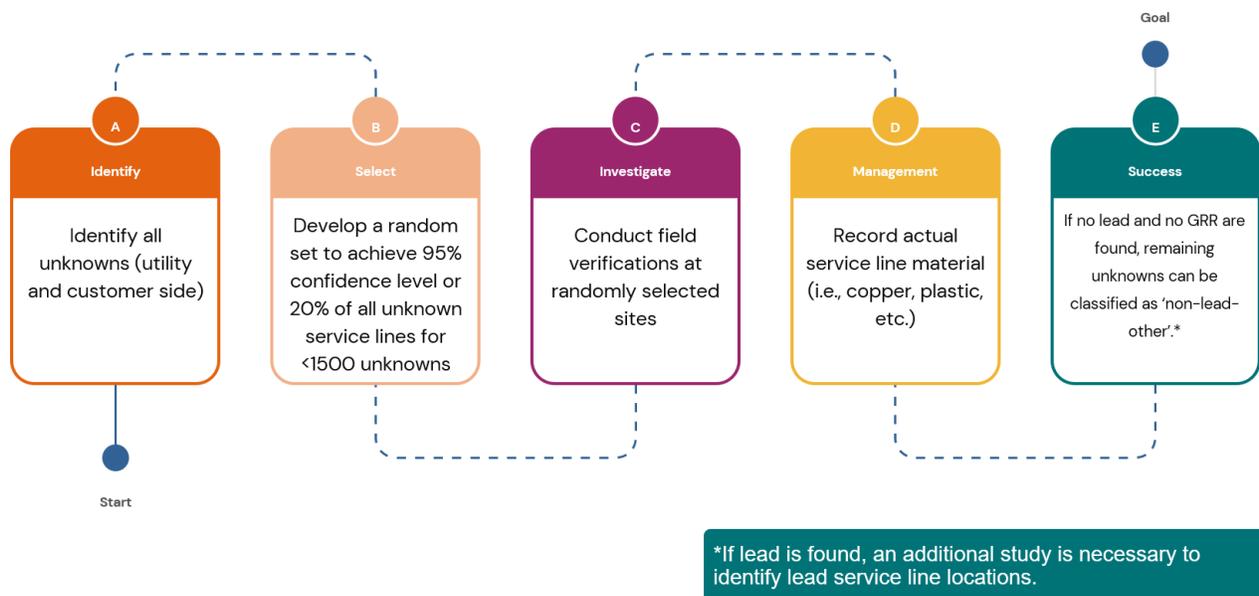# Statistical Verification and Validation of Non-Lead Water Service Lines

Example Guidance

To meet the requirements of the Lead and Copper Rule Revisions (LCRR) and mitigate lead exposure within communities, Indiana public water systems (PWSs) must create a service line inventory. Accurate location and material identification of lead service lines are crucial to eliminate the possibility of lead exposure in drinking water. With the primary goal of protecting public health, Indiana Department of Environmental Management's (IDEM) objective is to allow the application of statistical methods to identify service line materials, thereby reducing the necessity of inspecting each unknown service line. **The statistical methods approach is typically used in systems with no history of lead.**

Statistical Method

Goal

A — Identify	B — Select	C — Investigate	D — Management	E — Success
Identify all unknowns (utility and customer side)	Develop a random set to achieve 95% confidence level or 20% of all unknown service lines for <1500 unknowns	Conduct field verifications at randomly selected sites	Record actual service line material (i.e., copper, plastic, etc.)	If no lead and no GRR are found, remaining unknowns can be classified as 'non-lead-other'.*

Start

*If lead is found, an additional study is necessary to identify lead service line locations.

Step 1: Complete a desktop inventory from available data sources and determine the number of remaining unknowns

Before implementing the statistical approach for identifying unknown service lines, the PWS must create an initial service line inventory that identifies the location and categorizes the material type of each

service lines. IDEM's [Lead Service Line Inventory Guidance](#) provides detailed methodologies for identifying service line materials.

After an initial inventory is developed that exhausts all available records, determine the total number of unknown service lines that could not be categorized using another approved methodology. Please note, that if either side (system or customer) of the service line is classified as unknown, the entire service line would count as an unknown.

Step 2: Identifying service lines to be inspected

After a list of the unknown service lines is compiled, the total number of unknowns will determine how many locations will be randomly selected for investigation.

- A PWS with fewer than 1,500 unknown service lines must physically verify at least 20 percent of the total number of unknown lines.
- A PWS with more than 1,500 unknown service lines must physically verify enough lines to reach a minimum 95 percent confidence level. The specific number of service lines to be verified can be determined by referring to Appendix A.

Step 3: Random selection of service lines for physical inspection

To ensure an unbiased selection process for physically inspecting service lines, it is crucial to follow a uniformly random approach. Each unknown service line should have an equal chance of being chosen for verification, without any specific criteria that could introduce bias. **Appendix B** of [The Michigan guidance on Minimum Service Line Material Verification Requirements](#) provides steps on generating a uniformly random set of service lines for inspection.

Note: Introducing any "logic" or specific criteria to the site selection process, such as focusing on periods of construction or targeting specific areas, can unintentionally bias the dataset. Therefore, it is essential to adhere to a truly random selection method, as outlined in *(Minimum Service Line Material Verification Requirements)*

Step 4: Conduct a physical inspection at one or more points

At selected unknown service lines, the unknown service line must be inspected. In cases where the service line is unknown on both the system side and customer side, both the system and customer portions of the unknown line must be inspected. Acceptable identification methods include excavation, in-home inspections, or other IDEM-approved methods. Other methods and emerging techniques will be reviewed on a case-by-case basis.

During the inspection, IDEM recommends recording the actual material observed at each point of inspection. If the inspection is conducted near the meter, it is important to determine that the observed material pertains to the service line itself and not part of the metering components. For typical methods of service line identification, refer to Chapter 5 of the EPA's "Guidance for Developing and Maintaining a Service Line Inventory."

Step 5: Record and enter results of the physical inspection process

When conducting investigations, you must record your findings at a service line level. This can be done through a specifically designed spreadsheet, mobile application, or even directly input into the online portal. If using a spreadsheet or mobile application, make sure to gather information in a way that can easily be brought into the IDEM Lead Service Line Inventory Template or to the online portal. Record the specific material observed, such as copper, PVC, PEX, or any other material encountered.

When conducting the statistical sampling for unknown service lines inspected, it is important to record the material identification method as "visual" in the inventory spreadsheet. Additionally, it is recommended to list the exact service line material type for these inspected service lines.

Note: If a service line is found to be a lead, then the statistical method for determining unknowns may not be used and you must contact IDEM with your results.

Step 6: Retain identification records.

Create, compile, and retain documentation of all service line identification efforts. IDEM requires PWSs to produce or submit these records. Data can be added to the portal in two ways:

- Enter each service line individually, or
- Upload the completed IDEM template in Excel or formatted csv file using your GIS (Geographic Information System) data.

Statistical Methods Proposal

In advance of employing statistical methods for the purpose of assigning service line materials, the PWS must provide a proposal to IDEM describing the following items:

- The detailed description of methods used to validate their inventory and why the PWS does not suspect lead and galvanized requiring replacement (GRR).
- The results of the inventory including the total number of service lines, number that are non-lead, and the number that are unknown.

- The anticipated number of unknowns on both the system side and customer side, as well as the proposed number of field verifications. The intended field verification methods will also need to be described.
- Explain the expected findings from this approach and how the team intends to assign service line materials for the remaining unknowns.

Appendix A

Minimum Number of Service Lines Requiring Physical Inspection

Number of "Unknown" Service Lines*	Number of sites
Fewer than 1,500	20% of "unknown" lines
1,500	306
1,600	310
1,700	314
1,800	317
1,900	320
2,000	322
2,200	327
2,400	331
2,600	335
2,800	338
3,000	341
3,500	346
4,000	351
4,500	354
5,000	357
6,000	361
7,000	364
8,000	367
9,000	368
10,000	370
15,000	375
20,000	377
30,000	379
40,000	381
60,000	382
90,000	383
225,000 or more	384

Note:1. For the purposes of this process, this number represents the number of service lines that cannot be categorized from records, installation date, diameter, previous physical inspection, or customer data. If the number of unknowns falls between two values on the chart, either interpolate or round up to the higher number. 2.Uses a confidence level of 95 percent and a 5% margin of error.