

Chapter 6.0 — Lead Service Line Replacement

6.1 Overview of LSL Replacement Requirements

Lead Service Lines (LSLs) have been shown to contribute significant amounts of lead to drinking water at the consumer's tap. Corrosion control techniques are often effective in minimizing lead levels associated with LSLs by establishing a protective coating on the interior pipe surface. Although EPA believes that corrosion control treatment will be the primary means of lead level reduction for the majority of water systems, the establishment of such protection can vary from house to house. In many instances, corrosion control and/or source water treatment alone will not be sufficient to reduce lead levels below the lead AL. In such cases a PWS must replace its LSLs in accordance with the LSLRP requirements (§141.84). EPA believes that the progressive replacement of LSLs which contribute to lead levels above 0.015 mg/L will reduce adverse health risks imposed by lead exposure.

The Lead Service Line Replacement Program (LSLRP) in the June 7, 1991 rule is premised on five principles: (1) corrosion control can reduce lead levels from LSLs in some instances, but high levels may persist after treatment; (2) a system is triggered into a LSLRP if the system exceeds the lead AL after installing optimal corrosion control and source water treatment (follow-up monitoring); (3) water systems should only be responsible for

removing that portion of each LSL they control; (4) a system is not required to physically replace individual LSLs if direct sample lead concentrations are 0.015 mg/L or less and (5) water systems must annually replace at least 7 percent of the total number of LSLs in place at the beginning of the LSLRP.

Any water system that continues to exceed the lead AL after implementing optimal corrosion control treatment and/or source water treatment (whichever is installed later), or during any subsequent monitoring period, must begin replacing LSLs identified within the distribution system. The LSLRP begins on the date the system exceeds the lead AL as referenced above (i.e., January 1 or July 1 of a given year). The State also has the authority to require LSLRP commencement immediately for systems who have failed to install source water or corrosion control treatment by the deadline for follow-up monitoring as provided in §141.86(d)(2).

A water system which is triggered into the LSLRP is required to take three steps: (1) conduct a comprehensive materials evaluation (if not already completed) to identify all homes or buildings served by LSLs; (2) establish a schedule for replacing LSLs; and (3) physically replace all LSLs controlled by the system. Water systems can avoid replacing individual LSLs that are shown to contribute 0.015 mg/L or less to tap water lead levels as measured in LSL samples. Water systems can discontinue the LSLRP if they demonstrate that the lead levels in first-draw water collected

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at targeted taps are below the lead AL for two consecutive six-month monitoring periods. If a system subsequently exceeds the lead AL during any monitoring period, the LSLRP must be recommenced.

The following sections discuss the rationale of the LSLRP requirements, LSL control and related requirements, materials evaluation, LSL replacement schedules, and reporting/record-keeping requirements.

6.2 LSL Control and Related Requirements

EPA believes its authority to impose regulatory requirements on PWSs extends only to those distribution facilities under the control of the PWS. Under the Rule, systems replacing LSLs are required to replace the portions of LSLs under their control, presuming that the system controls the entire LSL (up to the building inlet). PWSs may rebut the presumption that they control the entire lead service line and replace only that portion which an appropriate legal authority (i.e., State statute, municipal ordinance, public service contract, etc.) defines as controlled by the PWS. The definition of control is discussed in the following subsection and is followed by explanations of the requirements for control presumption rebuttal and partial LSL replacement.

6.2.1 LSL Control Determination.

Control is defined in §141.84(e) as one of the following forms of authority:

- Authority to set standards for construction, repair, or maintenance of the line;

- Authority to replace, repair, or maintain the service line; and,
- Ownership of the line.

EPA acknowledges that ownership and/or control of LSLs is often split between the PWS and the property owner. Depending upon State laws or municipal ordinances, some public water systems control and/or own connections up to the property line, others control and/or own the LSL and other connections up to the building, and still others control and/or own the service connections only up to the curb (see Figure 6-1). It should be noted that a lead gooseneck is part of the LSL only when it is attached to the LSL. Where LSL ownership is split between the utility and the user, utilities sometime retain authority to prescribe the standards for construction, repair, and maintenance of service lines, and a right of entry to perform work deemed necessary.

6.2.2 Rebuttal of Control Presumption.

Water systems are required to replace the entire LSL (up to the building inlet) unless they can successfully demonstrate to the State that part of the LSL is beyond their control. A water system can rebut the control presumption by citing local ordinances or State statutes, or in the case of private systems, the contract between the systems and their customers that limit the extent of control.

Systems that do not intend to replace the entire LSL are required to submit a letter to the State, within the first year of their replacement schedule, demonstrating that their control is limited. This letter must be accompanied by a copy of the legal

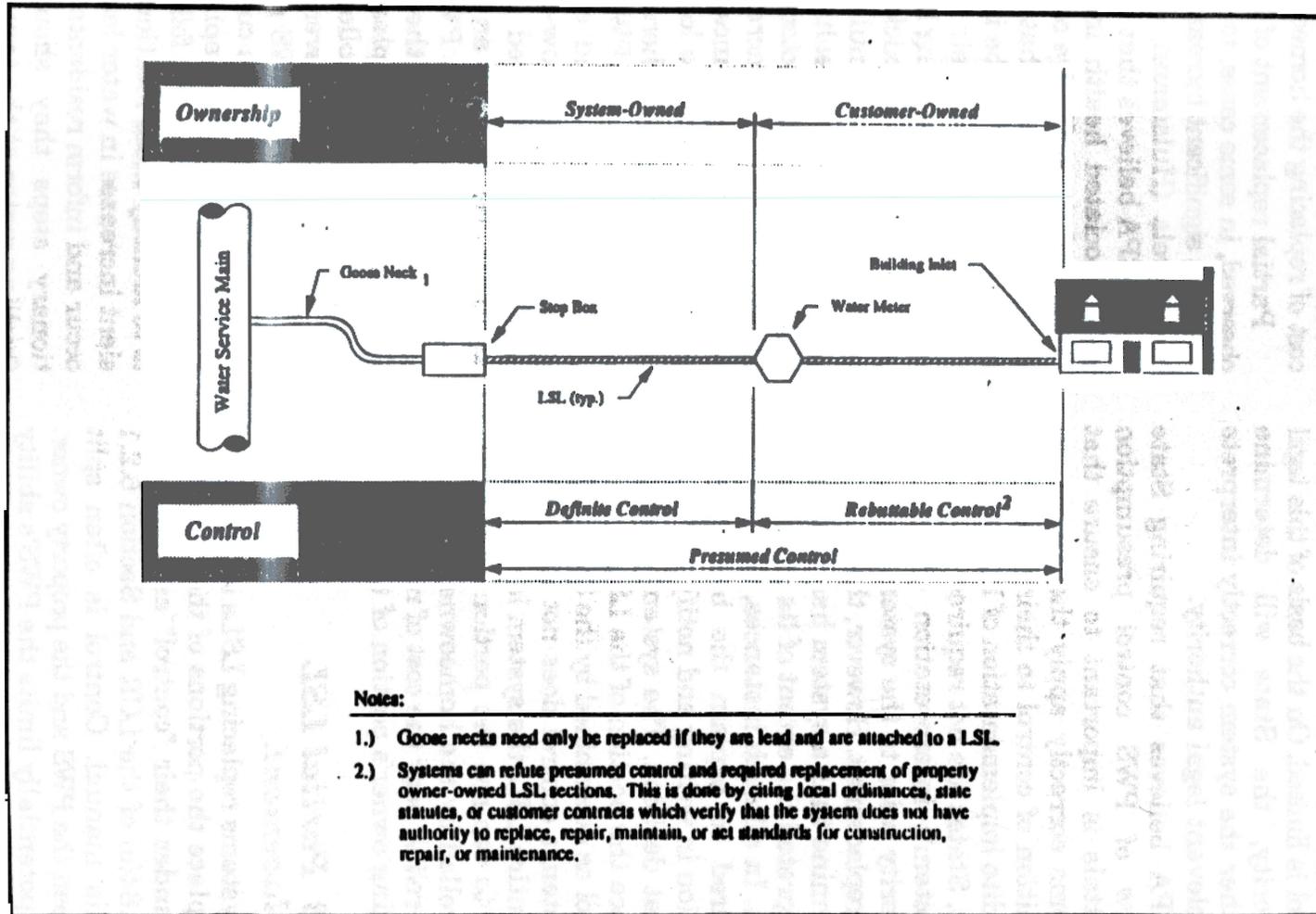


Figure 6-1. Extent of LSL Control

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authority the water system is relying upon to justify its position that the extent of its control is limited. On the basis of this legal authority, the State will determine whether the system correctly interprets its relevant legal authority.

EPA believes that requiring State review of PWS control presumption rebuttals is important to ensure that systems correctly apply the regulatory definition of control to their system. To expedite implementation of LSL replacement, States are not required to approve a system's interpretation of its legal authority prior to the system beginning LSL replacement. However, the State may determine that a system has incorrectly interpreted the extent of its control over LSLs. In all such instances, the State is required to explain the basis for its decision in writing and notify the system of that decision. The system must then replace the portion of the LSL under its control as determined by the State. Where a system's control does not extend over the entire LSL, the system is required to offer to replace the portion of the LSL controlled by the homeowner but is not required to bear the cost of replacing the building owner's portion of the line.

6.2.3 Partial LSL Replacement.

Systems replacing LSLs are required to replace the portions of the LSLs that are under their "control" as defined in §141.84(e) of the LCR and Section 6.2.1 of this manual. Control is often split between the PWS and the property owner. This potentially limits the PWS's ability to remove the entire LSL. The Rule requires that the system offer to replace

any portion of the LSL controlled by the homeowner but is not required to bear the cost of replacing the homeowner's portion.

Partial replacement of LSLs has been observed, in some cases, to result in short-term but significant increases in tap water lead levels (Hulsmann, 1990; Schock, 1990). EPA believes that such increases and associated health impacts will be minimized since effective corrosion control should be in place by that time, and also because customers will be informed of how they can minimize their exposure. The primary concern regarding lead in drinking water is not acute toxicity, but rather lead's capacity to accumulate in the body and result in chronic health effects. Thus, EPA believes that the potential risks posed by such temporary increases are outweighed by the importance of having lead levels reduced over the long term.

In those locations where only a portion of the LSL is replaced, PWSs must notify affected customers and offer them the option of having a follow-up tap sample collected and analyzed to determine whether there has been an increase in tap water lead levels. The PWS will not be required to pay for the collection or analysis of such samples nor will the system be required to collect and analyze the sample itself. However, if a customer accepts the offer, the PWS must report the sampling results to the customer within 14 days of partial replacement. The purpose of collecting the follow-up samples is to identify those locations where transient increases in water lead levels could occur and inform residents of the precautionary steps they should take (i.e., flushing water at the taps). Methods for collecting LSL samples at consumers' taps

are described in the LCR Guidance Manual, Volume 1 (Section 4.3).

6.3 Materials Evaluation

A complete determination of all LSL sites may not have been accomplished during the Material Survey for the Sample Plan Development. This survey effort must be completed if a system is triggered into the LSLRP, because the initial number of LSLs determined serves as the basis for replacement rate determination. Methods for determining the locations of LSLs were presented in Section 3.0 of the Lead and Copper Rule Guidance Manual, Volume 1. Twelve months after a water system is triggered into the LSLRP, it is required to submit to the State a revised materials evaluation identifying the initial number of LSLs in its distribution system. The initial number of LSLs is the number of LSLs in place at the time the LSLRP begins.

EPA believes 12 months is an adequate period of time because water systems should have obtained such information either when they were required to determine whether their distribution system contained lead or copper pipes [§141.42(d)], or when they established their sampling pool for tap monitoring under this Rule. While some municipalities will undoubtedly have inadequate records documenting the location of its LSLs, most systems are not required to submit a complete material evaluation of LSLs to the State until 8 to 10 years after promulgation of the Rule. EPA believes this provides water systems with sufficient time to locate all LSLs and recommends that

systems with monitoring data indicating LSLs may be a problem begin identifying the location of LSLs now.

6.4 LSL Replacement and Schedule Requirements

Systems which become subject to the LSLRP must physically replace all LSLs, except those for which the lead concentration in all lead service line samples is less than or equal to 0.015 mg/L. Thus, systems have a choice between replacing LSLs or conducting monitoring of the line to determine if the lead levels are less than or equal to 0.015 mg/L. LSLs may be considered to be "physically replaced", via the lead contribution presumption rebuttal and when excavation reveals that a presumed LSL is in fact not a LSL. Regardless of how LSLs are replaced/monitored, the process must proceed at the annual rate specified by the State and in accordance with size dependant LSLRP schedules. The following subsections discuss rebuttal of the lead contribution presumption, replacement/elimination rates, size-dependent LSLRP schedules, and LSLRP discontinuation.

6.4.1 Rebuttal of Lead Contribution Presumption.

The "lead contribution presumption" essentially presumes that each LSL scheduled for replacement significantly contributes to lead concentrations of more than 0.015 mg/L at the tap. Systems may rebut this presumption for individual LSLs, via sampling and analysis, if LSL samples (not

first-draw) reveal that the lead concentrations are no more than 0.015 mg/L.

Detailed sampling procedures for LSL monitoring are provided in Chapter 4.0 of Volume I of the Lead and Copper Rule Guidance Manual; a general description is provided below. Each LSL sample must be one liter in volume and stand motionless in the LSL for at least six hours. LSL samples must be collected in one of the following ways:

1. Calculating the interior diameter and length of the pipe between the tap and the LSL, flushing the calculated volume of water, and collecting the next one liter of water; (Table 3-3 provides volumes of standing water for various pipe lengths and diameters);
2. Tapping directly into the LSL and collecting one liter of water from the line; or
3. Allowing the water to run until there is a change in temperature and collecting one liter of water immediately after the change takes place. This method may be used only when the sampling site is constructed as a single family residence.

If the concentration in the LSL sample is less than or equal to 0.015 mg/L, then the system need not replace the individual LSL. Furthermore, each of these LSLs may be counted as "replaced" in the LSLRP accounting system. LSL monitoring by PWSs is strictly optional. A water system may choose to replace LSLs without conducting any monitoring, regardless of actual lead contribution, or if lead levels in LSLs are expected to exceed 0.015 mg/L.

6.4.2 Replacement/Elimination Rates.

It is difficult to establish a replacement rate that can be applied nationwide because the number of LSLs in each system varies tremendously. EPA estimates that LSLs may comprise anywhere from 10 to 50 percent of the service lines in those systems that have LSLs. Replacement of all LSLs via normal maintenance schedules could take as long as 50 years for some systems. EPA believes that it is necessary to accelerate the rate at which LSLRP systems replace LSLs in order to ensure that public health will be adequately protected. States will be in the best position to assess the factual circumstances of each individual system and the schedule the system can feasibly meet.

EPA decided that in no case can a LSLRP system take more than 15 years to replace all its LSLs; where LSL "replacement" consists of the summation of the following:

- LSLs physically replaced;
- LSLs for which the "lead contribution presumption" is successfully rebutted via sampling and analysis; and
- Lines identified as LSLs in the materials evaluation which are found not to be LSLs upon excavation.

Therefore water systems subject to the LSLRP are required to annually "replace" at least 7 percent of their initial number of LSLs as identified in the materials evaluation (see Section 6.3). For example, a system that identifies 10,000 LSLs in its materials evaluation would be required to cumulatively account for replacement of at least 700 individual/additional LSLs each year via

physical LSL replacement, LSL lead contribution rebuttals, and/or when initially identified LSLs are found not to be LSLs upon excavation. The system's LSL replacement pool for a given year, for example, could potentially consist of 690 LSLs which are physically replaced, 8 LSL lead contribution rebuttals, and 2 via excavation. An LSL replacement work sheet, which could be used to assist systems in their LSLRP accounting process, and a completed example have been included as Tables 6-1 and 6-2, respectively.

The Rule also requires that water systems replace LSLs at a greater rate than 7 percent annually where the State finds that an accelerated schedule is feasible. The State must make such determinations in writing and must notify the system of its findings within six months after the system is triggered into the LSLRP.

6.4.3 Size-Dependent LSLRP Schedules.

The timing of LSLRP requirements is dependent upon when systems complete corrosion control and/or source water treatment, which in turn varies based upon system size. This is particularly true for small and medium size systems based upon whether or not a corrosion control study is conducted. Schedules for small and medium-size systems, as well as large systems, are presented in Figure 6-2.

6.4.4 LSLRP Discontinuation.

It is conceivable that systems can meet the lead AL which they had previously exceeded through improved treatment—corrosion control or source water treatment—or because they obtain an alternative source of water. Thus,

water systems can discontinue the LSLRP if they can demonstrate that first-draw tap water lead levels are below the lead AL for two consecutive six-month monitoring periods. EPA decided to require lead AL compliance over the course of an entire year to ensure that the lower levels genuinely reflect a lowering of lead levels, and not normal variability in lead levels at the tap. Recommencement of the replacement program is required if a system subsequently exceeds the lead AL during any single monitoring period.

6.5 Reporting Requirements

Once the LSLRP is initiated, a system must meet reporting requirements in accordance with the standardized schedule presented in Table 6-3 and outlined below.

Within three months of being required to begin the LSLRP, a system seeking to rebut the control presumption (presumes the system controls the entire LSL) must submit a letter to the State describing the legal authority which limits the system's control over the LSL and explain the extent of the system's control. The letter must include copies of the State statute, municipal ordinance, public service contract, or any other legal authority the system contends limits control.

Within 12 months a system must submit to the State a schedule for the replacement of all its LSLs at the annual rate approved by the State. The schedule must also state the initial number of LSLs. The schedule could include the location of the LSLs within the distribution system, and identify the LSLs scheduled for replacement during each year of the replacement schedule.

Every 12 months a system must demonstrate that 7 percent (or more as specified by the State) of its LSLs have

Table 6-1. LSLRP General Accounting Worksheet

Initial No. of LSLs: _____

Required Annual Replacement (No.): _____

Required Annual Replacement (%): _____

Year	Annual Numbers					Cumulative Numbers	
	PHS	RBT	EXC	No.REP	%REP	CNo.REP	C%REP
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

- PHS = Number of LSLs physically replaced in the given year.
- RBT = Number of LSLs eliminated via Pb contribution rebuttals.
- EXC = Number of initially identified LSLs which are found not to be LSLs upon excavation for given year.
- No.REP = Number of LSLs "replaced" in the given year (PHS + RBT + EXC).
- %REP = Percent of LSLs replaced for the given year (No.Rep/Initial No.)(100)
- CNo.REP = Cumulative number of LSLs replaced through given year.
- C%REP = Cumulative percent of LSLs replaced through given year.

Table 6-2. LSLRP General Accounting Worksheet

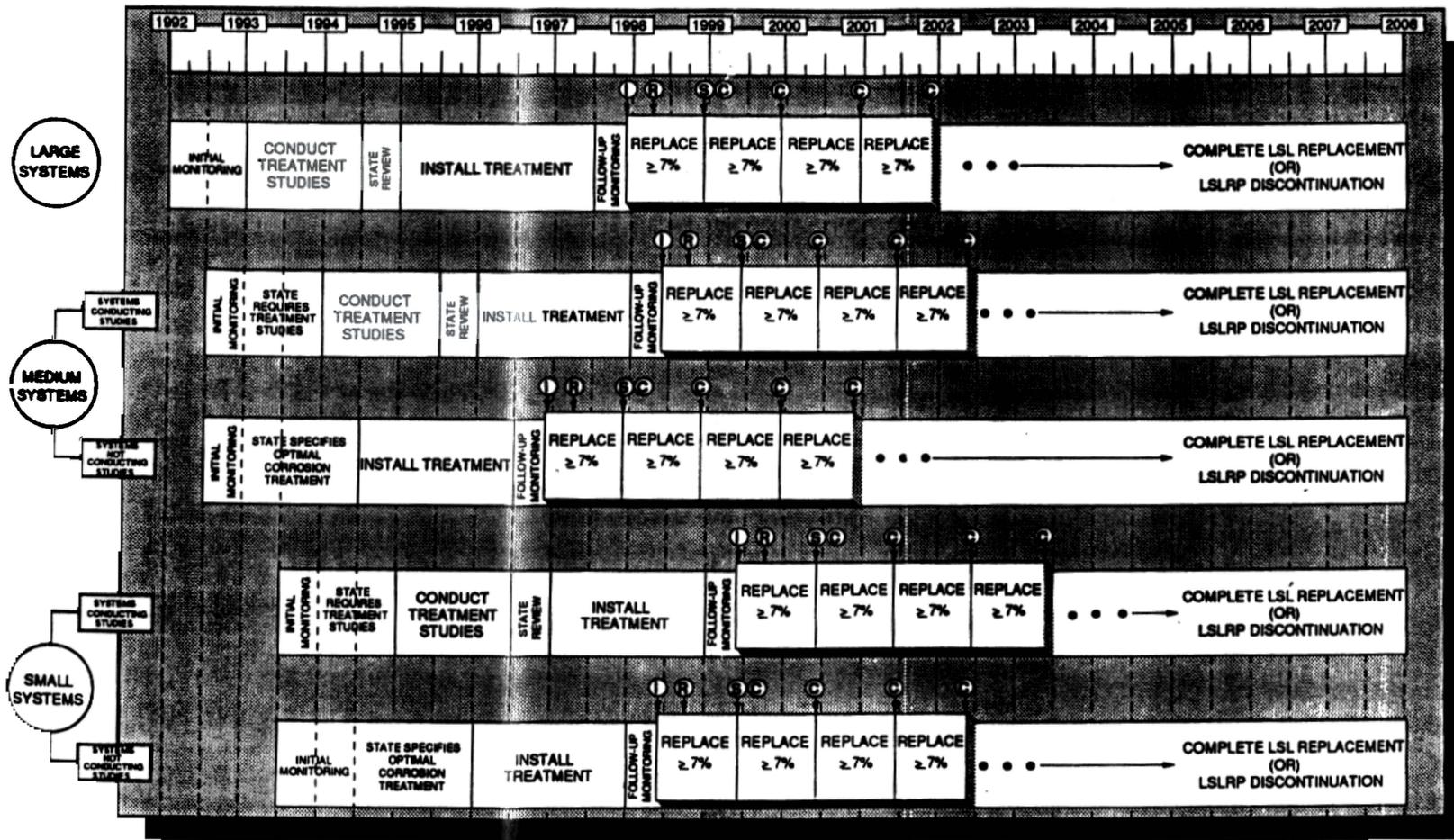
Initial No. of LSLs: _____

Required Annual Replacement (No.): _____

Required Annual Replacement (%): _____

Year	Annual Numbers					Cumulative Numbers	
	PHS	RBT	EXC	No.REP	%REP	CNo.REP	C%REP
1	693	7	0	700	7	700	7
2	694	6	0	700	7	1400	14
3	690	10	0	700	7	2100	21
4	690	10	0	700	7	2800	28
5	690	10	0	700	7	3500	35
6	690	10	0	700	7	4200	42
7	688	12	0	700	7	4900	49
8	689	11	0	700	7	5600	56
9	670	29	1	700	7	6300	63
10	664	34	2	700	7	7000	70
11	665	34	1	700	7	7700	77
12	645	55	0	700	7	8400	84
13	638	60	2	700	7	9100	91
14	630	68	2	700	7	9800	98
15	186	12	2	200	2	10000	100

- PHS = Number of LSLs physically replaced in the given year.
- RBT = Number of LSLs eliminated via Pb contribution rebuttals.
- EXC = Number of initially identified LSLs which are found not to be LSLs upon excavation for given year.
- No.REP = Number of LSLs "replaced" in the given year (PHS + RBT + EXC).
- %REP = Percent of LSLs replaced for the given year (No.Rep/Initial No.)(100)
- CNo.REP = Cumulative number of LSLs replaced through given year.
- C%REP = Cumulative percent of LSLs replaced through given year.



NOTES:
 These schedules depict LSLRP events as they would occur if the LSLRP were invoked at the earliest possible date. Marked dates may change. However, the intervals between marked events will remain constant. (See Section 5.5 and Table 5-1 in this manual)

L. INVOKE
 LSLRP invoked on January 1 or July 1 of the marked year, assuming the lead AL is exceeded in the first round of follow-up monitoring (see note 1)

R. REBUT
 Deadline for submitting rebuttal of control to the State; three months after LSLRP commencement (April 1 or October 1 of the marked year).

S. SCHEDULE
 Deadline for submitting materials evaluation and replacement schedule to the State; twelve months after LSLRP commencement (January 1 or July 1 of the marked year).

C. CERTIFY
 Deadline for submitting letter to the State certifying "replacement" of the State-specified percentage of LSLs and documenting LSL sampling results for "Pb contribution presumption" rebuttal. Every twelve months following LSLRP commencement (January 1 or July 1 of the marked year), until complete LSL replacement or LSLRP discontinuation.

LEGEND

Ⓢⓐ EVENT MARKER: EACH CIRCLE REPRESENTS A LSLRP EVENT. THE ARROW "MARKS" THE DATE OF THE REFERENCED EVENT(s). EACH ENCIRCLED LETTER REFERENCE THE NOTE WHICH PROVIDES EVENT DESCRIPTION AND MARKED DATE CLARIFICATION.

**FIGURE 6-2
 LSLRP SCHEDULES
 BY SYSTEM SIZE**

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Table 6-3. Reporting Requirements Schedule

Within 3 Mo of LSLRP Triggering	Within 12 Mo of LSLRP Triggering	Within Each 12 Mo Period Following LSLRP Triggering
Rebuttal of "control presumption"	Materials evaluation and replacement schedule	Certification of "replacement" of LSLs equaling at least 7 percent of the initial number of LSLs as specified by the State

been replaced. Sample documentation demonstrating rebuttal of the lead contribution presumption must also be submitted in accordance with this schedule. The annual letter must contain the following information:

1. The number of LSLs scheduled to be replaced during the previous year of the replacement schedule.
2. The number and location of each LSL replaced during the previous year of the schedule.
3. If measured, the water lead concentration and location of each LSL sampled, the sampling method, and the date of sampling.

EPA believes that this information must be submitted annually to insure that the system is properly completing the LSLRP.

6.6 Record-Keeping Requirements

Any system subject to the record-keeping requirements of §141.91 must retain on its premises original records of all sampling data and analyses, reports, surveys, letters, evaluations, schedules, State determinations, and any other information required by §141.81 through §141.88. Each water system shall retain these records for no fewer than 12 years.

6.7 References

- Hulstmann, A.D. 1990. Particulate Lead in Water Supplies. *Jour. Institution of Water and Envir. Mang.* 4(1):19-25.
- Schock, M.R. 1990. Causes of Temporal Variability of Lead in Domestic Plumbing Supplies. *Envir. Monitoring and Assess.* 15:59-82.