



# 3D MAPPING AND DEPTH OF COVER

**Accurate spatial data (both location and depth) for pipelines is a critical input to integrity management programs (IMP).**

Locations where this data is incomplete or of poor quality are challenging to assess, prioritize and manage. Accurate and complete data supports multiple elements within the IMP including, damage prevention, weather and outside forces management, inspection, and construction planning.

In addition to integrity management planning and operations, both US and Canadian pipeline regulations (CFR 192 & 195, CSA Z662, CSA S250) include requirements and standards that pipeline operators are held to for pipeline geospatial data, including guidance on accuracy, records, and data types.

Operators have several methods available for collecting spatial data, however many come with limitations and complexities with soil, terrain, and pipeline configurations.



**Electro-Magnetic Finders (EMF) and Ground Penetrating RADAR (GPR) are commonly used for pipeline locating however they are limited by:**

- operator capabilities
- soil type
- limited data outputs



**Inline inspection (ILI) with inertial mapping units (IMU) are well suited for accurate and complete pipeline locating however they are also subject to some limitations:**

- High cost
- Require more in-depth planning
- May disrupt normal operations.
- May not be feasible due to the configuration or equipment associated with the pipeline.



**Close Interval Surveys (CIS) are also used to locate pipelines but are also vulnerable to:**

- operator capabilities
- soil type
- limited data outputs

**Skipper NDT has developed a proprietary method to provide precise and continuous coordinates (longitude, latitude) and depth of cover of buried pipelines.**

The patented hardware measures the magnetic field above the pipeline, using fluxgate three-component magnetometers and a GNSS. To determine a precise position, an algorithm performs 2D and 3D magnetic data inversions along the magnetic map for automatic detection and georeferencing. This technology addresses regulatory and operational considerations that pipeline operators are faced with:



## Field operator safety

- Fully automated data acquisition done remotely



## Operational advantages

- Can find and map both known and unknown locations of bending strain
- Adapted to any type of metallic pipeline diameter from 2" to 48"
- Able to cover up to 1 mile per day



## High quality data:

- XYZ accuracy : <1ft (33cm) 90 % confidence interval



## High data density allowing

- advanced pipeline integrity operations such as bending strain assessment



## High sampling frequency

- One point of measurement every 2'



## Certified technology by major operators

- PG&E, Chevron, PRCI

# TRADITIONAL APPROACH

## INCLUDES

- ⊕ Electro Magnetic Finders / Ground Penetrating RADAR
- ⊕ Soil condition constraints
- ⊕ Extended times to obtain data
- ⊕ Coarse and sometimes inconclusive data acquisition
- ⊕ Unnecessary safety risks

## RESULTS

- ⊗ Longer inspection times
- ⊗ Manual data acquisition procedures
- ⊗ Increased risk
- ⊗ Lower density/quality data / difficult decision making
- ⊗ Higher total lifecycle cost due to uncertainty in decision making

# SKIPPER NDT'S APPROACH

## INCLUDES

- ⊕ Technology focused solution
- ⊕ No soil condition constraints
- ⊕ Efficient data collection
- ⊕ Accurate and repeatable
- ⊕ Fully documented with electronic records
- ⊕ Dense, precise data for both the asset location and depth of cover

## RESULTS

- ✓ 3 times faster than traditional inspections
- ✓ 100% automated data acquisition procedure
- ✓ Reduced risk
- ✓ High quality, repeatable data acquisition enabling confident and effective decision making
- ✓ Low total lifecycle cost due to optimized decision making

**LEARN  
MORE ABOUT  
3D MAPPING AND  
DEPTH OF COVER**

Read **our engineers' paper about 3D Mapping and Depth of Cover**  
on our website [www.skipperndt.com](http://www.skipperndt.com)

**SKIPPER** NDT