Sourcewell
Awarded Contract
Contract #012524-ABN

BlueConduit

BlueConduit Proposal

LSL Predictions

Platform-as-a-Service

Hernando County, FL

Sourcewell Member # 19571
BlueConduit Sourcewell Contract 012524-ABN

APRIL 30, 2024

Table of Contents:

Machine Learning Methodology and Approach

BlueConduit's methodology and approach is closely aligned with the guiding Principles of Data Science for Lead Service Line Inventories and Replacement Programs and in accordance with the EPA Guidance for Developing and Maintaining a Service Line Inventory, where our work is cited several times.

To ensure that the statistical methods results are accurate and interpreted appropriately, BlueConduit recommends that water suppliers adhere to the following fundamental statistical and research principles when using data science to inform the classification of the service line material at each property in their system:

1. Develop a data management plan.

2. Understand existing verified service lines materials, historical records, and all other information about service lines and addresses.

3. Verify service line material for a representative set of service lines, which can be focused on some types of service lines or addresses based on risk factors. Evaluate the correspondence between historical records and verified materials.

If lead is discovered, then:
4a. Develop the predictive model, providing the estimated likelihood of lead service line by service line, and demonstrate that the predictive model performs well for the supply region.

If there is zero lead discovered, then:
4b. Provide valid statistical documentation about how much lead may be in the service area (i.e., estimated likelihood that the entire service area has a very small fraction of lead service lines). Provide an estimated, address-level likelihood of lead probability.

5. Ensure transparency by submitting model and analysis results to FDEP, explaining how results were utilized to inform the prioritization of properties for service line investigation/replacement and/or to develop the inventory and classify material types.

Before we go any further, we want to be clear about what we mean by "lead" and "no lead." We consider lead to be present if any of these is present:

- utility-owned or customer-owned lateral service line is lead, or
- utility-owned or customer-owned lateral service line is galvanized requiring replacement (according to EPA)

When we say "no lead" as it relates to LCRR compliance, we mean that none of the above is present.

Step 1: Data Collection & Preliminary Inventory Review

The very first step to building an accurate and comprehensive inventory starts with data collection, records and system review. The first guiding principle in running any statistical analysis is to ensure that data is organized and consistent. This means ensuring all of the information collected related to a point of service is associated with that point of service (i.e., a home's specific water SL).

BlueConduit begins the process by analyzing data that can be classified as service lines of "known" materials. This involves reviewing preliminary inventory data composed of verified service line material records, building codes, County ordinances about banned service line materials, and investigating other sources that provide certainty about pipe materials in the system. This initial step provides a baseline for the inventory and helps set the strategy for reducing "unknowns" for locations where pipe material is not known with high degrees of certainty.

BlueConduit will request information from the water system to begin the statistical analysis process.

High-value data sources that are commonly used in an SLM Inventory project include:

- Recently Verified Service Line Material Records (both Public and Private-side)
- Historical Water Service Line Material Records (both Public and Private-side)
- Information on service line cards, which are primarily incomplete but could have any of the following information on them: Main size, Service line size, Service line materials, Customer account
- Records of previous materials for service line replacements performed over the last two years. (Earlier replacements do not indicate the date of replacement or material.)
- Water main age (this information is the best beginning in the 1950s)
- Historical water service line maps
- Taxable Parcel Records (year built, land size, value, zoning, etc.)
- Construction records (if available)
- Water Account Billing information (if available)
- Water Sampling Test Results (if available)
- Water Main Size and Material (if available)
- Census Data (if available)
- Fire Hydrant Locations and Attributes (if available)
- List of daycare and school facilities and their previous testing records

Essential Data Fields

Verified Service Line Material records and Historical Service Line Material records are absolutely essential to our work. Using ESRI's Lead Service Line Inventory Solution Version 3.0 or higher, BlueConduit recommends organizing and loading available data as it relates to the required fields in the designated State Agency or EPA Service Line Inventory Template . BlueConduit will ingest these data points via direct connection with Esri's Lead Service Line Inventory Solution.

Field	Status	Empty Values
Public Water System Number (PWSID)	Required	Not Permitted
Unique Service Line ID	Required	Not Permitted
Street Address	Required	Not Permitted
Geometry (Parcel, Service Point Asset)	Required (if available)	Permitted
Public Side - Service Line Material	Required (if available)	Permitted
Public Side - Replaced (Y/N)	Required (if available)	Permitted
Public Side - Install/Replacement Date	Nice to have	Permitted
Public Side - Basis of classification	Nice to have	Permitted
Private Side - Service Line Material	Required (if available)	Permitted
Private Side - Replaced (Y/N)	Required (if available)	Permitted
Private Side - Basis of classification	Nice to have	Permitted
Private Side - Service Line Material	Nice to have	Permitted
Lead connector?	Nice to have	Permitted
Lead solder?	Nice to have	Permitted

Our statistical approach requires, at a minimum, the following fields:

- Public Water System ID (PWS ID) Number associated with the service line
- Unique service line ID
- Street address
- Utility side service line material information and replacement data (unknown permitted)
- Customer side service line material information and replacement data (unknown permitted)

BlueConduit uses available data inputs to move "unknown" data points to high-probability data points, reducing

uncertainty. Recognizing that all requested information might not be available or accessible in all locations, BlueConduit's data scientists can work with the available data to develop the service line inventory.

Step 2: Data Evaluation and Validation

There are many potential sources of data about service line (SL) information, and the types and accuracy of SL data will vary between water systems. Existing data about SL materials comes from different sources (e.g., water main repairs, water meter replacement programs, old construction records) and the accuracy and reliability of these records varies by record type and location. Replacements may have been made over time without proper record keeping or records simply may be incomplete or incorrect. It is therefore crucial to establish how correct a water system's historical records are. **Out of caution, BlueConduit does not treat historical data as 100% truth when performing statistical analysis.**

Many water systems do not know which types of records are correct and which are not. For BlueConduit, it is important to establish an understanding of how accurate those records are, while also noting that some types of records are going to be more accurate than others. The process of learning just how accurate (or otherwise) a system's records are is a powerfully informative piece of this data-driven approach.

As a best-practice, to be considered a reliable known material in the preliminary analysis and therefore excluded from further field investigation, a service line should meet criteria 1 or 2 below, supported by data from a reliable source:

1. The service line was recently physically verified **-OR-**
2. Ordinances or controls were in place and all of the following apply:
    - Ordinances or other controls were in place at the time the service line was installed specifying materials used in service line construction **-AND-**
    - The water supplier has not observed deviations from these ordinance(s) or control(s) during operations and maintenance.

Any service line that does not meet one of the two criteria above may be included in the list of locations from which a set of sites will be uniformly randomly selected for verification in Step 3.

Evaluating Historic Records

Evaluating the reliability of historic records is an important starting place because it can a) identify whether available historic records can be used reliably for an inventory and b) that historic records may be insufficient as the sole source of information for a service line inventory.

Where records are not accurate or are incomplete, alternative strategies, such as a statistical analysis approach, for producing a reliable inventory are required to understand where and how many lead service lines may be present.

BlueConduit will work with the County to understand how their preliminary inventory was developed, and what data and records were collected and utilized to classify known materials. We will then evaluate, in collaboration with the County to determine the accuracy and reliability of those records and recommend field investigation to validate as needed.

Data Enrichment

BlueConduit also enriches the water system provided inventory data with several features that we spatially join to the inventory. Some information comes from National Regrid Parcel Data, which gives us information such as the land value and number of rooms in a structure. We also use public census data from the American Community Survey to provide us demographics such as race and education level. These added features help us determine whether there is bias in a sample, build inspection lists that do not have bias, and more precisely build models to predict the probability of lead.

Step 3: Representative Field Investigation

Generating an estimate of the total number of lead service lines in a system or the material at any given address will use information from previously verified service line materials to predict the materials at service lines of unknown material. The accepted best practice in statistics to be able to make these kinds of estimates is gathering verified service line

material data at a representative random set of homes where the service line material is unknown. Statistically, only such a representative set of verified service points will truly reflect the whole system.

In order to determine the appropriate number of field verifications necessary, the following information will be considered: (1) total number of service lines in the system, (2) total number of unknown service line materials in the system, (3) desired confidence level (e.g., 95%). The accepted standard confidence level across several states is 95%.

After preliminary evaluation of the quantity and quality of existing verified data, BlueConduit will generate a targeted list of ~100-150 service lines for the water system to visually inspect and confirm the existing service line material on both the public and private sides of the line. Site selection will be representative of the unknown population in order to mitigate data biases that may exist in already known data. This verified data will then be used in conjunction with any other confirmed information to inform BlueConduit's statistical analysis.

Subsequent field verifications may be recommended as needed to reach desired level of confidence/FDEP minimum requirements and will be provided in batches of 50-100 locations. Based on best practices in statistics and sample size calculation (Appendix A: Michigan EGLE Guidance), BlueConduit estimates that a representative sample of up to ~400 of the system's unknown service lines will require visual inspections to reconcile uncertainty.

The final count of recommended inspections will be based on BlueConduit's initial data analysis and developed in collaboration with the water system, subject to final approval by FDEP.

Results demonstrating evidence of representative investigations will be included in the final project summary report.

Field Verification Method

While BlueConduit does not require the water system to use a specific verification method in the field, we do recommend potholing/hydrovac at the curb box as the most accurate and efficient method to verify material on the public and private sides of the service line. We recognize that every system's infrastructure is different and recommend utilizing the verification method(s) most efficient and effective for the County, so long as the chosen methods are aligned with any specific field verification requirements set forth by FDEP.

Step 4: Statistical Analysis

Upon completion of the recommended field investigation effort, combining the verified material results with other characteristics of those parcels (e.g., age of home, neighborhood, water testing, etc.) allows BlueConduit to calculate the probability of finding an LSL at locations with unknown materials on both the public and private side of the service line.

If during data evaluation and representative field investigation, lead is found to be **absent** in the system, the "Statistical Method for Showing Evidence of the Absence of Lead" as outlined below will be employed to generate results.

If during data evaluation and representative field investigation, lead is found to be **present** in the system, the "Machine Learning Method" as outlined below will be employed to generate results.

Statistical Method for Showing Evidence of the Absence of Lead

Many water systems report having never encountered a lead pipe in all of their time maintaining their water infrastructure, and have no historical records of lead line installations.

However, the absence of evidence of lead at a subset of service lines alone cannot "prove" an absence of lead altogether across the whole service area — but it's an important part of the picture. If the preliminary inventory data **and** representative field investigations reveal *zero* lead - (no lead service lines, no galvanized service lines requiring replacement, or no lead goosenecks) - the remaining unknown service lines will have a very low probability of being lead.

The only way to absolutely prove with complete certainty there are no lead service lines in a water system is to dig up and visually inspect every single length of every single service line. Water systems and regulators alike recognize that 100% physical verification is not feasible from a time or cost perspective. This is where BlueConduit's statistical analysis approach provides significant value and is the most efficient, scientific alternative to putting eyes on every single pipe. This approach has also proven to be more effective than using historical records alone.

If we have representative data that shows zero lead, our data scientists take two inputs:

1. the number of service lines in the representative sample that you inspected where you found no lead **and**
2. the desired level of confidence (e.g. 95%) - and create the highest possible percentage of lead services lines you could reasonably expect to find in the water system.

When a representative set of unknown service lines are inspected (on both portions of the service line) and when not even one of them turns out to be lead, then we can characterize our uncertainty about that water system's remaining unknowns with statistical calculations such as: "We are 95% confident that there are fewer than X# lead service lines on the public side of the system (n% of the system) and fewer than X# lead service lines on the private side of the system (n% of the system).

These calculations will translate to a likelihood of lead on all unknown service lines at the address level. This documented evidence can support the County's use of a category label of "Non-Lead" for the remaining unknown service lines in the inventory, using statistical analysis as the basis of material classification. These resulting calculations can also guide community and utility action even when it is very likely that there is a very low number of lead service lines in the system.

Where applicable, in addition to the address-level likelihood of lead predictions, results documenting evidence to support our statistical no-lead conclusion for the County will be included in the final project summary report.

Machine Learning Method

If during data evaluation or representative field investigation, lead is found to be present in the system, BlueConduit will develop a machine learning predictive model to generate the probability of having a lead service line for each unknown service line in the distribution system. Address-level predictions will be provided for the private side of the service line, the public side, and for the entire service line.

These predictions can also be provided at different levels of detail as needed by the water system:

- *System-Wide Level* A service-wide estimate can be used to estimate the total number of lead service lines, develop annual capital and operating budgets, request funding and communicate this to customers.

- *Neighborhood Level* If there are indicated lead service lines, neighborhood-by-neighborhood information is ideal for prioritizing resources across the service area. Additionally, this information can be used to develop a public health communication strategy and, potentially, a "Filter Distribution Program."

- *Water main or block-level* Shows the highest likelihood of lead service lines by water main. The water system can coordinate service line replacement work with other planned infrastructure/asset management work to optimize spending and reduce overall community disruption.

The machine learning process is most effective when taking an iterative approach, as recommended by the EPA. Each time the County verifies service line material through its regular operations, that data will be automatically integrated into the model to refine the predictions accordingly. Leveraging the statistical model's machine learning nature, the model can improve over time with additional data. If lead is found during evaluation of historic records or representative sampling, several iterations of the model will be generated throughout the project before recommendations are made for material classifications in the LSLI.

When developing and using a predictive model, it is important to continually evaluate model performance at every stage of model development and implementation. It is also critical to establish reasonable baselines for comparison throughout. BlueConduit evaluates the performance of its statistical models with various metrics to ensure accuracy and reliability.

Where applicable, model performance metrics such as hold-out sample accuracy, AUROC (Area Under Receiver Operator Characteristic), Precision vs. Recall, and Model Calibration Plots may be included in the final project summary report.

Measures of Accuracy and Reliability

When using a statistical model, it is important to continually evaluate model performance at every stage of model development and implementation. BlueConduit evaluates the performance of its statistical models with various metrics to ensure accuracy and reliability. One of the most critical metrics of model reliability is the AUROC (Area Under ROC Curve), which says how good a predictive model is at determining a lead pipe from a non-lead pipe. In multiple geographies, our models have accurately made this distinction 95% of the time. We anticipate that by following BlueConduit's methodology and approach, the Utility would achieve a similar level of confidence in communicating its inventory to regulators and consumers.

Another accuracy method leverages the use of a hold-out sample. A holdout sample refers to withholding a random portion of a data set from an initial model and then using the withheld data to assess the statistical model's performance. Aside from making sure that model probabilities are well-calibrated, it is important to define the accuracy measures used to evaluate and monitor model performance. The key metric to be used for in-the-field true hold-out evaluation is "Hit Rate," the number of LSLs that were identified divided by the number of attempted replacements regardless of what was discovered. Hit rate can be computed for an entire region or broken down into a specific geography or time.

BlueConduit also validates the model's performance using state-of-the-art metrics (e.g., precision and recall). Read about the tradeoff between Precision vs. Recall in this Article by BlueConduit Chief Data Scientist Jared Webb.

Step 5: Results and Documentation

Utilizing Results to Classify Service Line Materials in LSLI

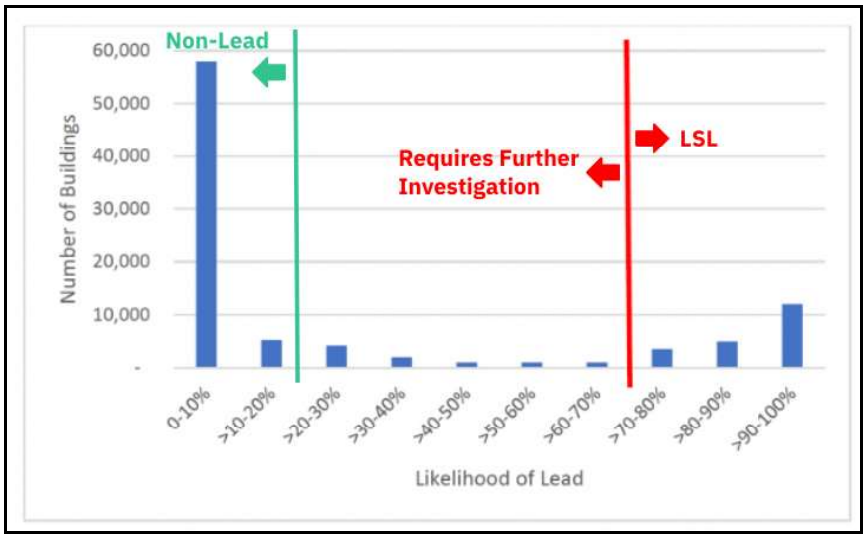
At the conclusion of the project or prior to the October 2024 LCRR deadline for LSLI submission, BlueConduit will provide guidance to the water system with evaluating the results and will make recommendations for classifying unknown service line materials accordingly.

- If lead service laterals and/or galvanized lines requiring replacement are found to be **absent** through data review and representative field investigations, our no-lead statistical conclusion can be utilized to support classifying all remaining unknown service lines as non-lead.

- If lead service laterals and/or galvanized lines requiring replacement are found to be **present** during data review and representative field investigations, the below thresholds approach will be implemented.

To determine which service lines to count as lead or non-lead in the inventory, a threshold can be chosen at a point so that all SLs with lead likelihood greater than this point are considered likely to be in one category (e.g., "lead," "require

physical inspection due to high likelihood of lead"). In this example below, the threshold point approach, as provided by the New Jersey DEP (which they call "inflection" point), would suggest that any property with a likelihood of lead greater than 70% (red line) should be included in the inventory as an LSL.



Source: [NJDEP Guidance for Utilizing Predictive Modeling to Identify Lead Service Lines for Inventory Development]

Similarly, another threshold can be established for the lower end of the range of likelihood of lead. That lower threshold can be chosen so that all SLs with lead likelihood less than this point are considered to be in a different category (e.g., "not lead," "not requiring physical inspection due to low likelihood of lead"). A water system may choose to say that all SLs with lead likelihood less than 10% can be considered to not have lead for the purposes of their inventory.

This lower threshold may be of particular value for the water system, so they can consider service lines as non-lead for inventory purposes when the SL's lead likelihood is below a threshold. The decision of where to set the threshold for determining which properties to identify as served by a lead or non-lead service line in the inventory will be thoroughly explained and defended in BlueConduit's reports about statistical analysis and service line predictive modeling and is subject to final FDEP approval.

The County should recognize that FDEP may request additional physical verification after review of the statistical analysis report and findings, including possible excavation of additional service lines. Even when there is a low likelihood of a property having an LSL (e.g., 95% chance that a service line is non-lead), there remains a small chance that the property will have an LSL (e.g., 5% chance of LSL).

The County should also expect the lead service line inventory to remain a living and evolving data set as future field inspections and potential replacements are completed. In accordance with LCRR, if after a service line classified as non-lead based on the results of statistical analysis is eventually found to be lead in the field, the classification of the material should be adjusted accordingly in the inventory and proper notification and remediation steps executed.

Statistical Analysis Project Summary Report for FDEP

At the end of the project or prior to the October 2024 LSLI submission deadline, BlueConduit will prepare a comprehensive statistical analysis report to be submitted to FDEP for final review and approval which will include:

(1) How the analysis/model for the water system was performed, evaluated, and assessed for reliability
(2) The results of the investigation and analysis (i.e., likelihood of each property having lead or non-lead)
(3) Evidence demonstrating representative field investigation
(4) How the results were utilized to inform the prioritization of properties for service line investigation/replacement and/or to develop the inventory and classify material types.

Esri ArcGIS Collaboration - BlueConduit Smart SLM Inventory

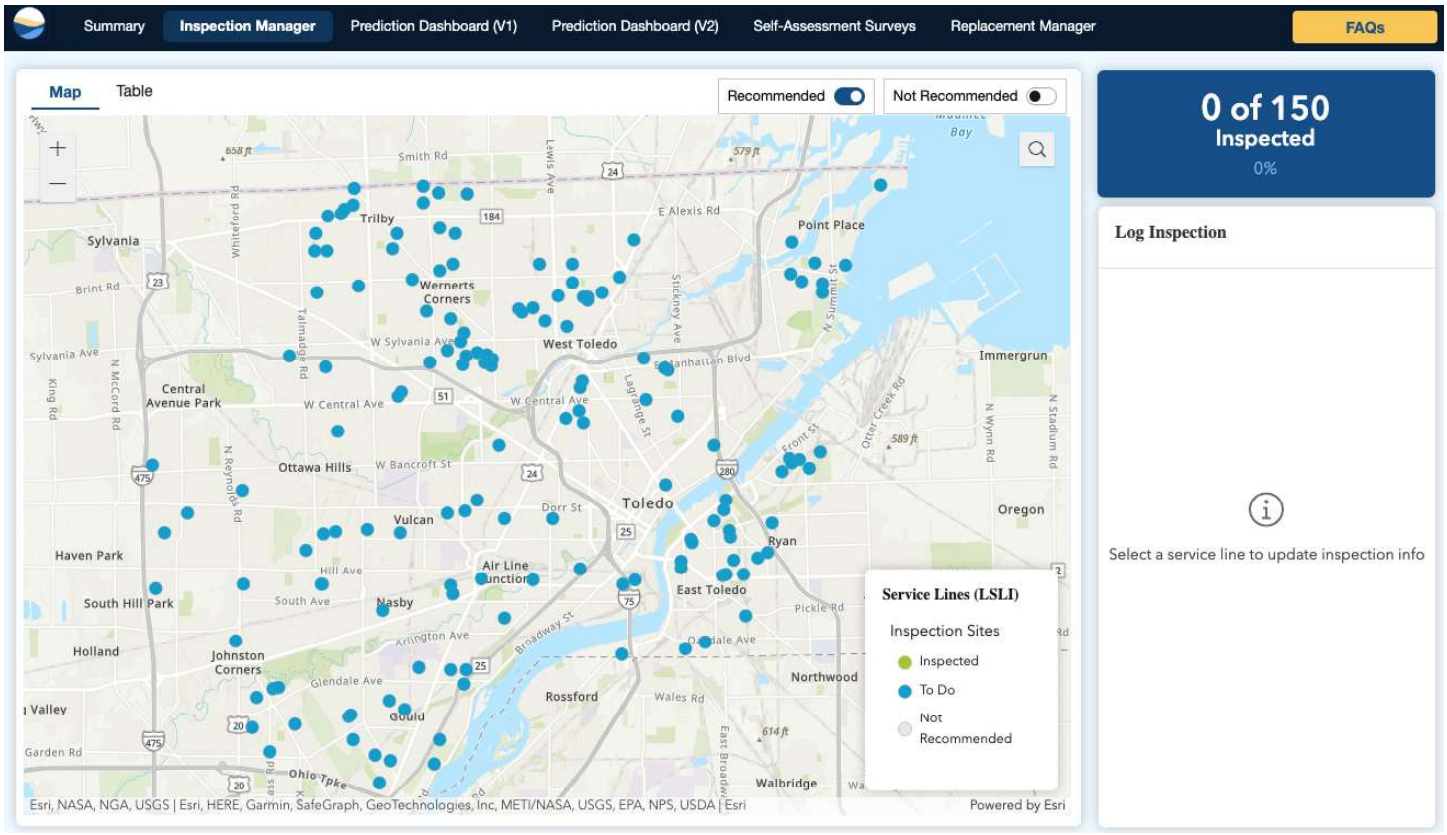
BlueConduit is partnered with Esri to deliver a best-in-class, GIS-based Lead Service Line Inventory software solution. By combining the Esri ArcGIS Online technical architecture with BlueConduit's robust data analytics, service line inventory management and compliance is simplified and efficient.

Our predictive model and machine learning capabilities are seamlessly integrated with the Esri Lead Service Line Inventory Solution, which features eleven applications that provide each key user with targeted functionality and can be deployed *free of charge* for existing Esri customers. **This solution requires the Utility to retain an active ArcGIS Online environment and utilizes existing Esri licensing.**

Features:

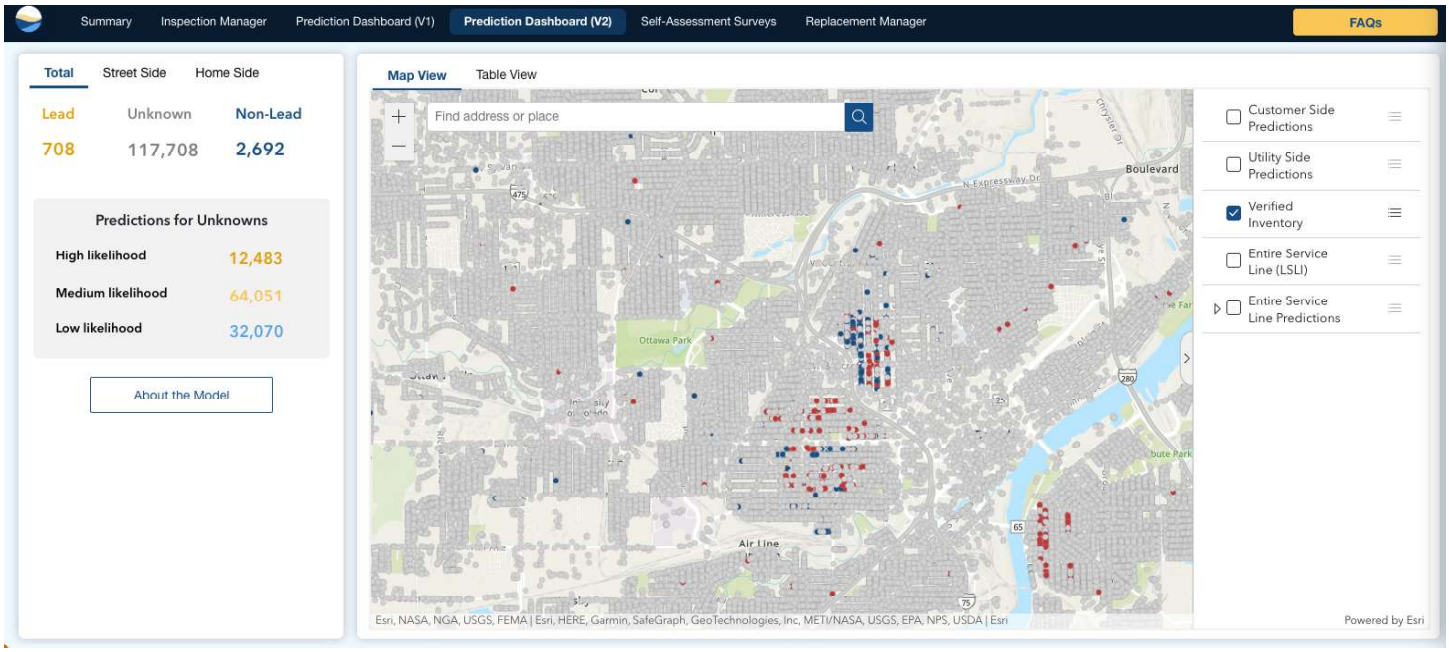
- BlueConduit Data Analytics for Smart SLM Inventory
- SLM Inventory Data Management
- ArcGIS Inventory Online Project Map (Hosted by the Client)
- Public-Facing Inventory Map
- Configurable Dashboards
- Address-level Material Predictions (Public and Private Sides)
- Up-to-date inventory with two views displayed on the map: verified and predicted materials.
- Ability to collect and record physical verifications using Esri field-based apps, where saved inspection records are automatically linked to the inventory table
- Water Service Line Material Survey for customer self-reporting

BlueConduit Inspection Manager - BlueConduit configured Esri experience integrated with Esri LSLI, hosted in the client's ArcGIS Online Environment. BlueConduit will deliver recommended inspection location list(s) directly to the Inspection Manager. Users can view recommended inspection locations in map or table format. Users can select a service line point to update attributes and/or inspection information in the web. Lists can be exported in .csv format

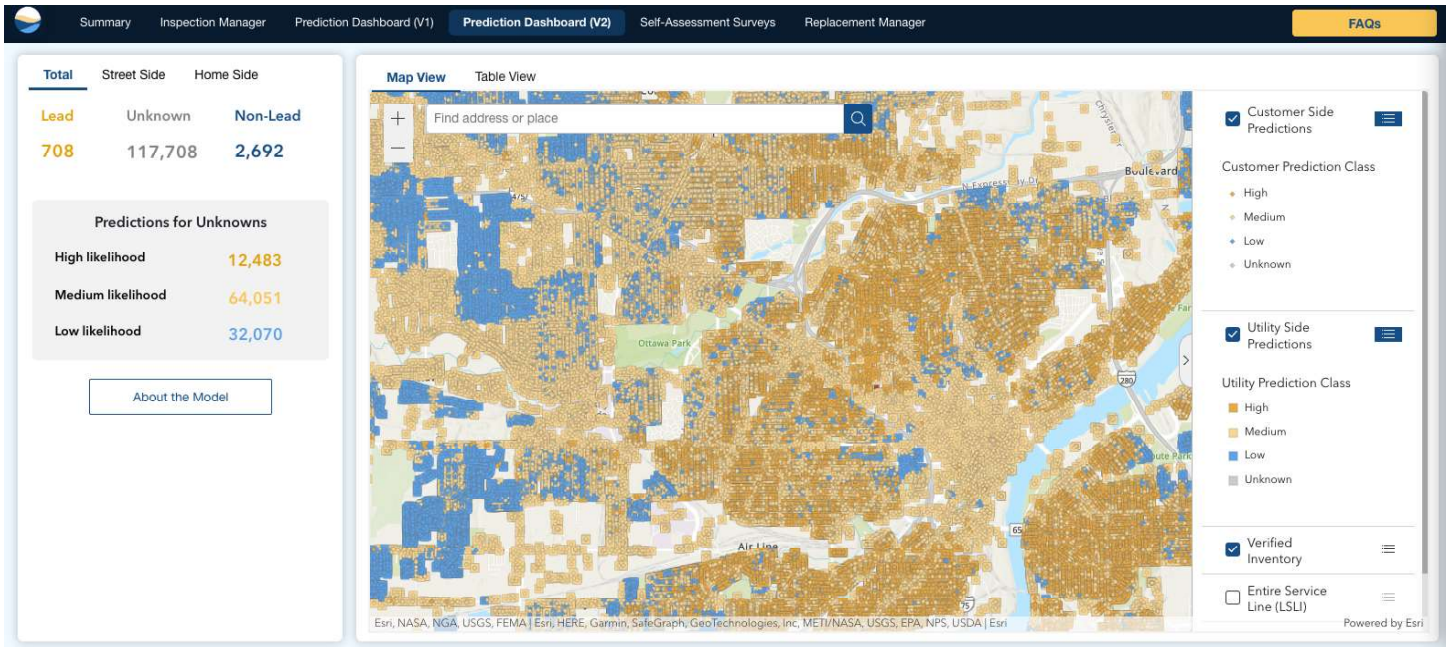


BlueConduit Prediction Dashboard(s) - BlueConduit configured Esri experience integrated with Esri LSLI, hosted in the client's ArcGIS Online Environment. BlueConduit will deliver parcel-level material predictions directly to the Esri LSLI, with a custom table schema and symbology to track and visualize public side, private side, and gooseneck material predictions. Utility staff can zoom in to parcel level or search for an address/asset ID. Also viewable in table format and can be exported in .csv.

Verified Inventory Layer:



Predictions Layer:



Esri LSLI Project Workflow Summary

This high-level overview summarizes the workflow expectations defined by the BlueConduit project scope. We recognize that the County may have already completed some of these initial steps to launch the use of Esri's Lead Service Line Inventory solution.

1. The County will collect, organize, review, and prepare available data for the service line material inventory.
    a. BlueConduit recommends organizing data aligned to the EPA Inventory Template Schema for easy loading into the Esri LSLI.
2. The County will deploy and host the free version of the Esri LSLI Solution Version 3.0 or higher in their ArcGIS Online (AGOL) account.
3. BlueConduit will coordinate with the County to install a routine that adds our custom schema, dashboards and applications to the Esri LSLI Solution. Additional columns will be appended to the LSLI data table.
    a. The County will provide BlueConduit with read/write access to ESRI LSLI Solution Inventory Data Layer.
        i. BlueConduit only writes into the additional columns we append to the data table.
    b. The County will allocate a (temporary) creator license for configuration and deployment of BlueConduit - Esri Application Experience.
4. The County will load collected data into the Esri LSLI Application and notify BlueConduit when completed.
5. BlueConduit will utilize the direct interface with Esri to pull the data into the BlueConduit machine learning platform to perform phase 1 of data analysis.
6. BlueConduit will produce the initial batch of targeted locations for the County to complete physical verification (100-150 locations), which will be representative of the entire system.
    a. BlueConduit estimates that up to ~400 total will yield sufficient results to support statistical analysis.
    b. Recommended Inspection locations will be delivered directly to the Esri LSLI data table; visible in the BlueConduit Inspection Manager and can be exported in .csv format.
7. The County performs physical verifications and logs results using Esri LSL Field Map App, where saved inspection records are automatically synced to the project's inventory table.
    a. If the County uses an alternative field data collection tool/method, the County must load the updated material data into the Esri LSLI for ingestion by BlueConduit.
8. BlueConduit will utilize the direct interface with Esri to pull the newly verified data into the BlueConduit machine learning platform to perform phase 2 of data analysis.
9. BlueConduit will generate the 1st iteration of address-level predictions and deliver directly into the Esri LSLI.
10. BlueConduit will update the LSLI dashboard, reflecting verified service line materials and predictions.
11. As ongoing inspections and/or replacements are performed by the County, the newly updated material data will be ingested and analyzed by BlueConduit for the duration of the contract agreement.
12. Service line material predictions will automatically be updated at a frequency determined between BlueConduit and the County based on availability of newly collected data for the duration of the contract agreement.

Pricing Summary - Sourcewell Contract 012524-ABN

BlueConduit Platform-as-a-Service (Year 1 - Fixed Fee)	**$112,500.00**
Project Management/Meetings	
BlueConduit - Esri Integration	
Deployment: BlueConduit Experience powered by Esri LSLI	
Data Science Validation and Analysis	
Data Enrichment	
Configuration of BlueConduit LSLI Dashboard (Verified and Predictions)	
Recommended Inspection List(s)	
Lead Predictions per Unknown Service Line (Public and Private)	
Public Facing Map	
Statistical Analysis Report	
Sourcewell Discount (-20%)	**-$22,500.00**
Year 1 - Fixed Fee Project Total	**$90,000.00**

BlueConduit Platform-as-a-Service Renewal - Year 2	$35,000.00

Pricing – Key Assumptions

1. ~67,000 SL's
2. Base Project TimeFrame: Contract Signing +12 months.
3. Sourcewell Contract 012524-ABN with contract discount of 20% applied.
4. The County will prepare the preliminary inventory and load data into the Esri LSLI application.
5. Project Total will be invoiced within 10 days of contract signing and subject to NET30 payment terms.
6. The County is required to utilize existing Esri licensing to deploy and use the configured solution, including allocating user licenses (viewer, editor, mobile worker) for all staff and/or contractors to view and edit the LSLI data.
7. Optional renewal in subsequent years provides ongoing access to the integrated BlueConduit solution, including data science analysis, updates to material predictions and continued no-lead validation or replacement prioritization.

Statement of Work

BlueConduit LSL Predictions Platform-as-a-Service (12 months)

BlueConduit's LSL Predictions Platform-as-a-Service (PaaS) is an annual fixed fee that includes the following:

- Professional Services for Project Management, Implementation and Data Science Analysis (Tasks 1-4)
- Backend Software Infrastructure, Tools, Hosting and Environment for supporting the Client's analysis and deliverables
- Integration of BlueConduit's Proprietary Statistical Analysis and Machine Learning Algorithms
- Esri - BlueConduit Integration
- BlueConduit Experience Deployed to the Esri LSLI (Custom Applications and Dashboards)
    - Recommended Inspection List(s)
    - Lead Predictions (Public and Private)
    - Likelihood of Lead Categorization for Replacement Planning (Low, Medium, High Risk)
    - Public-Facing Inventory Map
- Statistical Analysis Reports for Compliance

Task PM: Project Management

BlueConduit will provide project management services throughout the project to ensure successful execution of each task. BlueConduit's dedicated Project Manager (PM) and/or Customer Success Manager (CSM) will be responsible for all project coordination and communication with the County (the Client). BlueConduit will track project performance including budget and schedule, identify any outstanding issues, and hold progress meetings/conference calls with the Client as necessary. BlueConduit will also perform typical project management activities including the following: preparation of invoices, work plan, coordination, staffing, schedule management, QA/QC, and project updates.

Task 1: Project Startup

1.1 Project Kickoff Meeting

⇒ BlueConduit will conduct a virtual project kickoff meeting in coordination with the Client to introduce our project team, establish lines of communication, set mutual project expectations, and review the scope of services and project schedule.

⇒ Following the kickoff meeting, BlueConduit will provide a finalized project work plan/schedule.

1.2 BlueConduit Platform Setup

⇒ BlueConduit will set up the necessary backend software infrastructure, tools, and environment to support data hosting, analysis, machine learning, integration and outputs for the Client's project.

1.3 Regulator Project Plan (if required by regulator)

⇒ If required by FDEP, BlueConduit will prepare a draft project plan to be submitted to FDEP for review and approval, as needed. The project plan will outline the proposed methodology and approach, as well as recommended framework for applying the statistical analysis results for material classification.

Assumptions

⇒ All Client staff involved in LCRR compliance preparation will be encouraged to attend the Kickoff Meeting.

⇒ The Client will provide an estimated timeframe to complete each of their respective tasks for inclusion in the Project Work Plan/Schedule.

⇒ The Client will review and provide necessary input/feedback on the Regulator Project Plan draft.

⇒ Once the Regulator Project Plan is finalized, the client will submit to FDEP for review and approval.

Deliverables

⇒ Copy of Kickoff Meeting Slide Deck/Notes

⇒ Finalized Project Work Plan/Schedule

⇒ Regulator Project Plan Draft (if applicable)

Task 2: Implementation

2.1 BlueConduit - Esri Integration and Deployment

⇒ BlueConduit will host a virtual working session with the Client's GIS staff to install a routine that adds our schema (tables, columns, views, triggers) to the ESRI inventory.

⇒ BlueConduit will configure the Esri applications for the BlueConduit Experience) to include our custom applications and dashboards.

2.2 Data Ingestion and Phase I Analysis

⇒ BlueConduit will utilize direct integration with Esri LSLI to ingest existing Client data.

⇒ BlueConduit's Data Scientists will perform preliminary analysis of existing data to evaluate for quality, gaps, biases and representativeness.

⇒ During this task, BlueConduit will also enrich the provided data set with several features which will be spatially joined to the inventory. Example sources of enrichment include: National Regrid Parcel Data and the American Community Survey for census and demographic data.

2.3 Inventory Data Summary and Review

⇒ BlueConduit will provide a summary of its data assessment and present any gaps and recommendations to be addressed for the purpose of supporting the BlueConduit machine learning process.

- ⇒ BlueConduit will host a virtual meeting with the Client to review the Inventory Protocol, ensuring all available data is provided and that we understand how the preliminary inventory was developed, including data sources, material classifications etc.
- ⇒ At the conclusion of this task, the Client will be asked to provide confirmation and sign-off on the mutual understanding of the preliminary inventory ground truth before BlueConduit proceeds with Recommended Inspections.

2.4 Recommended Inspection List (Batch 1)

- ⇒ BlueConduit will produce an initial batch of locations for the Client to complete physical verifications on each the public and private sides of unknown service lines. These results will shore up the baseline data for statistical analysis.
- ⇒ BlueConduit's recommended inspection list is based on the quality of verified data provided.
- ⇒ The number of locations to be included in the first batch (typically 100-150) can be discussed and mutually agreed upon between the Client and BlueConduit, taking into consideration the preliminary data evaluation, overall project timeline and State compliance requirements.
- ⇒ Total physical verifications required to support the statistical analysis/modeling process for material classification may depend on FDEP requirements and approval.
- ⇒ **The Client** will assume any property inspection and physical validation costs.

2.5 Recommended Inspection List(s) (Additional Batches)

- ⇒ Subsequent inspections may be recommended and can be provided in batches, as needed; the final recommended inspection expectation cannot be determined until BlueConduit has reviewed and analyzed the existing Client data in its entirety, however, BlueConduit estimates that ~400 field verifications total may be necessary.

Assumptions

- ⇒ Our assumptions based on preliminary discussions with the County is that little to no lead is expected. If during recommended field investigations, an LSL is discovered, this may impact the course of action as far as the need for additional inspections.
- ⇒ The Client will deploy and host the Esri Lead Service Line Inventory (LSLI) Solution v 3.0+ in their ArcGIS Online (AGOL) account.
- ⇒ The Client will utilize existing Esri licensing to deploy and use the configured solution, including allocating user licenses (viewer, editor, mobile worker) for all staff and/or contractors to view and edit the LSLI data.
- ⇒ The Client will provide BlueConduit with read/write access to the inventory data layer.
- ⇒ The Client will allocate a (temporary) creator license to BlueConduit to execute configuration of Esri LSLI solution.
- ⇒ The Client will collect, organize, review, and prepare available data for the preliminary service line material inventory.

- ⇒ The Client will load their available LSLI data into the Esri LSLI Application Service Line layer.
  - If the Client requires services or support from BlueConduit in regards to preliminary inventory development and/or data loading in Esri, a change order or update to scope/fee will be needed..
- ⇒ The Client will be available to meet and answer questions about the provided inventory data and ground truth data.

Deliverables

- ⇒ BlueConduit Experience deployed to the Esri LSLI
- ⇒ Data Analysis Report
- ⇒ Recommended Inspection List(s)
  - Inspection lists will be delivered directly to the BlueConduit Inspection Manager in Esri and can be exported in .csv format.

Task 3: Statistical Analysis and Predictions

3.1 Data Ingestion and Phase II Data Analysis

- ⇒ Upon completion of the Client's field investigation effort, BlueConduit will utilize direct integration with Esri LSLI to ingest the newly collected verified service line material data.
- ⇒ BlueConduit's Data Scientists will perform analysis of the newly collected data for the purpose of statistical analysis, training machine learning models and producing address-level predictions.
- ⇒ This task may begin and run in parallel with Task 2.5.

3.2 Material Predictions

- ⇒ BlueConduit will deliver service line material predictions, which will include the likelihood of lead vs non-lead for each segment (public and private) for each unknown service line in the distribution system.
- ⇒ Lead = LSL, GRR, and/or Lead Goosenecks and Non-Lead = All other "safe" materials.
- ⇒ Predictions will be delivered directly to the Esri LSLI application.
- ⇒ If lead is discovered, BlueConduit's Data Scientists will perform ongoing analysis of newly integrated data for the purpose of re-training the machine learning models and refining service line material predictions for the duration of the defined agreement.
- ⇒ If lead is discovered, BlueConduit will continuously update material predictions at a frequency determined in coordination with the Client during implementation for the duration of the contract agreement.
- ⇒ This task may begin and run in parallel with Task 2.5 and 3.1.

3.3 Configuration of BlueConduit Predictions Dashboard

- ⇒ BlueConduit will configure a custom Esri LSLI dashboard which will visually display both verified materials and predictions, with separate layers for public side and private side predictions.

⇒ BlueConduit will coordinate with the Client to determine appropriate thresholds categorizing low, medium, and high risk levels.

3.4 Results Explanation and Review Meeting

⇒ BlueConduit will host a virtual meeting(s) with the Client to review and explain the dashboard, prediction results and performance metrics as well as recommended next steps for model improvement.

Assumptions

⇒ The Client staff will be available to answer questions about the data provided, as needed.
⇒ The Client will be prepared to perform physical verifications in a timely manner and log results using Esri LSL Field Map App. Saved inspection records are linked to the project's inventory table.
⇒ If the Client uses an alternate field data collection tool/method, the Client must load the updated material data into the Esri LSLI for ingestion by BlueConduit.
⇒ The Client will own and maintain the inventory source of truth in the Esri LSLI.

Deliverables

⇒ Service line material predictions (public and private side) that indicate the likelihood of lead (LSL, GRR, lead goosenecks) vs non-lead (safe materials) for each unknown service line in the distribution system.
    ■ Ongoing updated address-level predictions for the duration of the contract agreement.
⇒ BlueConduit Predictions Dashboard

Task 4: Reporting and Compliance

4.1 Statistical Analysis Report for Compliance

⇒ BlueConduit will prepare a detailed report summarizing our methodology, data inputs, performance metrics and results of our analysis and predictions as necessary for FDEP compliance.
⇒ This report will include recommendations for LSLI material classifications based on the results of analysis and predictions.

4.2 LSLI Export for Compliance

⇒ The LSLI will be available for export directly from Esri for submission ahead of the LCRR deadline. BlueConduit will support necessary data mapping to the required State Inventory Template.
⇒ BlueConduit will assist the Client with statistical analysis based prioritization recommendations as it relates to LSL Replacement Strategy and Planning.

4.3 Public-Facing Inventory Map

⇒ BlueConduit will configure a public-facing map of the LSLI in Esri for the Client to host on their website.

Assumptions

- ⇒ The Client is responsible for exporting and submitting the Lead Service Line Inventory and supplemental reporting to FDEP.
- ⇒ The Client is responsible for hosting their Public-Facing Map on their website to comply with LCRR requirements.

Deliverables

- ⇒ Statistical Analysis Project Summary Report
- ⇒ Compliant LSLI Export
- ⇒ Public-Facing Inventory Map