *Federal Action Plan to Reduce Childhood Lead Exposures and Associated Health Impacts*, Washington, DC, December 2018, https://www.epa.gov/sites/production/files/2018-12/documents/fedactionplan_lead_final.pdf. The President's Task Force on Environmental Health Risks and Safety Risks to Children was established pursuant to Executive Order 13045, issued in 1997, and is composed of 17 federal departments and offices.

On November 13, 2019, EPA published proposed comprehensive revisions to the LCR in the *Federal Register*²⁰ and solicited public comment on the proposed rule.²¹ On January 15, 2021, EPA promulgated the final rule with an effective date of March 16, 2021.²² EPA issued these “long-term” revisions to the LCR (Lead and Copper Rule Revisions, or LCRR) after a lengthy effort to revise the rule. As discussed above, EPA began its efforts in 2004 when high levels of lead were detected in Washington, DC, and promulgated short-term revisions to the LCR in 2007, while working on long-term revisions that continued as the events in Flint, MI, highlighted that the rule had several implementation issues.²³

During that time, Congress made several amendments to SDWA to address lead specifically (see **Appendix**). The LCRR includes changes to address those SDWA amendments, as well as the recommendations of NDWAC. As required by SDWA, the revised rule is intended to provide greater and more effective protection of public health.²⁴ The LCR includes requirements for public water systems to control both lead and copper levels in drinking water. This report analyzes implementation issues of the LCR (e.g., variability of tap-water monitoring protocols, clarity and effectiveness of corrosion control requirements, and adequacy of public notification and reporting requirements) and discusses how the LCRR is intended to address such issues. The report focuses on the lead-related provisions of the LCR and LCRR.

On January 20, 2021, the Biden Administration issued a memorandum directing executive agencies and departments to consider postponing for 60 days from January 20, 2021, the effective date of rules published in the *Federal Register* that had yet to enter into effect, to allow the Administration to review such rules.²⁵ On March 12, 2021, EPA announced that the agency will extend the effective date of the LCRR from March 16, 2021, until June 17, 2021, and issued a second notice proposing to delay the rule’s effective date to December 16, 2021, with water systems needing to be in compliance by September 16, 2024.²⁶

²⁰ EPA, “National Primary Drinking Water Regulations: Proposed Lead and Copper Rule Revisions,” 84 *Federal Register* 61684-61774, November 13, 2019.

²¹ EPA, “National Primary Drinking Water Regulations: Lead and Copper,” 84 *Federal Register* 69695, December 19, 2019.

²² EPA, “National Primary Drinking Water Regulations: Lead and Copper Rule Revisions,” 86 *Federal Register* 4198-4312, January 15, 2021.

²³ See EPA website “Flint Drinking Water Response” at <https://www.epa.gov/flint>.

²⁴ EPA, “National Primary Drinking Water Regulations: Lead and Copper Rule Revisions,” 86 *Federal Register* 4198, January 15, 2021. EPA identified quantitative and nonquantitative benefits and costs associated with the LCRR (86 *Federal Register* 4249-4267). Such costs and benefits are not discussed in this report.

²⁵ Ronald A. Klain, Assistant to the President and Chief of Staff, Memorandum for the Heads of Executive Departments and Agencies, January 20, 2021, <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/20/regulatory-freeze-pending-review/>. Specifically, the memo states that “with respect to rules that have been published in the *Federal Register*, or rules that have been issued in any manner, but have not taken effect, consider postponing the rules’ effective dates for 60 days from the date of this memorandum, consistent with applicable law and subject to the exceptions described in paragraph 1, for the purpose of reviewing any questions of fact, law, and policy the rules may raise.”

²⁶ EPA, “National Primary Drinking Water Regulations: Lead and Copper Rule Revisions; Delay of Effective Date,” 86 *Federal Register* 14003-14006, March 12, 2021. EPA, “National Primary Drinking Water Regulations: Lead and Copper Rule Revisions; Delay of Effective and Compliance Dates,” 86 *Federal Register* 14063-14066, March 12, 2021. The comment period for proposed changes to the effective date and compliance date ended April 12, 2021.

Main Provisions of the Lead and Copper Rule (LCR) and Lead and Copper Rule Revisions (LCRR)

EPA regulates lead and other contaminants in drinking water under the authority of the Safe Drinking Water Act (SDWA).²⁷ Lead is regulated through LCR, which EPA promulgated in 1991.²⁸ The LCR replaced a lead standard of 50 micrograms per liter ($\mu\text{g/L}$, or parts per billion [ppb]), which was measured at the water treatment plant but not at a customer's tap.²⁹ However, lead primarily enters water after it leaves the treatment plant as it travels through the distribution system to the water tap. This occurs where water is corrosive and lead is leached from lead-containing pipes, plumbing materials, and fixtures (e.g., faucets) present in the distribution system and premise plumbing.³⁰ To address this, EPA developed a rule that requires sampling water at the tap, rather than at the treatment plant. Further, the LCR does not include an enforceable standard (i.e., maximum contaminant level [MCL]), as is often the case for drinking water regulations; rather, the rule established a treatment technique that is triggered when the rule's "action levels" are exceeded.³¹ Unlike an MCL, an action level is not a health-based standard but, rather, a screening tool for determining whether treatment technique actions are required.³² According to NDWAC, "the lead action level is based on the practical feasibility of reducing lead through controlling corrosion."³³ An exceedance of the action level is not a violation of the rule but triggers other actions that a water system is required to take. A water system violates the LCR if the system does not take the required actions after an exceedance.

The LCR "action level" is 15 ppb for lead (and 1,300 ppb for copper), based on the 90th percentile level of a system's tap water samples.³⁴ If more than 10% of samples collected during a monitoring period exceed the action level, the water system must take specified actions that depend upon the system's size and corrosion control treatment status.³⁵ The required actions (which comprise the treatment technique and are enforceable) include (1) corrosion control

²⁷ SDWA §1412; 42 U.S.C. §300f et seq. The LCR includes requirements to control copper leaching into drinking water. This report focuses on lead-related provisions of the existing and proposed rules.

²⁸ EPA has made several minor revisions to the LCR since 1991 and promulgated a set of "short-term revisions" and clarifications in 2007. See EPA, "National Primary Drinking Water Regulations for Lead and Copper: Short-Term Regulatory Revisions and Clarifications," 72 *Federal Register* 57781-57820, October 10, 2007.

²⁹ 40 C.F.R. Part 141 Subpart I. The 1991 Lead and Copper Rule replaced an interim drinking water regulation (with an enforceable standard of 50 ppb), which EPA had promulgated in 1975.

³⁰ The National Research Council defined "premise plumbing" as that portion of the distribution system from the main water meter to the consumer's tap in homes, schools, and other buildings. Corrosion is a chemical reaction between the water and the plumbing materials. Factors affecting corrosion include changes in water treatment that affect the water's acidity, temperature, water use patterns, and the presence or absence of protective coatings of mineral deposits that can accumulate inside pipes, among other factors.

³¹ If the treatment of a contaminant is not feasible—technologically or economically—EPA may establish a treatment technique in lieu of an MCL. SDWA §1412(b)(7)(A); 42 U.S.C. 300g-1(b)(7)(A).

³² EPA, *Understanding the Lead and Copper Rule*, Washington, DC, September 2019, https://www.epa.gov/sites/production/files/2019-10/documents/lcr101_factsheet_10.9.19.final_.2.pdf.

³³ NDWAC Lead and Copper Rule Working Group, *Report of the Lead and Copper Rule Working Group to the National Drinking Water Advisory Council*, p. 8.

³⁴ If more than 10% of tap samples exceed 15 ppb, then the public water system is required to take actions specified in the treatment technique.

³⁵ 40 C.F.R. §141.80.

treatment optimization, (2) water quality parameter monitoring,³⁶ (3) source water monitoring, (4) LSL replacement, and (5) public notification and education.

The LCR requires community water systems (CWSs) and nontransient, noncommunity water systems (NTNCWS) to monitor for lead and copper at a specified number of taps within their service area.³⁷ The monitoring requirements vary according to water system size and other factors.³⁸ The LCR generally requires water system operators to obtain test results from taps at homes or multifamily residences, when such residences comprise more than 20% of structures served by the water system, at high risk of lead contamination (i.e., with known LSLs or lead plumbing) if sufficient sites can be identified.³⁹ Sampling results must be provided to water users at tested sites. EPA reported that more than 95% of public water systems reported no lead action-level exceedances in the past three years.⁴⁰

In the preamble to the LCRR, EPA explained that the new rule is intended to strengthen public health protections against lead by revising several requirements for water systems.⁴¹ These include requiring water systems to take a set of actions when lead is detected at lower levels in tap water than previously required, increasing customer engagement and public awareness, revising tap sampling procedures to better target the highest risk of lead contamination, and requiring water systems to proactively plan for replacement of LSLs. Among other changes, the LCRR

- establishes a new lead “trigger level” at 10 ppb that would require water systems to take further treatment, monitoring, and public notification actions when the trigger level is exceeded (currently, additional actions are required when the action level [15 ppb] is exceeded);
- clarifies tap sampling procedures and makes some adjustments to prioritized monitoring sites;
- requires public water systems to monitor for lead at elementary schools and child care facilities;
- adds requirements for water systems to inventory LSLs and develop plans for LSL replacement; and
- implements statutory public notification provisions added by the Water Infrastructure Improvements for the Nation (WIIN) Act (P.L. 114-322) by

³⁶ Water quality parameters identified in the LCR are pH; alkalinity; orthophosphate, if a corrosion inhibitor containing a phosphate compound is used; silica, if a corrosion inhibitor containing a silicate compound is used; calcium; conductivity; and water temperature.

³⁷ 40 C.F.R. §141.80(a). Public water systems can be privately or publicly owned and are composed of three subcategories: (1) CWSs that regularly serve the same residences year-round, (2) NTNCWSs, such as schools and factories, which have their own water supplies and generally serve the same individuals for more than six months, and (3) transient noncommunity water systems, such as campgrounds and gas stations, which provide their own water to transitory customers (SDWA §1401(15); 42 U.S.C. §300f(15)).

³⁸ For purposes of the LCR, small water systems serve 25 to 3,300 individuals; medium water systems serve 3,301 to 50,000 individuals; and large water systems serve more than 50,000 individuals (40 C.F.R. §141.81(a)).

³⁹ 40 C.F.R. §141.86(b).

⁴⁰ EPA, “National Primary Drinking Water Regulations: Proposed Lead and Copper Rule Revisions,” 84 *Federal Register* 61685, November 13, 2019.

⁴¹ 86 *Federal Register* 4201.

requiring notification within 24 hours of an exceedance of the system-wide lead action level.⁴²

Lead Action Level and Trigger Level

Both the LCR and the LCRR require that, if more than 10% of samples collected during a monitoring period exceed the 15 ppb lead action level, a water system must take additional actions, which vary according to the system's size and corrosion control treatment status. Large water systems (those serving more than 50,000 for purposes of the lead regulations) are required to maintain optimized corrosion control. Smaller systems that conducted initial monitoring and did not exceed the action level are initially deemed to have achieved corrosion control. If large systems (or smaller systems that have already optimized corrosion control treatment) exceed the lead action level, the systems must (1) take actions to notify and educate the public, (2) monitor source water and water quality parameters, and (3) begin replacing LSLs.

LCRR establishes another level, the "lead trigger level," at 10 ppb,⁴³ below the action level and above 5 ppb, which is the lowest lead concentration that can be reliably measured.⁴⁴ Similar to the action level, the trigger level is not a health-based standard. Paralleling LCR requirements for an action-level exceedance, water systems that have a system-wide trigger-level exceedance are required to take various actions, which depend on the water system's characteristics (e.g., size, corrosion control treatment status, or presence of LSLs). In addition, an exceedance of the trigger level, like the action level, would prompt a water system to take planning, monitoring, treatment, and LSL replacement actions. In the preamble to the LCRR, EPA states that the new trigger level will help water systems prioritize actions to control lead prior to an action level-exceedance (and reduce the likelihood of an exceedance), and will assist states in identifying and working proactively with systems with higher lead levels.⁴⁵ By requiring water systems to take action after a trigger-level exceedance, the LCRR may prompt water systems to address the presence of lead in the distribution system at lower levels than the action level.

Tap Water Monitoring

Lead primarily enters drinking water after leaving the treatment plant. Accordingly, the LCR has always included requirements to monitor for lead (and copper) at household taps. Water systems are required to monitor every six months at a specified number of taps based on water system size.⁴⁶ Since its 1991 promulgation, the LCR has allowed public water systems to reduce monitoring frequency for lead and copper, under certain conditions. Water systems that do not exceed the lead and copper action levels during two initial six-month monitoring periods can reduce monitoring to an annual basis. To qualify for reduced monitoring, large systems that meet

⁴² The Water Infrastructure Improvements for the Nation (WIIN) Act (P.L. 114-322), §2106, amended SDWA §1414(c) to require public notification within 24 hours of system-level action-level exceedance that could result in serious adverse health effects as a result of short-term exposure. Prior to these amendments, §1414(c) required 24-hour notification only for *violations* with potential to have serious adverse health effects. An action-level exceedance is not a violation of the LCR and, thus, was not covered by this provision. Other amendments to SDWA §1414(c) are outlined in the **Appendix**.

⁴³ 40 C.F.R. §141.80(c).

⁴⁴ 86 *Federal Register* 4207. The lowest concentration of a substance that can be reliably measured is called the *practical quantitation limit*.

⁴⁵ 86 *Federal Register* 4208.

⁴⁶ 40 C.F.R. §141.86.

the action levels for two monitoring periods are also required to maintain state-established water quality parameters for optimal corrosion control and receive state approval.⁴⁷

The LCR allows public water systems to further reduce monitoring frequency. Generally, water systems that do not exceed the lead and copper action levels for three years can reduce monitoring frequency to a triennial basis. Large water systems that meet the lead and copper action levels for three years can monitor on a triennial basis if the system maintains state-established water quality parameters and receives approval from the state. Triennial monitoring is also available for water systems when both lead and copper results are at or below 5 ppb or 650 ppb, respectively, for two consecutive six-month monitoring periods. Small water systems can apply to the state for a waiver that allows such systems to monitor for lead and copper every nine years.⁴⁸ As revised in 2007, the LCR requires water systems to provide households with notice of their individual tap sample results from lead testing within 30 days of receiving results.⁴⁹

To support the rule's progressive set of actions, the LCRR makes several changes to the tap monitoring frequency. The LCRR uncouples monitoring for lead and copper, which may allow for more frequent tap water monitoring for lead than for copper.⁵⁰ Such changes parallel NDWAC's recommendations to "separate lead and copper risk management, refocusing attention to where there may be a problem with copper without increasing the burden on systems where there is not a problem."⁵¹

The LCRR provides increased stringency by lowering the lead level at which public water systems could qualify for reduced monitoring frequency. Under the LCR, water systems could be eligible for reduced monitoring frequency after not exceeding the action level for two consecutive six-month monitoring periods. The LCRR lowers the level at which water systems could reduce monitoring frequency to the lead trigger level.⁵² For large water systems to be eligible for reduced monitoring under the LCRR, such systems must not exceed the lead trigger level for two consecutive six-month monitoring periods; paralleling the LCR, these systems must also maintain state-established water quality parameters for optimal corrosion control and receive state approval.⁵³

The LCRR maintains the monitoring frequency reductions (i.e., once every three years) for qualified water systems under similar conditions to the LCR. That is, systems that do not exceed the action level for three years, and meet other requirements, may reduce monitoring frequency.⁵⁴ Under the LCRR, however, a water system is eligible for monitoring frequency reductions when the system does not exceed the trigger level for three years.⁵⁵

⁴⁷ 40 C.F.R. §141.86(d)(4).

⁴⁸ 40 C.F.R. §141.86(d)(4).

⁴⁹ 40 C.F.R. §141.85(d).

⁵⁰ Under the revisions, copper would be subject to the same monitoring requirements as the current LCR.

⁵¹ NDWAC Lead and Copper Rule Working Group, *Report of the Lead and Copper Rule Working Group to the National Drinking Water Advisory Council*, p. 37.

⁵² The LCRR retains that a water system not exceed the copper action level in order to qualify for reduced monitoring frequency.

⁵³ 86 *Federal Register* 4299.

⁵⁴ The revisions authorize monitoring on a three-year basis for large water systems that meet the lead trigger level for three years, provided these systems comply with state-established water quality parameters. Reduced monitoring is subject to state approval.

⁵⁵ 86 *Federal Register* 4299.

Under the LCR, water system operators are required to obtain water samples from taps at homes or multifamily residences when such buildings comprise more than 20% of structures served by the water system at high risk of lead contamination. Water systems with LSLs must collect 50% of samples from single- or multiple-family residences served by LSLs or copper pipes with lead solder, if sufficient sites can be identified.⁵⁶

The LCRR is intended to increase the likelihood of capturing the highest levels of lead in drinking water taps by revising selection criteria to better target high-risk sites for lead contamination. The revised rule generally requires all samples to be taken from single-family structures served by LSLs, to the degree sufficient sites are available.⁵⁷ The LCRR is also intended to increase customer awareness of monitoring results. Under the LCRR, public water systems are required to provide sampling results to water users at tested sites and to notify any customer with a tap sample above the action level within three days.⁵⁸

EPA stated that the agency “is aware that some water systems have provided sampling procedures to residents that included recommendations that may inadvertently reduce the lead levels detected.”⁵⁹ Examples of such instructions included recommendations to run the water from the tap (or so-called flushing) prior to the beginning of the required six-hour stagnation period.⁶⁰ EPA issued a memorandum in February 2016 to clarify the allowable sample collection procedures.⁶¹ Consistent with the 2016 memorandum, the LCRR adds more specificity and clarity to permissible sample collection procedures and prohibits certain collection practices. For example, in contrast to the LCR, the revisions specify that sampling instructions for customers may not include instructions to flush tap water or to remove and clean aerators prior to sample collection.⁶²

The 1991 LCR requires tap samples to be “first draw” samples with certain exceptions, without further stipulating sample collection procedures. The express prohibition of certain sample collection procedures in the LCRR is intended to better ensure that sampling captures the highest lead levels in tap water.⁶³ Under the LCRR, all samples are required to be “first draw,” except those samples from taps served by an LSL. The LCRR requires both a first draw sample as well as a fifth liter sample from taps served by an LSL. The fifth liter sample is intended to capture the water in direct contact with the LSL.⁶⁴

School Testing

Although large buildings, such as schools or child care facilities, are unlikely to be served by LSLs, the complex premise plumbing and irregular water use patterns of these facilities may result in a higher potential for elevated lead levels.⁶⁵ Due to the vulnerability of young children

⁵⁶ 86 *Federal Register* 4228-4229.

⁵⁷ Residences served by service lines of unknown material would not be prioritized for LCR monitoring.

⁵⁸ 86 *Federal Register* 4295. The three-day timeline begins when a water system receives tap sample results.

⁵⁹ 84 *Federal Register* 61705.

⁶⁰ 84 *Federal Register* 61705.

⁶¹ Peter Grevatt, Director of EPA Office of Ground Water and Drinking Water, Memorandum on the Clarification of Recommended Tap Sampling Procedures for Purposes of the Lead and Copper Rule, February 29, 2016.

⁶² 86 *Federal Register* 4297.

⁶³ 86 *Federal Register* 4200.

⁶⁴ 86 *Federal Register* 4298.

⁶⁵ 86 *Federal Register* 4231.

(especially under the age of six) to the effects of lead and the long periods of time that children spend in such facilities, the LCRR adds a requirement for CWS operators to collect water samples from schools and child care facilities. Within three years of promulgation, CWS operators are required to identify all schools and child care facilities in the water system's service area and contact them to offer to conduct sampling, within five years of the rule's implementation.

The LCRR requires water systems to sample at least 20% of elementary schools and at least 20% of child care facilities each year until all facilities are contacted.⁶⁶ An elementary school or child care facility may decline to have its taps sampled. The LCRR does not require schools or child care facilities to sample for lead or require them to allow water systems to conduct sampling; however, a CWS is required to conduct sampling at the request of any school or child care facility within its service area. Water systems are required to sample at secondary schools upon the request of the school. States may offer waivers to the school and child care facilities sampling requirements under certain circumstances.⁶⁷

The LCRR requires CWSs to provide public education materials on the health effects of lead to schools and child care facilities. For each facility sampled, water system operators are required to provide the sampling results to the school or child care program within 30 days.⁶⁸ The LCRR requires the water system to provide school and child care monitoring results to the state drinking water agency, and local or state health department, as a part of annual reporting.⁶⁹

Corrosion Control

Lead enters drinking water primarily through the corrosion of lead pipes and plumbing materials, which can be present in a public water system's distribution system and/or in premises served by the system. Corrosion of lead pipes or plumbing materials may result in the dissolution or suspension of lead in water.⁷⁰ Consequently, corrosion control treatment is a key component of the LCR. The LCR requires all water systems that have exceeded the action level to recommend a corrosion control treatment method to the state.⁷¹ Water systems serving 50,000 or fewer persons are considered to have optimal corrosion control if 90% of samples collected as a part of tap water monitoring provide water below the action level. If monitoring results indicate the 90th percentile for lead (or copper) exceeds the action level, such water systems must undertake (1)

⁶⁶ 86 *Federal Register* 4306. Under the revised LCR, schools and child care facilities that were constructed, or replaced all plumbing, after January 1, 2014, or after the date of state-adopted standards that meet the definition of "lead free" are excluded from this requirement.

⁶⁷ 86 *Federal Register* 4307. For example, a state can waive school and child care facility sampling requirements, if the state has an alternative school lead testing program that is consistent with the LCRR.

⁶⁸ Under the LCRR, a water system is required to contact all secondary schools within its service area annually to perform outreach on lead's health risks and notify the schools of how to request sampling. 86 *Federal Register* 4306. The 30-day timeline begins when the water system receives the tap monitoring results.

⁶⁹ 86 *Federal Register* 4305.

⁷⁰ Corrosion is a chemical reaction between the water and the pipes or plumbing materials. Factors affecting corrosion include the water's acidity, temperature, water use patterns, and the presence or absence of protective coatings of mineral deposits that can accumulate inside pipes, among others.

⁷¹ 40 C.F.R. §141.82.

water quality parameter monitoring, (2) corrosion control treatment optimization, and (3) source water monitoring.⁷² CWSs must also notify the public when the lead action level is exceeded.⁷³

The LCR requires systems that have installed corrosion control treatment to continue to maintain corrosion control treatment and meet water quality parameters set by the state. Failure to meet these water quality parameters is a violation of the rule. The LCR also requires that, if a system plans to change the source or treatment of its water, the water supplier must notify the state in advance to evaluate the impact of the proposed change on corrosion control.⁷⁴

Under the LCRR, corrosion control remains a core component of a multifaceted regulatory strategy to limit lead in tap water and reduce lead exposures. The LCRR changes corrosion control requirements for lead (but not for copper). Under the 1991 LCR, public water systems are required to take actions when the lead action level (15 ppb) is exceeded. As revised, these corrosion control actions would be required if a public water system exceeded the lead trigger level (10 ppb): The LCRR requires the system to either conduct a corrosion control treatment study (if required by the state) or reoptimize the corrosion control treatment—depending on the water system’s corrosion control treatment status. For a system with an action-level exceedance, the LCRR requires the system either to install corrosion control treatment (regardless of subsequent monitoring results) or reoptimize the existing corrosion control treatment, depending on whether the system had corrosion control treatment already installed.⁷⁵

The LCRR also clarifies that state agencies are required to review corrosion control treatment and water quality parameter monitoring data as a part of the sanitary survey.⁷⁶ Sanitary surveys are a system-level review of a public water system’s capacity and capability to provide drinking water that meets drinking water regulations.⁷⁷ This includes a review of the water system’s source water, treatment, distribution system, physical infrastructure, and monitoring and reporting requirements. States conduct sanitary surveys of public water systems, with priority given to water systems not in compliance with drinking water regulations.⁷⁸ While a broad review of a public water system’s treatment processes is currently required as a part of the sanitary survey, the LCRR specifies that states are required to review corrosion control treatment and water quality parameter monitoring.⁷⁹

“Find and Fix”

To address individual household samples that exceed the lead action level, the LCRR includes a “find and fix” process for water systems. NDWAC’s recommendations included a similar concept to address situations where a water system has not exceeded the action level (measured at the 90th percentile), though some individual residents may be exposed to levels of lead in the drinking water above the action level. As a part of the “find and fix” process, water systems are required to

⁷² The 1991 rule stipulates that CWSs that have optimized corrosion control and still exceed the lead action level are required to replace at least 7% of their lead service lines (LSLs) annually, until the action level is not exceeded for two consecutive six-month monitoring periods.

⁷³ 40 C.F.R. §141.85.

⁷⁴ 40 C.F.R. §141.82.

⁷⁵ 86 *Federal Register* 4287-4290.

⁷⁶ 86 *Federal Register* 4310.

⁷⁷ 40 C.F.R. §§142.14-142.16.

⁷⁸ 40 C.F.R. §142.10(b)(2).

⁷⁹ 86 *Federal Register* 4310.

perform follow-up water quality monitoring and sampling at or near sites where samples at individual taps exceed the lead action level. Water systems are required to notify the customer/persons served at the site within 24 hours of an individual lead action-level exceedance. To determine whether the cause of the exceedance is ineffective corrosion control or site-specific plumbing materials, the revisions require water systems to take two actions. Within five days, water systems are required to perform water quality monitoring at a location and time as close as replicable to the tap sample with the lead action-level exceedance.⁸⁰ Within 30 days, water systems are required to collect a follow-up sample at the tap with the previous lead action-level exceedance. Based on these steps, water systems would employ mitigation strategies (e.g., an adjustment to corrosion control treatment or flushing portions of the distribution system) to address the cause of the exceedance, if possible. Together, these steps are intended to help water systems identify whether water-system-level actions need to be taken to address elevated lead levels, or whether the elevated lead levels are caused by household-specific characteristics (e.g., interior plumbing).⁸¹

Lead Service Lines

Until Congress prohibited the use of lead in pipes, pipe fittings, and fixtures in 1986, lead was widely used in plumbing materials.⁸² Pre-1900s to about the 1930s, lead pipes, known as lead service lines (LSLs), were commonly used to extend water service from the water main under the street to a residence or other building inlet.⁸³ As a result of lead's wide use, EPA estimates that currently 6.3 million to 9.3 million homes are served by LSLs, in addition to the numerous older buildings with lead solder and lead-containing faucets.⁸⁴ Given the prevalence of lead in plumbing materials, the LCR relies primarily on corrosion control to prevent lead from leaching into drinking water. If a water system is unable to reduce the lead levels via corrosion control, the rule requires water systems to replace its portion of LSLs. Specifically, the 1991 LCR required CWSs that have optimized corrosion control and still exceed the lead action level to replace at least 7% of their LSLs annually until the action level is not exceeded for two consecutive six-month monitoring periods.⁸⁵ The LCR did not require full LSL replacement: a water system is required to offer to replace a customer's portion of an LSL at the customer's expense. Under the 1991 rule, water systems could use sample results from the next monitoring period to "test out" of the 7% LSL replacement requirement if the system-wide action level was not exceeded.⁸⁶ This

⁸⁰ Small systems are required to perform such monitoring within 14 days.

⁸¹ 86 *Federal Register* 4235-4237.

⁸² 86 *Federal Register* 4199. The Safe Drinking Water Act Amendments of 1986 (P.L. 99-339) prohibited the use of pipes, pipe fittings, solder, and flux that were not "lead-free" (which the 1986 amendments defined as having no more than 8% lead) in the installation or repair of a water system or in plumbing used to provided water for human consumption (SDWA §1417(d)). In P.L. 111-380, Congress revised the definition of "lead-free" to be "not more than a weighted average of 0.25% lead when used respect to wetted surfaces of pipes, pipe fittings, plumbing fixtures, and fixtures."

⁸³ David A. Cornwall, Richard A. Brown, and Steve H. Via, "National Survey of Lead Service Line Occurrence," *Journal AWWA*, vol. 108, no. 4 (April 1, 2016), p. E190.

⁸⁴ 86 *Federal Register* 4199. In 2020, the U.S. Government Accountability Office (GAO) made several recommendations to EPA to update guidance to better identify LSLs in communities. GAO, *Drinking Water: EPA Could Use Available Data to Better Identify Neighborhoods at Risk of Lead Exposure*, 21-78, December 18, 2020, <https://www.gao.gov/products/gao-21-78>.

⁸⁵ For more information on LSL issues, see CRS In Focus IF11302, *Controlling Lead in Public Drinking Water Supplies*, by Elena H. Humphreys.

⁸⁶ 40 C.F.R. §141.84(c).

authority to test out using sample results meant that most water systems were only temporarily subject to a 7% replacement rate. Water systems that did not exceed the lead action level for two consecutive monitoring periods could discontinue LSL replacement.⁸⁷

Under the 1991 LCR, water systems were required to complete an evaluation of construction materials used in the distribution system, when initial sampling began. The LCR did not require systems to update the materials evaluation. The LCRR requires all water systems to develop an inventory of LSLs (or demonstrate their absence) within three years of promulgation of the final rule. Based on a system's tap sampling frequency, water systems with LSLs or service lines of unknown material are required to update their inventory annually or triennially. If the water system cannot confirm that a service line is not constructed from lead, these service lines are designated as "unknown." Galvanized service lines downstream from an LSL must also be identified in the inventory.⁸⁸ All water systems are required to make the inventories publicly available. Large water systems, serving more than 50,000 persons, are required to post such LSL inventories on the internet.⁸⁹

As recommended by NDWAC, the LCRR gives CWSs with LSLs or service lines of unknown materials three years to develop a plan to replace all LSLs in their system. The plan must include the following elements: (1) procedures for full LSL replacement, (2) an LSL replacement goal rate for water systems serving 100,000 or more individuals in the case of a trigger-level exceedance, (3) public notification procedures prior to a full or partial LSL replacement, and (4) a funding strategy that also considers customers who wish to replace their LSL portion but are unable to cover the costs. For the purpose of calculating LSL replacement rates, service lines of unknown material and galvanized service lines are included in the count of LSLs.⁹⁰

If a water system serving more than 10,000 persons exceeds the action level, the system is required to replace 3% of the LSLs annually based on a two-year rolling average until the action level is not exceeded for four consecutive six-month monitoring periods. Unlike the LCR, the LCRR does not allow water systems to "test out" of the 3% LSL replacement requirement using tap sample results below the action level for two consecutive six-month monitoring periods.

Service lines of unknown material and galvanized service lines are considered LSLs for the purposes of establishing the 3% replacement rate and conducting consumer outreach. Partial LSL replacement would not count toward the 3% replacement rate or replacement goal. If the state determines it is feasible, water systems may be required to conduct LSL replacement on a shorter schedule (i.e., at an increased rate from 3% annually).⁹¹

The LCRR does not require water systems to pay to replace a privately owned portion of an LSL, but a system is required to give notice and offer to replace the owner's portion of the line at the owner's expense. The LCRR requires water systems to develop financial assistance strategies for consumers who are unable to pay for replacement of their LSL portion, while not obligating the water system to pay for such replacement. If a consumer chooses to replace their portion, the water system would be required to replace the system's portion of the LSL within 45 days of learning of a consumer's replacement or intent to replace their LSL portion. If a water system

⁸⁷ 40 C.F.R. §141.84(f).

⁸⁸ Galvanized service lines are pipes that have a protective zinc coating to prevent corrosion and rust. Lead particles can attach to the surface of galvanized pipes.

⁸⁹ 86 *Federal Register* 4283-4284; 86 *Federal Register* 4290-4294.

⁹⁰ 86 *Federal Register* 4291-4292.

⁹¹ 86 *Federal Register* 4293-4294.

could not meet the 45-day time frame, the water system would be required to notify the state, and replace within 180 days the water system's portion of the LSL.⁹²

The LCRR requires public water systems to provide pitcher filters and replacement cartridges to customers for various situations. Full or partial LSL replacement triggers a requirement for public water systems to provide customers served by those lines with pitcher filters and replacement cartridges for six months. The revisions also require replacement of other lead piping (i.e., goosenecks, pigtails, and connectors) that are encountered in the course of planned or emergency infrastructure work. After the replacement of such lead pipe fittings, the water systems are required to provide affected customers with pitcher filters and replacement cartridges for six months.⁹³

Regulatory Flexibility for Certain Water Systems

EPA notes that small systems' limited technical, managerial, and financial capacity to implement complex treatment techniques means that additional compliance flexibility is needed for these systems.⁹⁴ Challenges that small systems may encounter include insufficient revenue to pay for repairs or difficulties accessing financing, retirement of experienced operators and challenges replacing them, and lack of understanding of existing or new regulatory requirements and treatment technologies.⁹⁵ To address these challenges, EPA makes alternative compliance options available for small water systems in the LCRR. If a CWS serving 10,000 or fewer individuals or an NTNCWS exceeds the trigger level (but not the action level), the system is required to collect water quality parameter data, evaluate that data, and select from several compliance options. After selecting the compliance option, the water system is required to notify the state of that option, which the system would implement if it had a system-wide action-level exceedance.

Among the alternative options to address system action-level exceedances, small systems could (1) install or reoptimize corrosion control treatment, (2) install and maintain point-of-use devices and replacement filters to control lead at the tap, or (3) replace all LSLs and lead-bearing plumbing. With these options, EPA provides small water systems with some flexibility in complying with the LCRR.⁹⁶ If the system subsequently has an exceedance of the action level, it is required to implement the state-approved compliance option. Should a small water system or NTNCWS choose LSL replacement as its compliance option, it would have up to 15 years to complete full LSL replacement on a schedule approved by the state. Water systems that use point-of-use devices for their compliance option are required to provide customers with information on the correct use of such devices to effectively reduce lead in tap water.⁹⁷

Public Notification

As required by SDWA, the LCR includes several public notification and education requirements. For premises where samples were taken, the LCR requires public water systems to notify consumers of lead tap water monitoring results as soon as practicable but no later than 30 days after the operator receives the results. If a public water system's sampling results exceed the

⁹² 86 *Federal Register* 4292.

⁹³ 86 *Federal Register* 4292-4295.

⁹⁴ 84 *Federal Register* 61700.

⁹⁵ 84 *Federal Register* 61700.

⁹⁶ 86 *Federal Register* 4219-4221.

⁹⁷ 86 *Federal Register* 4308-4309.

action level, the public water system is required to provide public education materials on the sources of lead and its health effects to “bill paying” consumers and to sample tap water for any consumer who requests it.⁹⁸

In the LCRR, EPA changes several public notification and education provisions to implement SDWA amendments enacted in 2016 in the WIIN Act (P.L. 114-322).⁹⁹ These include requiring public notification within 24 hours of a water system learning of system lead action-level exceedance that could result in serious adverse health effects as a result of short-term exposure. Further, if the water system or state fails to issue a notification within 24 hours, EPA is required to provide such notification.¹⁰⁰ The LCRR requires operators to notify the public within 24 hours of any system lead action-level exceedance and to notify within 24 hours individuals at locations where tap water samples exceed the lead action level.¹⁰¹ For individual notification of tap samples with exceedances, the LCRR specifies the manner in which water systems are required to notify individuals of results and requires water systems to provide public education material to individuals within three days.¹⁰² Under the LCRR, water systems must notify individuals that their results exceed the action level electronically, by phone, or by a method approved by the state.¹⁰³

Building on the LCRR’s requirement for water systems to identify LSLs, the LCRR adds notification procedures specific to the results of the LSL inventory. Pursuant to SDWA Section 1417, the LCRR requires water systems to notify consumers who are served by LSLs, service lines of unknown material, or galvanized service lines, informing them that they are served by such a line and with specified information on potential health effects associated with lead exposure.¹⁰⁴ Water systems are required to notify consumers within 30 days of the completion of the LSL inventory and on an annual basis until the premise is no longer served by an LSL. EPA states that this notification is intended to raise awareness at a household level of potential exposure to lead and that such information may spur individuals to address such potential exposure.¹⁰⁵

The LCRR adds notification requirements regarding when LSLs are disturbed, as well as when the water system implements its goal-based LSL replacement program as a result of a trigger-level exceedance. Should a water system fail to achieve its LSL replacement goal, the revisions require the water system to perform additional outreach activities (e.g., social media campaign).¹⁰⁶

The LCRR requires water systems to conduct annual outreach to state and local health officials to discuss lead sources, health effects of lead, and activities that a water system has taken to address lead at individual houses through “find and fix.”¹⁰⁷ This requirement provides a mechanism for

⁹⁸ 40 C.F.R. §141.85.

⁹⁹ 86 *Federal Register* 4206.

¹⁰⁰ SDWA §1414(c); 42 U.S.C. §300g-3(c).

¹⁰¹ 86 *Federal Register* 4310; 86 *Federal Register* 4240.

¹⁰² The three-day timeline begins when the water system learns of the tap water monitoring results. 86 *Federal Register* 4295.

¹⁰³ 86 *Federal Register* 4295.

¹⁰⁴ SDWA §1417, added by the Safe Drinking Water Act Amendments of 1986 (P.L. 99-339), states that “notice shall be provided in such manner and form as may be reasonably required by the Administrator.”

¹⁰⁵ 86 *Federal Register* 4295; 86 *Federal Register* 4224.

¹⁰⁶ 86 *Federal Register* 4295-4296.

¹⁰⁷ 86 *Federal Register* 4296.

water systems to coordinate with state and local agencies regarding lead risk communication and responses to detections of lead in drinking water.

Considerations

As noted, SDWA requires that any regulatory revisions maintain or provide greater public health protection. In the preamble to the LCRR, EPA explains that the revisions are intended to achieve this mandate in various ways, including by requiring water systems to identify LSLs and other potential lead sources in drinking water systems, improve responsiveness to elevated lead levels in drinking water, and require actions to mitigate or address lead in drinking water.¹⁰⁸ The LCRR implements recent SDWA amendments and addresses some of the issues that have emerged with implementation of the LCR. These include (1) adding more specificity to accepted sampling protocols, (2) increasing clarity of certain LCR monitoring and corrosion control requirements, and (3) expanding public notification requirements. Further, EPA notes that the improvement of sampling procedures to better identify elevated levels of lead will result in more systems exceeding the action level, and subsequently more actions to reduce drinking water exposure to lead.¹⁰⁹

The LCRR is expected to improve the rule's effectiveness in reducing lead in drinking water, though it may add to broader SDWA implementation issues. Such issues may involve (1) the adequacy of state agency resources to oversee public water systems and ensure SDWA compliance, (2) the management and technical capacity of systems—particularly in smaller and lower-income communities—to comply with drinking water regulations and other SDWA requirements, and (3) the financial capacity of some systems to repair or replace drinking water infrastructure. Examples of selected potential implementation and enforcement considerations are outlined below.

Implementation

Congressional interest may involve oversight of the LCR revisions, the implementation of the revised rule, and its effectiveness in reducing lead in tap water. To support various lead reduction efforts, the Drinking Water State Revolving Fund program authorizes financial assistance for projects needed for SDWA compliance. Further, Congress has established a number of grant programs to support public water system compliance with SDWA. These include grant programs targeted to assist water systems with lead reduction activities, or those systems that serve small and disadvantaged communities in particular. These grant programs were authorized by the WIIN Act or America's Water Infrastructure Act of 2018 (AWIA 2018; P.L. 115-270).¹¹⁰ Through legislation, Congress has addressed the allowable lead concentration in plumbing materials along with other SDWA amendments to improve public notification regarding exceedances. In the preamble to the LCRR, EPA states that the LCR remains a complicated rule, and notes that actions to reduce lead in drinking water cannot be implemented unilaterally by water systems.¹¹¹

¹⁰⁸ 86 *Federal Register* 4186.

¹⁰⁹ 86 *Federal Register* 4208.

¹¹⁰ See **Table A-1** for a discussion of such grant programs.

¹¹¹ 86 *Federal Register* 4200. NDWAC made several recommendations for broader actions that would support efforts to reduce exposures to lead, in addition to revisions to the LCR. For example, "cooperation with state, county, and local health departments to promote an integrated approach to childhood lead poisoning screening, prevention, and protection that emphasizes drinking water and its potential as a primary lead source (e.g. infants dependent on reconstituted formula)." NDWAC Lead and Copper Rule Working Group, *Report of the Lead and Copper Rule*

To coordinate efforts, the 2018 Federal Action Plan to Reduce Childhood Lead Exposures and Associated Health Impacts outlines actions for federal agencies and stakeholders to reduce childhood lead exposure.¹¹²

As water systems implement the revised rule's requirements, systems may record an increased number of lead action-level exceedances, as the revisions strengthen tap sampling procedures and prioritize sampling at sites with potential for elevated lead levels. Other requirements may stretch the technical, managerial, and financial capacity of water systems.

The LCR revisions rely on corrosion control treatment to control lead in drinking water, which can be technically challenging for water systems. Similar to the action level under the existing LCR, the revisions use an exceedance of the trigger level to require public water systems to take action regarding corrosion control. Experience with the action level demonstrates that systems face an ongoing challenge of continuing corrosion control while making necessary adjustments to treatment processes to comply with other drinking water regulations.¹¹³ As the revisions reduce the lead level at which systems would be required to undertake corrosion control treatment, the revisions may result in an increased number of systems balancing corrosion control treatment with the treatments to comply with other drinking water regulations (e.g., Disinfectant and Disinfection Byproduct Rule).

Competition at the municipal level for financing to support existing drinking water infrastructure repairs and/or replacement, in addition to LSL replacements, may pose financial challenges for communities—particularly small communities that have a narrow rate base from which to fund capital improvements.¹¹⁴ One example of an aspect of the LCRR that may add to communities' financial challenges is the requirement for public water systems to replace their portion of an LSL within 45 days of notification that the customer intends to replace their portion. Public water systems would need to quickly fund the replacement of its portion of LSL, which may divert funds from other drinking water infrastructure repairs or disrupt scheduled replacements in other neighborhoods. Cost estimates for LSL replacement vary, ranging from \$2,500 to \$5,500 per line, with some industry estimates at \$8,700 per line.¹¹⁵ Related to LSL replacement, one survey reports that 34% of water systems had identified all LSLs within their distribution system. Based on this estimate, the requirement to perform an LSL inventory may challenge public water systems.¹¹⁶

Other implementation considerations include the level of water system assistance to individual households that the revised rule requires for various purposes (e.g., provision of pitcher filters and

Working Group to the National Drinking Water Advisory Council, p. 40.

¹¹² President's Task Force on Environmental Health Risks and Safety Risks to Children, *Federal Action Plan to Reduce Childhood Lead Exposures and Associated Health Impacts*, Washington, DC, December 2018, https://www.epa.gov/sites/production/files/2018-12/documents/fedactionplan_lead_final.pdf.

¹¹³ EPA, *Lead and Copper Rule Revisions White Paper*, Office of Water, Washington, DC, October 2016, https://www.epa.gov/sites/production/files/2016-10/documents/508_lcr_revisions_white_paper_final_10.26.16.pdf.

¹¹⁴ In 2018, EPA issued its sixth Drinking Water Infrastructure Needs Survey and Assessment, which estimated that water systems would have to invest \$472.6 billion over the next 20 years with a majority of cost attributed to ongoing investments to repair infrastructure.

¹¹⁵ EPA, *Lead and Copper Rule Revisions White Paper*, Office of Water, Washington, DC, October 2016, https://www.epa.gov/sites/production/files/2016-10/documents/508_lcr_revisions_white_paper_final_10.26.16.pdf.

¹¹⁶ American Water Works Association, *2019 State of the Water Industry Report*, May 2019, https://www.awwa.org/Portals/0/AWWA/ETS/Resources/2019_STATE%20OF%20THE%20WATER%20INDUSTRY_post.pdf.

replacement cartridges, repeated sampling under “find and fix,” and targeted public education), and to schools and child care facilities for sampling and public education efforts, among others.

Enforcement

Stakeholders have long awaited comprehensive revisions to the LCR.¹¹⁷ While broadly supportive of the final rule, the Association of State Drinking Water Administrators (ASDWA) states that the revisions are complex and increase primacy states’ data management burden.¹¹⁸ EPA estimates that implementation of the new rule will cost primacy states \$19.7 million to \$22.2 million annually.¹¹⁹ Congress provides annual appropriation for the Public Water System Supervision (PWSS) program. For FY2021, the Consolidated Appropriations Act, 2021 (P.L. 116-260) provided \$112 million for the PWSS program.¹²⁰ For FY2020, the PWSS program received \$106.3 million in appropriations. Prior to EPA’s promulgation of the LCR revisions, ASDWA identified a \$308 million per year gap in funding needed to support state implementation of the PWSS program and other SDWA requirements.¹²¹ ASDWA attributed this gap to increased workload for water system supervision for an increased number of regulated contaminants.

EPA and State Roles

Regarding regulatory and enforcement roles under SDWA, the act is generally administered jointly by EPA and most states. Among other duties, EPA promulgates national primary drinking water regulations that establish standards or treatment techniques to control drinking water contaminants. SDWA authorizes states to assume primary responsibility (primacy) for oversight and enforcement of public water system compliance with drinking water regulations.¹²² Primacy states or tribes adopt and enforce regulations at least as stringent as EPA rules, provide technical assistance to public water systems, conduct inspections of systems, maintain records and compliance data, and report to EPA, among other duties. All states (except Wyoming and the District of Columbia) and territories, and Navajo Nation have primacy. EPA directly oversees public water systems in nonprimacy areas and retains oversight of primacy states.

EPA and the states expect that the LCRR will increase resources needed by states to which EPA has delegated primary enforcement authority for SDWA.¹²³ Such states may need additional resources to support and enforce water system compliance with the rule.¹²⁴ One potential example is the availability of compliance alternatives that provide regulatory flexibility for small water systems. State enforcement of such alternatives may require state agencies to oversee small water systems on a system-by-system basis. The individual system-by-system approach would increase

¹¹⁷ See for example, U.S. Congress, House Committee on Oversight and Government Reform, *Examining Federal Administration of the Safe Drinking Water Act in Flint, Michigan, Part 3*, 114th Cong., March 17, 2016.

¹¹⁸ Letter from Association of State Drinking Water Administrators to EPA, February 10, 2020, https://www.asdwa.org/wp-content/uploads/2020/02/ASDWA-Cover-Letter_Comments_CoSTS-on-Proposed-LCRR-Final.pdf.

¹¹⁹ 84 *Federal Register* 4257-4258.

¹²⁰ P.L. 116-94.

¹²¹ Association of State Drinking Water Administrators, “Insufficient Resources for State Drinking Water Programs Threaten Public Health,” December 2013, p. ix, <https://www.asdwa.org/wp-content/uploads/2017/03/SRNAP-Analysis.pdf>.

¹²² SDWA §1413; 42 U.S.C. §300g-2.

¹²³ For a discussion of EPA and state roles under SDWA, see “EPA and State Roles” text box.

¹²⁴ See, for example, discussion of “Primacy Agency Costs,” 86 *Federal Register* 4295.

complexity for states and may further increase resource needs and result in data management challenges for state agencies to ensure SDWA compliance.¹²⁵

These are selected examples of potential implementation and enforcement considerations associated with EPA's recent revisions to the LCR. As EPA, states, and water system operators implement the LCRR, more issues and considerations are likely to arise. Notwithstanding these likely issues, the long-awaited revisions to the LCR are intended to improve the effectiveness of the rule to further reduce the occurrence of lead in tap water and related exposure risks.

¹²⁵ Letter from Association of State Drinking Water Administrators to EPA, February 10, 2020, https://www.asdwa.org/wp-content/uploads/2020/02/ASDWA-Cover-Letter_Comments_CoSTS-on-Proposed-LCRR-Final.pdf.

Appendix. Provisions to Address Lead In Drinking Water

**Table A-1. Provisions to Address Lead in Drinking Water
(111th Congress-115th Congress)**

Public Law, Section	SDWA/U.S. Code Citation Amended or Added	Description of the Provision
Reduction of Lead in Drinking Water Act (P.L. 111-380), Section 2 <i>Enacted January 4, 2011</i>	SDWA §1417; 42 U.S.C. §300g-6	Revises the SDWA definition of “lead-free” to reduce the maximum allowable level of lead in plumbing components in contact with drinking water from 8.0% to a weighted average of 0.25% (in the wetted surface material). Effective January 4, 2014, plumbing components that do not meet the 0.25% lead-free calculation cannot be sold or installed unless specifically exempt.
Community Fire Safety Act of 2013 (P.L. 113-64), Section 3 <i>Enacted December 20, 2013</i>	42 U.S.C. §300g-6 note	Directs EPA to consult with and seek the advice of the National Drinking Water Advisory Council on potential changes to lead regulations, and requests that the Council consider sources of lead throughout drinking water distribution systems.
The Water Infrastructure Improvements for the Nation Act (WIIN Act) (P.L. 114-322), Section 2105 <i>Enacted December 16, 2016</i>	SDWA §1459B; 42 U.S.C. §300j-19b	Directs EPA to establish a grant program for projects and activities that reduce lead in drinking water, including replacement of lead service lines and corrosion control, and authorizes \$60 million per year for FY2017-FY2021 for this grant program. Eligible recipients include community water systems, tribal systems, schools, states.
WIIN Act (P.L. 114-322), Section 2106(a)	SDWA §1414(c); 42 U.S.C. §300g-3(c).	Requires water systems to notify the public, the state, and EPA of system lead action-level exceedances. (Notification was previously required under SDWA for violations of drinking water regulations rather than exceedances.) Requires water systems to notify the public, the state, and EPA within 24 hours of an exceedance that has potential to cause serious adverse health effects from short-term exposure. Requires EPA, within 24 hours of receiving notice, to notify the public if the state or system owner/operator does not provide the required notice. Required EPA, within 180 days of enactment, to develop a strategic plan for providing targeted outreach, education, and technical assistance to populations affected by lead in the water system.^a Requires EPA, upon developing or receiving data indicating that a household’s water exceeds the lead action level, to forward such data and testing information to the water system and the state. Requires the water system to provide the data and other specified information to the affected households. Requires EPA, within 24 hours of receiving notice that a water system has not provided such data, to consult with the governor and, using the strategic plan, provide the information to the households no later than 24 hours after the end of the consultation period.

Public Law, Section	SDWA/U.S. Code Citation Amended or Added	Description of the Provision
WIIN Act (P.L. 114-322), Section 2106(b)	SDWA §1417(f); 42 U.S.C. §300g-6(f)	Directs EPA to make information regarding lead in drinking water broadly available to the public.
WIIN Act (P.L. 114-322), Section 2107	SDWA §1464(d); 42 U.S.C. §300j-24(d)	Requires EPA to establish a voluntary program for testing for lead in drinking water at schools and child care programs under the jurisdiction of local education agencies (LEAs). States or LEAs may apply to EPA for grants; authorizes \$20 million per year for FY2017-FY2021 for this grant program.
America's Water Infrastructure Act of 2018 (AWIA) (P.L. 115-270), Section 2006(a) <i>Enacted October 23, 2018</i>	SDWA §1464(d); 42 U.S.C. §300j-24(d)	Authorizes a \$5.0 million increase (from \$20.0 million to \$25.0 million) in the amount authorized to be appropriated for the existing Voluntary School and Child Care Program Lead Testing Grant Program in FY2020 and FY2021. Directs EPA to give grant priority to LEAs in low-income areas, and to provide technical assistance to lead testing grant recipients.
AWIA (P.L. 115-270), Section 2006(b)	SDWA §1465; 42 U.S.C. §300j-25	Requires EPA to implement a drinking water fountain replacement grant program for school water fountains manufactured prior to 1988. Authorizes the annual appropriation of \$5.0 million for this program for FY2019-FY2021.
AWIA (P.L. 115-270), Section 2015(e)	SDWA §1452(h); 42 U.S.C. §300j-12(h)	Requires EPA to evaluate and include the cost to replace lead service lines in the drinking water infrastructure needs survey, which EPA completes every four years. (The needs survey provides the basis for allotting appropriations for the Drinking Water State Revolving Loan Fund [DWSRF] program.)

Source: Compiled by CRS from congress.gov.

Notes: The Water Infrastructure Improvements for the Nation Act, P.L. 114-322, Title II, Subtitle B, authorized \$150 million to be appropriated for disaster relief and infrastructure assistance in response to lead contamination in a public water system. P.L. 114-322, §2201, authorized to be appropriated \$100 million for DWSRF grants to a state subject to a presidential emergency declaration concerning lead in a public water system. Section 2201 authorized an eligible state to use funds to provide assistance to a water system that was the subject of the declaration to address lead or other drinking water contaminants—including repair and replacement of lead service lines (up to a building inlet) and water system infrastructure.

- a. EPA issued the strategic plan for populations affected by lead in June 2017. See EPA, *Strategic Plan for Targeted Outreach to Populations Affected by Lead*, EPA 816-B-17-007, Washington, DC, June 2017.

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