



Technology by Utilis

Proposal for Missoula Water, MT, April 12th, 2022

SAR Satellite Imagery Analysis for Underground Water Leaks

A Proposal for
Missoula Water, MT



Proposal & Scope of Work

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BACKGROUND

ASTERRA uses Utilis-patented technology for infrastructure condition assessment, pipe replacement modeling, and leak detection in urban treated water networks, using L-band synthetic aperture radar (SAR) mounted on a satellite. The technology is based on a proprietary algorithm that detects soil moisture resulting from treated water leaks, through the analysis of SAR data.

The scope of work contained herein details the work, product and deliverables ASTERRA will provide as well as the roles and responsibilities of both ASTERRA and Missoula Water, MT ("**Client**"). A fee schedule and a work schedule are also part of this scope of work.

RECITALS

WHEREAS, ASTERRA has developed a commercial product/service called Recover that can identify water as a result of leaking treated water pipelines, using remote sensing technology.

WHEREAS, **Client** owns and/or manages treated water distribution and transmission pipelines in AOI (area of interest) and is interested in using ASTERRA remote sensing analysis data overlay as part of a condition assessment strategy and/or reduce non-revenue water (NRW) losses.

Therefore, to accomplish the purpose stated above, and in consideration of the mutual statements below, ASTERRA and **Client**, agree as follows:

SCOPE OF WORK

In order to meet the objectives listed above, the ASTERRA Recover deliverable under this scope of work shall be a data-driven report of potential leak areas. These potential leak areas identified by the satellite are developed using ASTERRA standard techniques of data collection and analysis. Raw SAR satellite images are received as the input, after which the ASTERRA team applies a proprietary algorithm. The image is then analyzed, and potential leaks of treated water are identified. The potential leak target area is displayed as a highlighted pipe length that may be investigated by the **Client**. The delivery report is provided via a password-protected web portal, and includes GIS files, graphical leak reports, and/or a GIS web-based application. The Delivery report can also be provided offline, upon request.



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Main Benefits of Recover:

- Non-invasive technology: Deployment of sensors or hardware on the ground is not necessary. Recover can fit into OPEX or CAPEX budgets.
- Speed of delivery: Satellite images may be obtained and analyzed in the order of weeks after image acquisition.
- Increases the efficiency of traditional acoustic leak detection programs by prioritizing work locations and offering quicker response times.
- Identifies background (i.e., non-surfacing) leaks that may otherwise go undetected for long periods of time.
- Screening technology that can be used directly or indirectly for condition assessment.
- Simultaneously surveys an entire system in urban and rural areas, while also providing location intelligence at a fine resolution. Identifies leaks in areas where traditional acoustic leak detection programs may not typically survey.
- Technology is inherently agnostic to soil type, pipe material, and pipe diameter.

ROLES, RESPONSIBILITIES AND DELIVERABLES

ASTERRA

ASTERRA will provide Recover reports notating areas containing potential leaks (i.e., areas containing soil moisture of treated water underground) using a proprietary satellite imaging algorithm across the **Client's** water system. ASTERRA will provide a primary contact person for technical and administrative purposes who will interact with the **Client**.

ASTERRA responsibilities include:

- Acquiring and analyzing the satellite imagery.
- Preparing a GIS-based report of potential leak locations, a.k.a. Likely Leak Location (LLL) or Points of Interest (POIs).
- Providing best practices for field inspection protocols to the **Client**.
- Optional: sub-contracting certified field leak detection teams



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ASTERRA deliverable includes

- **Recover (POI Output):** GIS layer containing the POIs, provided in SHP and KML format for import into a GIS system (**Client**-based as in ESRI, ESRI Partners or ASTERRA-provided U-Collect and U-View) that can be overlaid on a map displaying streets, pipes, hydrants, valves, and potential leak information.
- **Online Dashboard:** A link to a password-protected portal with the data collected via the U-Collect field app for monitoring the project/service progress in real time and calculating KPIs. The license is active upon delivery and for three (3) months from the date of the last delivery.
- **U-Collect and U-View Licenses:** One (1) license is provided for each of the following: U-Collect (allows field technician to collect data in the field), and U-View (allows field technician to view data in the field). The license is active upon delivery and for three (3) months from the date of the last delivery. Additional licenses may be purchased and/or the initial license extended in 3-month terms at the request of the **Client**.
- **Kick-off meeting:** Prior to field work, an ASTERRA or ASTERRA certified team (regardless of if it is the **Client**'s team or a contractor), will call a kick-off meeting to agree on the operational field plan to address the **Client**'s specific needs and the best practices required to get the best results.
- **Optional: Acoustic Leak Detection Field Investigation.** Based upon selecting this option, ASTERRA will provide a certified sub-contractor for a dedicated acoustic field verification effort to investigate provided POI's and pinpoint possible leaks according to ASTERRA best practices and guidance. The leak detection field verification team(s) is proficient and experienced in using and operating acoustic equipment, such as amplified leak listeners, ground microphones, and leak noise correlators, at a minimum. The team(s) should be provided with all needed tools to access listening points.



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Client

Client is responsible for providing baseline system data, work order history and in some cases, an acoustic field verification team to inspect POIs identified by ASTERRA. **Client** shall identify a primary contact person for technical, administrative, and field inspection coordination. ASTERRA agrees to use the information described below only for **Client's** specific project and to not share the information with any other third party.

Client responsibilities include:

- **Pipe System Information:** Prior to image acquisition, the **Client** shall provide ASTERRA with a detailed and accurate GIS pipe system layer (if available). ASTERRA will use this layer to identify POI locations. The GIS layer should include pipe material and diameter, length of pipeline to be analyzed, hydrants, valves, and any other detailed information available.
- **Leak Detection History (Work Orders):** The **Client** shall provide ASTERRA with a detailed and accurate history of leak findings and repairs beginning one (1) week before the date the satellite image was acquired and ending when field verification efforts begin.
- **Leak Detection Performance Metrics:** The **Client** shall provide ASTERRA with relevant and available performance metric data related to previous **Client**-utilized leak detection methodologies. This information will be used to calculate value metrics of the service and will be provided to the **Client** in the final report for their use.

WORK PROCESS TIMELINE

- After contract signature, ASTERRA will acquire the satellite image(s). ASTERRA must have the contract signed at least 21 days prior to the satellite coverage date to move forward with the satellite data procurement. Your contract will be with Utilis Inc. The date of the acquisition is subject to technical and operational constraints of the third-party satellite operation company and may change at any time.
- Before image acquisition, the Client will provide ASTERRA with an area of interest (AOI). Unless agreed otherwise by the parties, the AOI is a designated geographical area to be surveyed using satellite within the Client-provided service area.
- During the period prior to the image acquisition, the Client will provide ASTERRA with a GIS layer of all available treated water lines in the AOI to be analyzed. If available, the Client will also provide a hydrant and valves layer within the AOI.



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- Unless otherwise agreed upon by both the parties, ASTERRA will provide services only in the AOI overlapping with the Client's provided GIS pipe system layer.
- After acquiring the image and receiving the GIS pipe layers from the Client, ASTERRA will produce the full analysis and deliver the leak report to the Client. Image acquisition dates may be changed by a third party (satellite operator) or due to technical constraints. Delivery date may be affected due to poor image quality according to ASTERRA's quality assurance standards.
- Where applicable, leak field inspection work can begin after the leakage report has been delivered on an agreeable date between both parties.
- Field inspection work should not begin until after ASTERRA has provided training, guidance, and interpretation of the leakage report.
- Unless otherwise agreed upon by the parties, field work with ASTERRA field engineer will be conducted only within the borders of the AOI and only within the areas within the **Client's** pipe system.

CLIENT PROJECT SPECIFICS

During this service, ASTERRA will survey the following area of interest* (figure 1.1) and up to 340 miles of main and service lines combined within the image boundaries.

Missoula Water Service Area

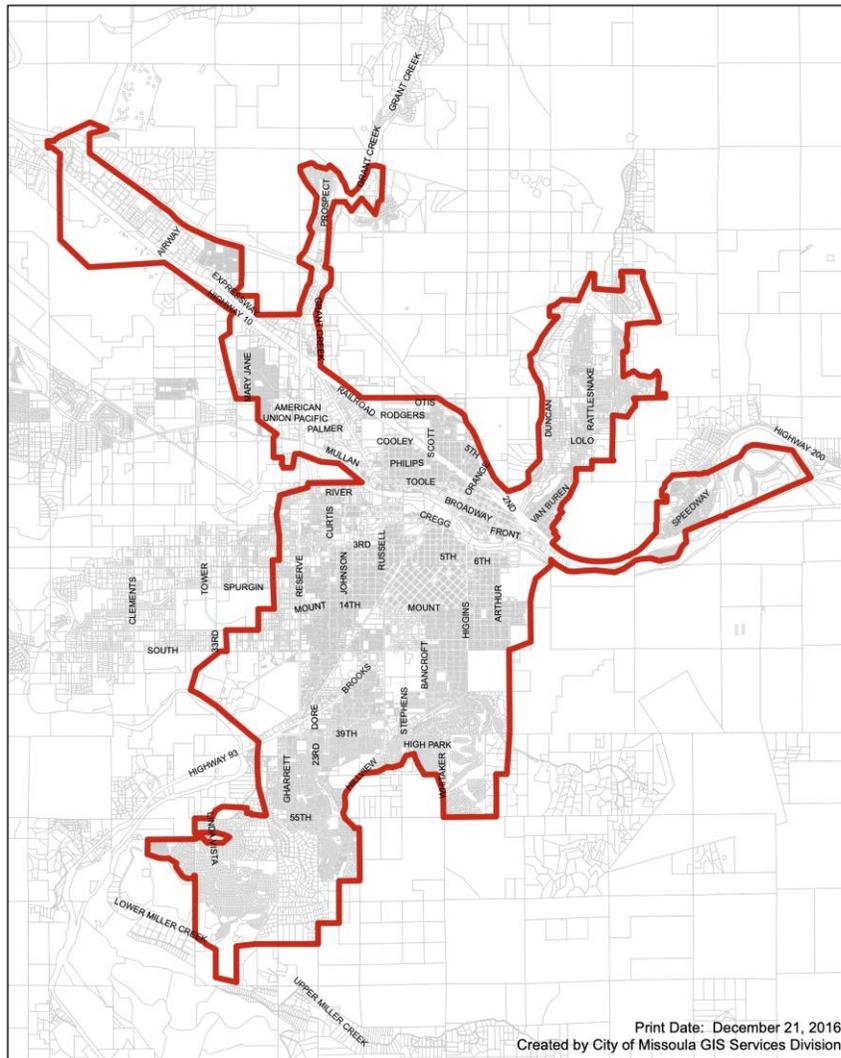


Figure 1.1: Client AOI

Once ASTERRA receives the full GIS pipe system information, the pipe and total miles analyzed per delivery will be identified. Note: both main and service lines will be counted for total pipe length calculation.



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LEAK DETECTION BENCHMARK

Client is expected to find more **background leaks** per day over the course of a field survey using Recover compared with traditional methods. Examples of traditional methods include either deployable technology such as lift-and-shift loggers and correlation, or contracted leak detection professionals surveying pipe system randomly using various acoustic equipment. The path to a successful project will be achieved through the objective comparative assessment of traditional results to those of Recover. Once system attributes and benchmark costs are set, ASTERRA will provide an analysis of expectations (benchmark), and likely outcome of reduced NRW with ASTERRA guided points of interest.

Utilizing Multiple Images

Often utilities deprioritize proactive leak detection and standard maintenance efforts due to resource constraints. In most cases utilities are forced to use limited resources for **Client** call-ins or work orders to find, dig, and repair. This results in falling further behind the curve and results in increased pipe breakage. In order to re-invest in proactive system maintenance and leak detection, Recover provides a highly efficient means to survey points of interest and avoid blindly surveying an entire utility's system of pipes. Multiple images and deliveries over time are recommended to keep up with the demands.

Multiple flyover images are important due to the following factors:

1. A single image will identify 30-40 % of the leaks in an AOI on average, and it has been seen that additional images within a defined timeframe will add 20 - 25% more leaks within the same AOI, thus increasing the efficiency of the service.
2. Multiple images will begin to identify clusters of leaks whereby identifying areas the **Client** can focus its efforts in the future.
3. These clusters of leaks can be used for asset management planning purposes, e.g., capital improvement replacement planning.
4. Leaks are continuously arising and enlarging, thus multiple images over the course of a year, or over a period of years, will continue to generate a significant number of leaks even in areas previously inspected.



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PRICING

Option A: Recover - Leak Survey, Package Price - \$27,200

What is included:

- Full System scan
- ASTERRA Recover Report: prioritized list of Points of Interest (POIs) for leak survey
- ASTERRA Best Practices for leak survey: up to 1.5 hours remote training
- ASTERRA Dashboard for leak detection tracking and reporting + U-Collect/U-View Apps (1 license)

Notes:

- Balance due upon delivery. ASTERRA will invoice for each delivery individually after analysis is sent. Invoice will be from Utilis Inc.



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TERMS

ASTERRA Services, as defined in the proposal, and respective deliverables (“deliverables”) as further specified throughout this document, respectively to (i) provide to Client (ii) potential leak information and investigative output based on the technology developed by ASTERRA, and subsequent analyses, recommendations, evaluations, ranking reports and guidance on best practices based on the foregoing. By their nature, the Services to provide and the deliverables themselves, are solely decision making and support tools acquired by Client. Any and all acts, omissions decisions and performance by Client based on the Services and /or the deliverables provided to Client under the Agreement, are the sole responsibility of Client and such activity does not form any part of ASTERRA Services and/or deliverables. By signing the Agreement Client signals its understanding of the scope of ASTERRA’ Services, performance, and the scope of ASTERRA deliverables. The contract is with Utilis Inc., also doing business as ASTERRA.

This proposal is subject to the following terms and conditions:

- **Limited Warranty.** ASTERRA warrants to **Client** that it has the full authority to bestow the rights granted herein. The services covered by this proposal are provided on an "AS IS" basis. Except for the above express warranty, ASTERRA makes no other warranties, express or implied, relating to the services covered by this proposal. ASTERRA does not represent or warrant that the services covered by this proposal be uninterrupted or error-free. ASTERRA disclaims and excludes any implied warranties of non-infringement, merchantability and/or fitness for a particular purpose.
- **Exclusion of Consequential Damages.** ASTERRA shall not be liable toward **Client**, or any other third party for any direct, indirect, special or consequential damages, including, without limitation, any damage or injury to business earnings, loss of data, lost profits or goodwill and/or personal injury, suffered by any person arising from and/or related with and/or connected to the services covered by this proposal, whether based on a claim or action of contract, tort, or otherwise, even if ASTERRA is advised of or should have been aware of the possibility of such damages.
- **Limitation of Liability.** In the event that, notwithstanding the terms above, ASTERRA is found liable for damages of any kind based on any theory of liability (including liability for negligence) connected and/or related to the services covered by this Agreement, ASTERRA’ s total liability for such damages shall not exceed the payments made by **Client** to ASTERRA for the Services that gave rise to the action or claim.
- **U-collect and U-view License.** Without diverging from the above, the terms of use and privacy policy applicable to the U-collect and U-view licenses granted to you as part of the Service shall be as detailed in <https://www.giscloud.com/terms-of-use/>. The number of licenses of secured online/offline GIS data map viewer for displaying the delivery data on a map must be set in advance. The viewer is accessible by desktop web browser or mobile application (iOS or Android). The license will automatically expire 90 days after the last scheduled delivery.



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Acceptance

Missoula Water, MT

By: _____

Name: _____

Title: _____

Date: _____

Utilis, Inc. DBA ASTERRA

By: _____

Name: _____

Title: _____

Date: _____