



**SubSurface Leak  
Detection, Inc.<sup>®</sup>**  
San Jose, California

LEAK DETECTION:  
BUY THE  
RIGHT EQUIPMENT  
FOR YOUR SYSTEM

## Search Strategy for Finding Leaks

### Area Analysis

- **Determined Through Water Audit of System**
- **Isolation of Area or Neighborhood With Largest Leaks**
- **At 3 AM: Close Valves and Measure Flows in These Areas**

### Pipeline Survey

- **Only Lines Within Area of Largest Water Losses**
- **Check Sounds at Hydrants, Valves and Meters**
- **Or Use Loggers to Survey System**
- **Narrow Leak to Between Two Hydrants, Two Services, Etc.**

### Leak Pinpointing

- **Mark Water Pipeline and Other Utilities with a Locator**
- **Listen over Pipeline with Leak Detector Ground Microphone**
- **Or Use Correlator to Pinpoint Leak Location**
- **Confirm Suspected Locations With Bore-Holes, Correlator, Etc.**

## Technologies Available for Leak Detection

- **Mechanical Amplifiers: Geophones, Listening Sticks**
- **Electronic Amplifiers for Surveys**
- **Electronic Amplifiers for Pinpointing**
- **Correlators**
- **Loggers for Night-Time Surveys**
- **Correlating Loggers for Surveys and Pinpointing**
- **Steel Probe Rods and Iron Bars**
- **Helium and Hydrogen Gas Leak Detectors**

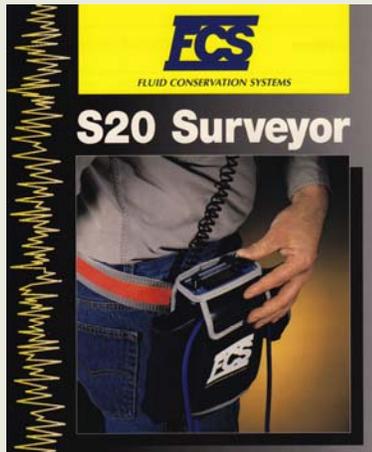
# Leak Detection: Buy the Right Equipment

## Mechanical Amplifiers

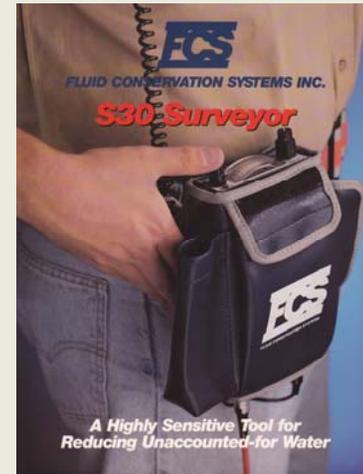


# Leak Detection: Buy the Right Equipment

## Electronic Amplifiers for Surveys



**Leak Surveying by listening at a hydrant with magnet base**



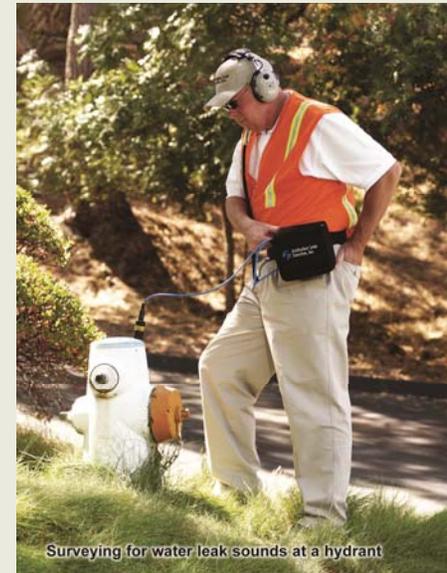
*A Highly Sensitive Tool for Reducing Unaccounted-for Water*



**Listening at a Hydrant with a 4-inch Rod**



Surveying for water leak sounds at a meter



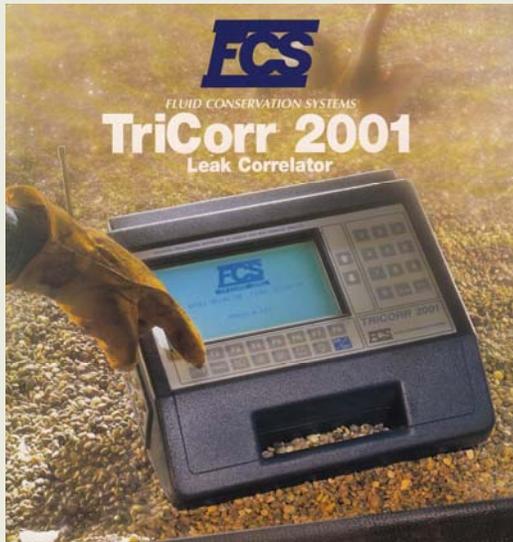
Surveying for water leak sounds at a hydrant

# Leak Detection: Buy the Right Equipment

## Electronic Amplifiers for Pinpointing



## Technologies Available for Leak Detection



### Other Correlators

- 1) **FCS/Palmer AccuCorr and Touch**
- 2) **Itron/Flow Metrix DigiCorr**
- 3) **Gutermann Leak Detection**
- 4) **ADS Environmental/Primayer**
- 5) **Sewerin USA/3M Dynatel**
- 6) **Ecologics/Mueller Water**
- 7) **Metrotech**

## Loggers for Night-Time Surveys



**PermaLog®** *Leakage Control for a New Generation!*

Leak detection has become a necessity as infrastructure ages and water shortages hamper growth – but traditional leak detection methods fall short and require too much manpower. See page 60 to read how the Las Vegas Valley Water District is reducing leakage with the PermaLog System.

**FCS** Fluid Conservation Systems

Used by more than 130 U.S. water utilities – over 150,000 units installed world wide!

2001 Ford Circle • Suite F • Milford, OH 45150 • (800) 531-5465

The advertisement features a mobile phone, several blue PermaLog sensors, and a diagram of a pipe with a sensor installed to detect leaks.

### Other Loggers

- 1) **Metrotech**
- 2) **Sewerin USA/3M Dynatel**
- 3) **Itron/Flow Metrix**
- 4) **Gutermann**

# Leak Detection: Buy the Right Equipment

## ZCorr Correlating Loggers for Surveys & Pinpointing

### A Single ZCorr Logger:

**Height:**  
5 inches

**Diameter:**  
2.25 inches

**Weight:**  
1 lb.

**Temperature Range:**  
-20 to +140° F



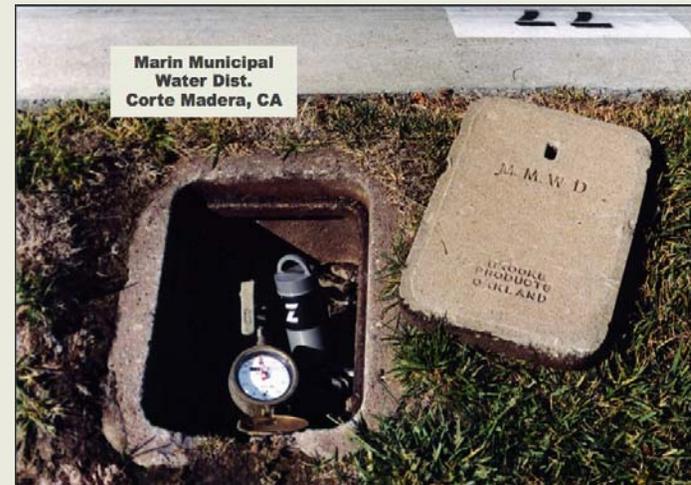
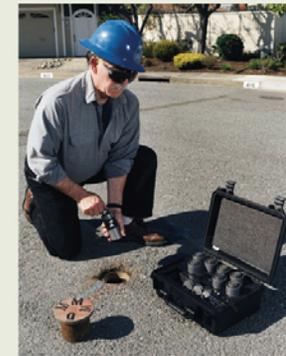
**Enclosure:**  
Aluminum, Cylindrical

**Protection:**  
Fully Submersible

**Power:**  
Lithium Battery  
(5 Year Life)

**Mounting:**  
Rare Earth Magnet  
(45 lb. pull force)

### A Set of 8 Loggers and Docking Station at a Hydrant Valve



Tools for Getting  
Closer to Pipe:  
Boring Bars, Push Rods,  
Slide Hammer Rod



# Leak Detection: Buy the Right Equipment

## Model MGD-2002 Multi-Gas Leak Locator

Leak detection made easy is the premise behind the Radiodetection/Dielectric MGD-2002 Multi-gas Detector. Through the use of a common tracer gas such as Helium or Hydrogen, leaks in most pressurized systems can be located with pinpoint accuracy.

Proven successes have been demonstrated for many disciplines such as Telecom's, Municipalities, Building Contractors, Plumbers, HVAC Technicians, Tank Inspectors and many more.

Whether you're identifying leaks in underground tanks, pipes, cables or tracing a leak in almost any pressurized system. The MGD-2002 has the sensitivity you'll need to accurately and efficiently locate the leak. The MGD-2002 performs equally well with either Helium or Hydrogen\* used as a tracer gas.



Helium is non-polluting, non-reacting and safe to use, making it the ideal tracer gas when applied to critical systems. In addition, the sensitivity of the MGD allows Helium to be mixed with ambient air in large volume systems further reducing the cost of use.

Convenient and easy to use, the MGD-2002 is designed for one-handed operation of all functions. Equipped with a tactile membrane keypad, all selections are easily confirmed with a distinctive "click" and the backlit display can be viewed in all light conditions. The MGD-2002 is supplied with a built-in headphone jack for use with the audio indicator.

The MGD-2002 is equipped with a rechargeable Ni-MH battery pack that provides over 8 hours of use per charge. Operating life can be further extended with an additional battery, available as an accessory, that can be installed in seconds. In addition, the Multi-Gas Detector can be recharged with the AC or car adaptors included in the kit.

With only a 30 second Power-On Self Test the Multi-Gas Detector is ready to go when you are!

## SOUNDS FROM WATER LEAKS

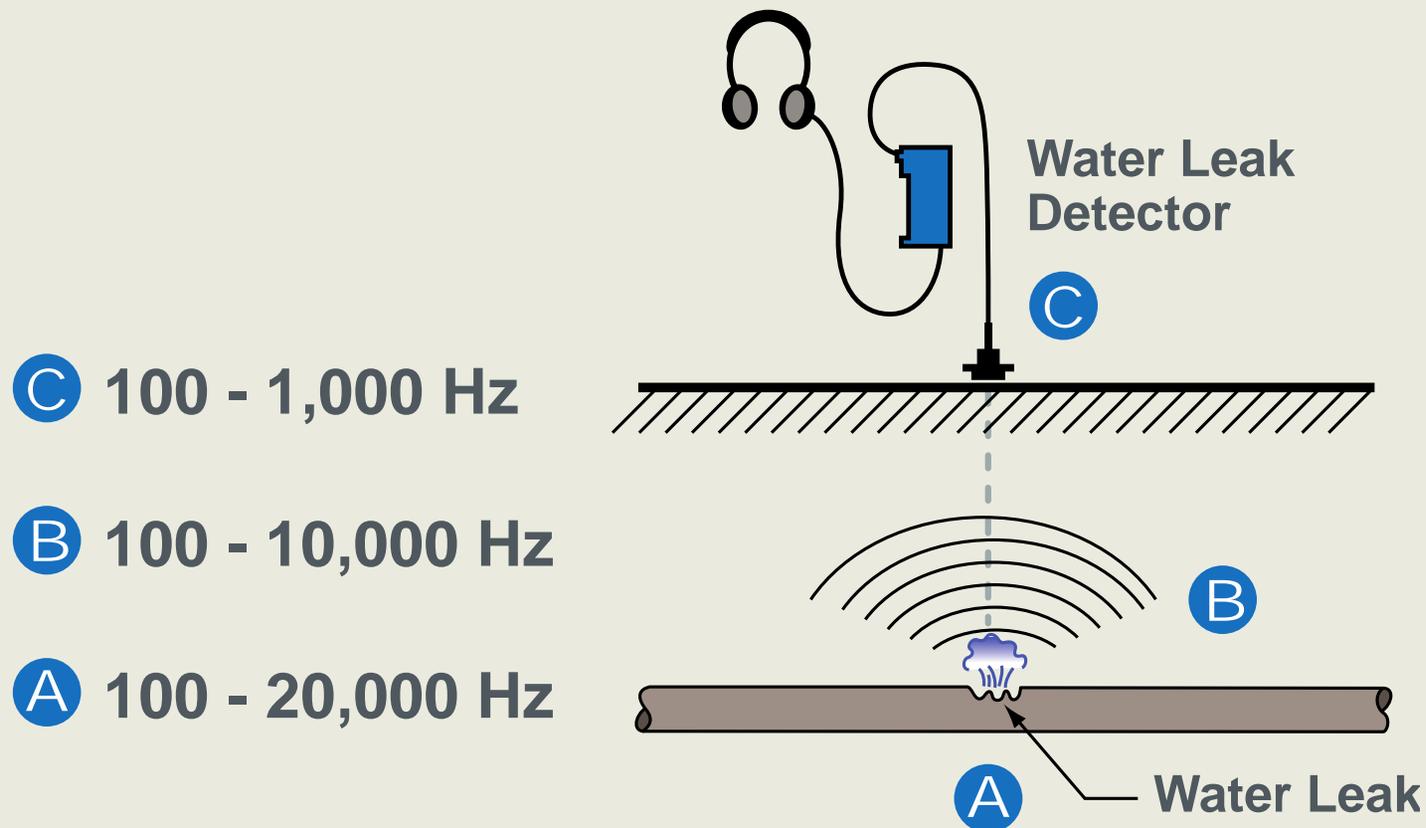
### Water Leaks Create Different Sounds

Type of Leak Sound	Frequency Range*
• <b>Pipe Resonance (Vibration) from Orifice Noise</b>	<b>500-800 Hz</b>
• <b>Water Impact on Surrounding Soil</b>	<b>20-250 Hz</b>
• <b>Water Circulation and Flow in Soil Cavity</b>	<b>20-250 Hz</b>

\* Measured in Vicinity of Sound

## SOUNDS FROM WATER LEAKS

Higher Frequencies are More Attenuated (Absorbed) in Soil than Lower Frequencies



## SOUNDS FROM WATER LEAKS

### What Affects Leak Sounds & Our Ability to Hear Them

- **Water Pressure in Pipe (Must be 15 psi or Greater)**
- **Type of Pipe Material and Pipe Diameter**
- **Soil Type and Soil Compaction  
(Hard and Dense Better)**
- **Ground Surface for Microphone:  
Concrete Versus Sod**
- **Extraneous Noises: Wind, Highways, Buildings,  
Machinery**
- **Depth of Pipe: 3 to 4 ft OK, 6 to 8 ft Tough**

## ACCOUSTIC LEAK DETECTORS

### Advantages of an Acoustic Leak Detector

- 1. Not Too Expensive**
- 2. Maintenance Free and Pretty Reliable  
(Don't Drop the Sensor!)**
- 3. Useful for Both Surveys and Water Leak Pinpointing**
- 4. Pretty Easy to Operate**
- 5. Can Be Used Inside of Buildings for Leaks Inside of Walls and Under Floors (Turn Off HVAC System and Other Building Noises)**
- 6. Almost Never Wrong: Where Leak is Loudest is Almost Always Where Leak is Located**
- 7. Last for Many Years: 10-15 Years Life Expectancy**

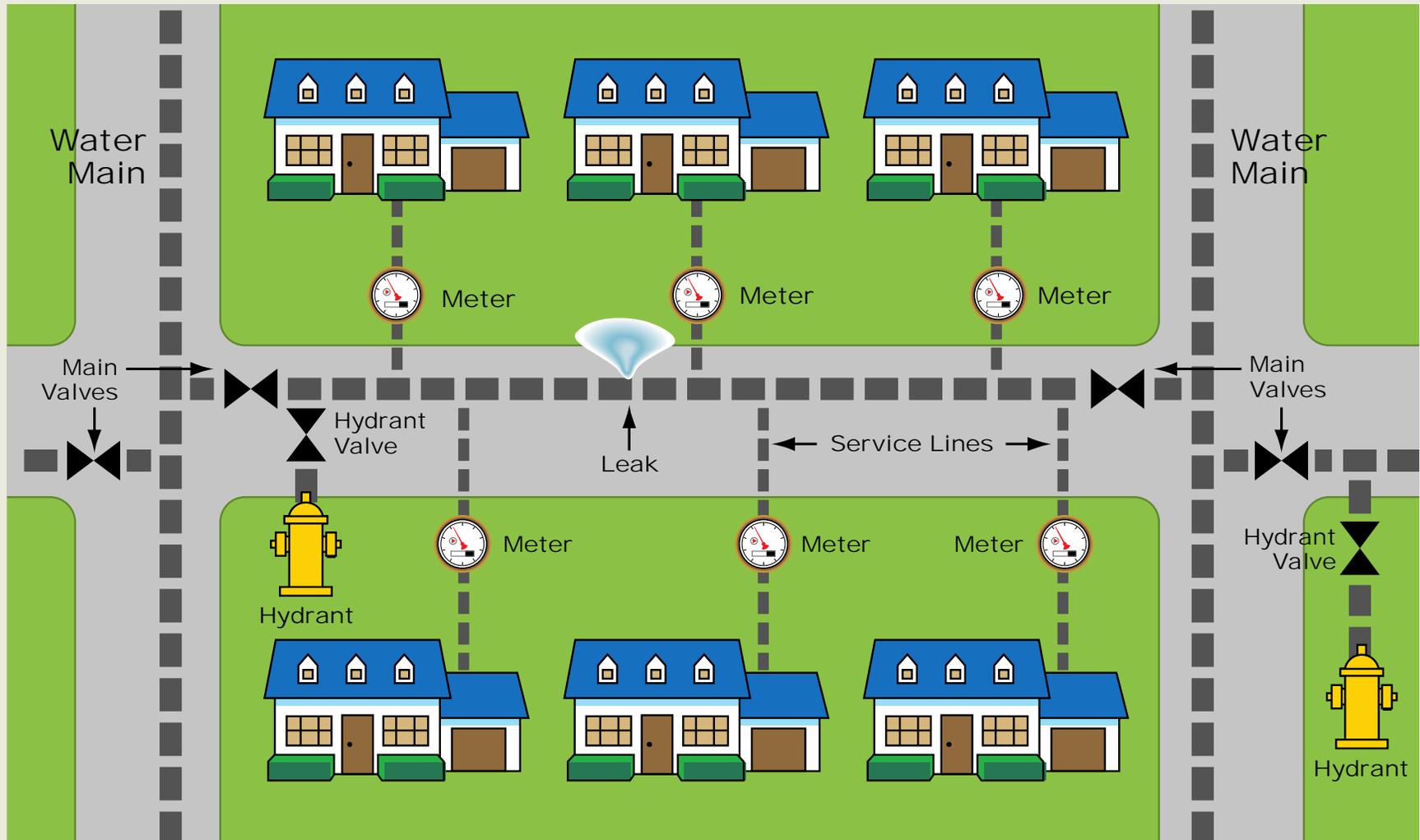
## ACCOUSTIC LEAK DETECTORS

### Disadvantages of an Acoustic Leak Detector

- 1. Sensitivity of Sensors/Transducers Varies Greatly from Manufacturer to Manufacturer**
- 2. Frequency Response Curves and Amplifier Background “Hiss” Vary Greatly from Manufacturer to Manufacturer**
- 3. Practice Required to Learn Leak Sounds and Techniques**
- 4. Filters on Amplifiers Useless in Heavy Traffic When Pinpointing**
- 5. Maximum Depth for Pinpointing: 5 - 8 feet for 1 - 3 gpm**
- 6. Pinpointing Over Soft Soil or Grass Cover More Difficult**
- 7. Pinpointing Sometimes Possible Only at Night**

# Leak Detection: Buy the Right Equipment

## Leak Detection Surveys: Listen at Hydrants, Valves, and Meters



Listening at a Hydrant with Magnet Base



Listening at a  
Meter with a  
Contact Rod

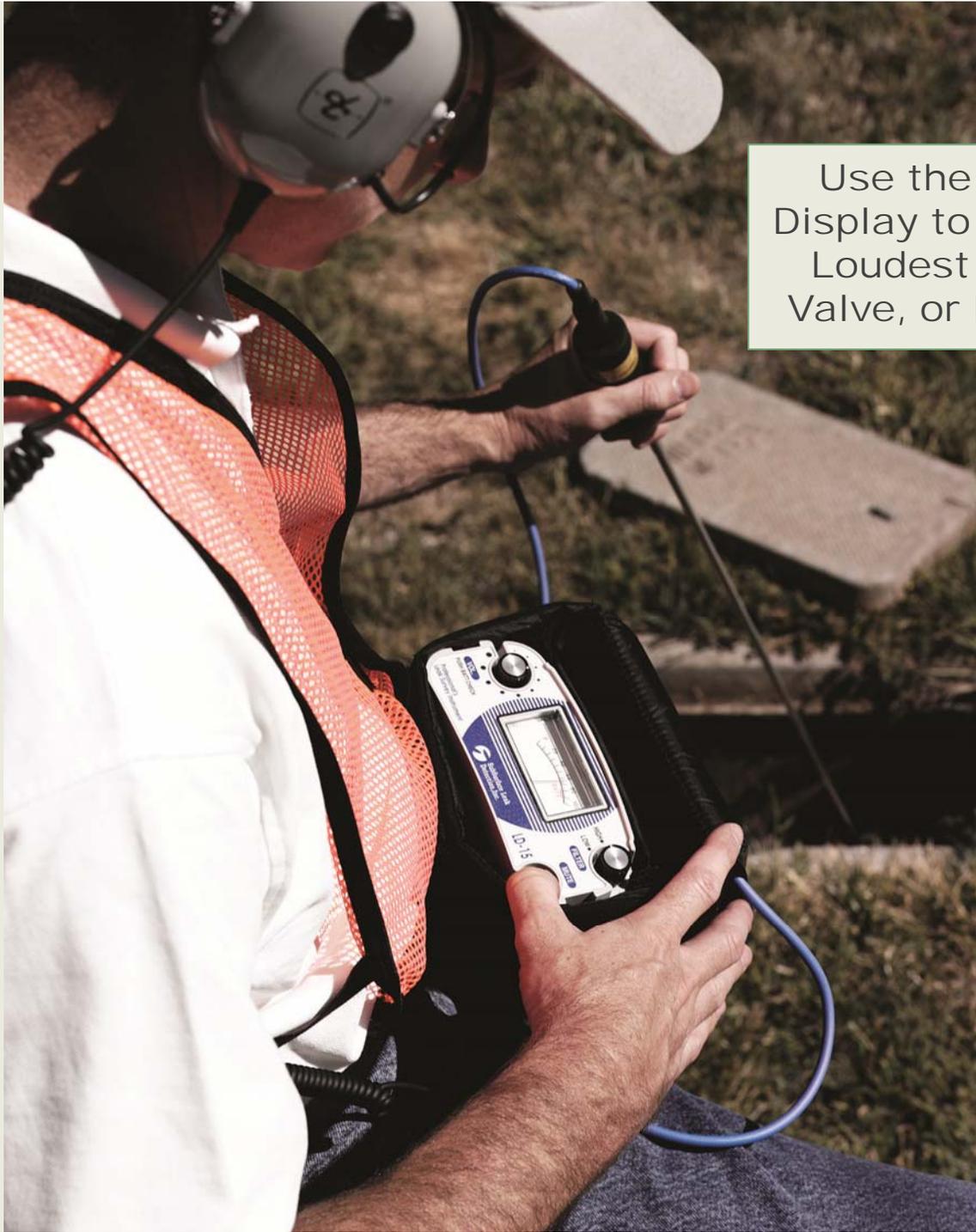




Surveying  
at a Meter  
with Vise Grip

Surveying  
at a Meter with  
Long Rod



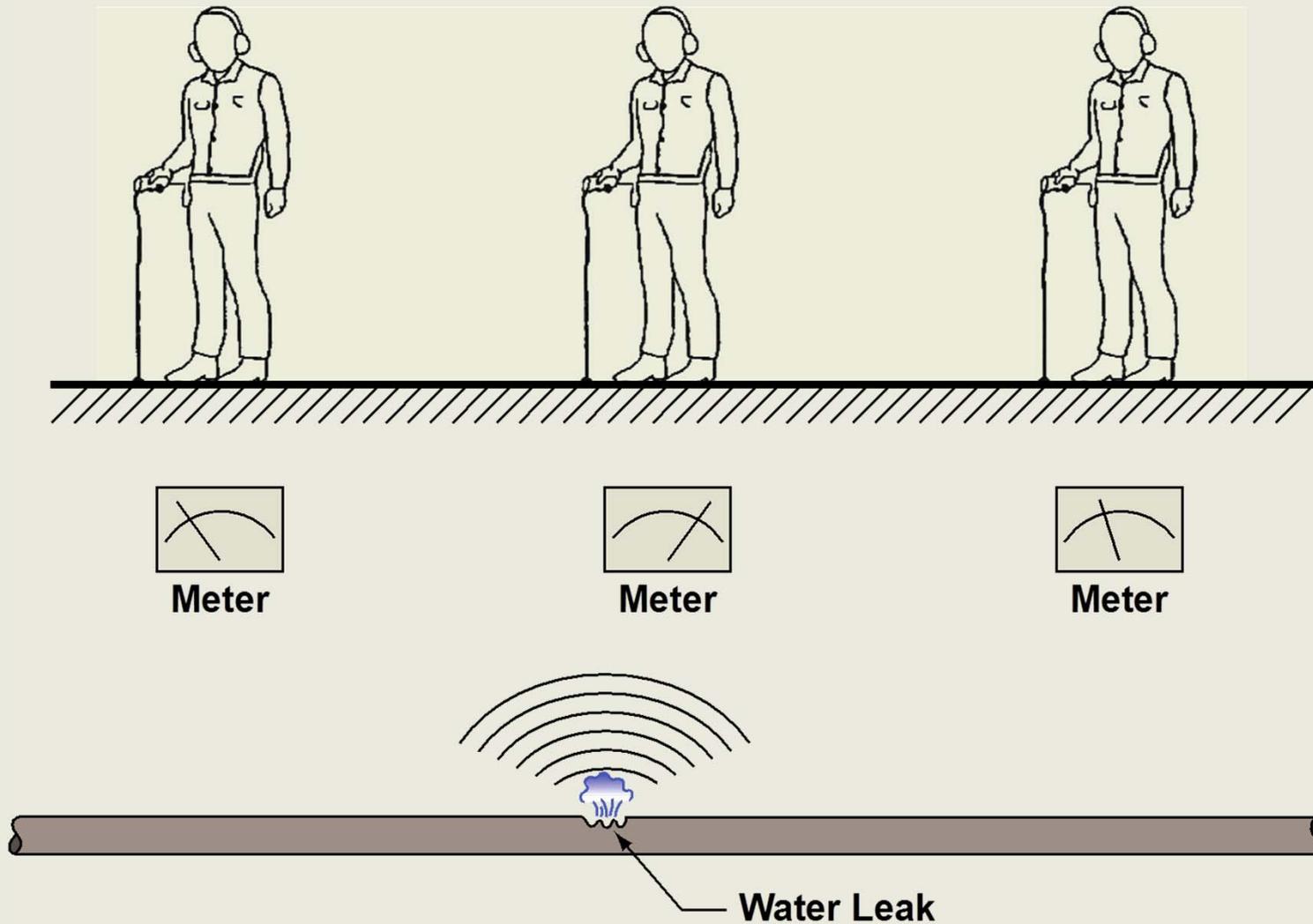


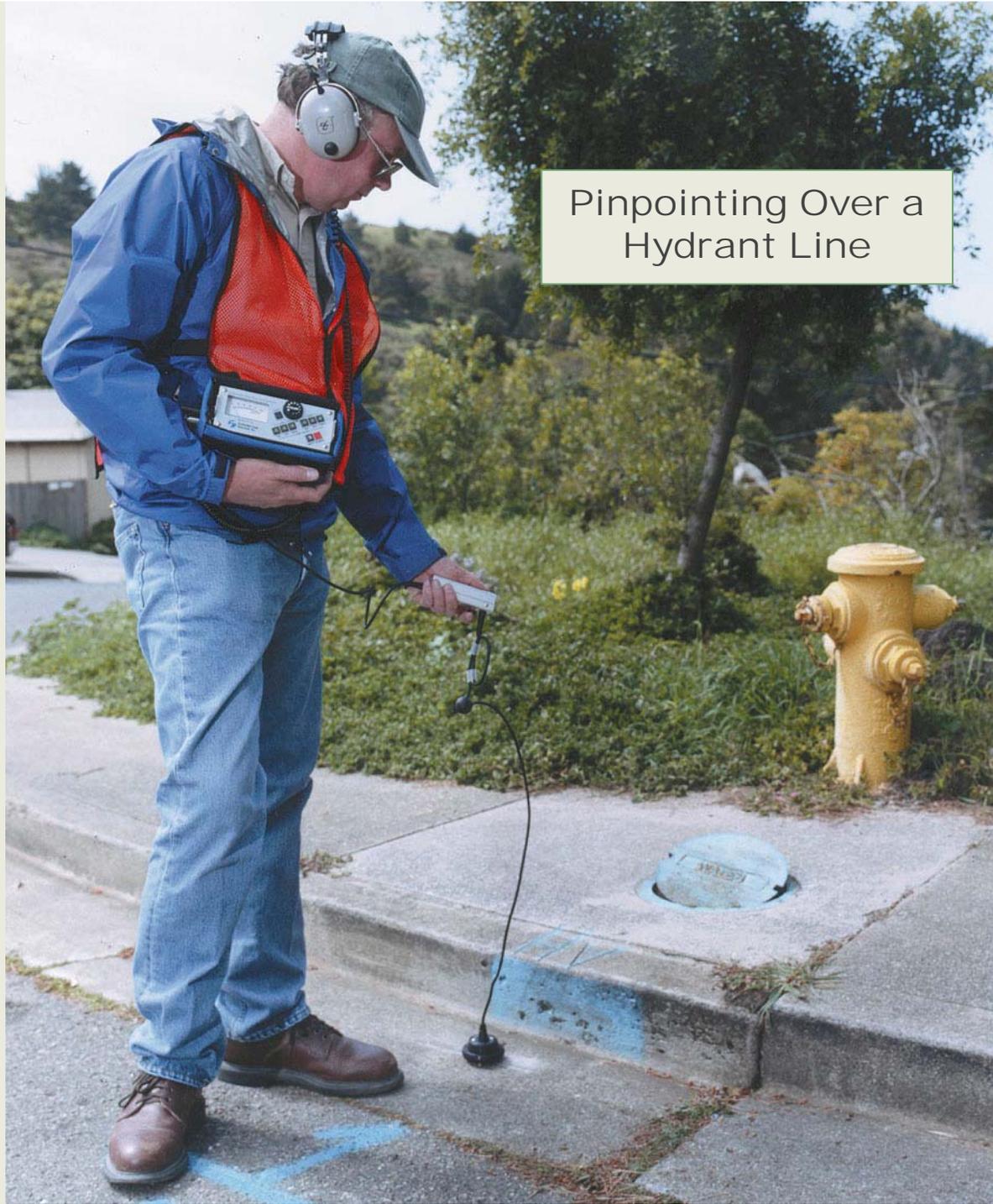
Use the Meter Display to Find the Loudest Meter, Valve, or Hydrant

## Acoustic Pinpointing: How to Do It

- 1. Mark Water Line With Pipe Locator Between Two Loudest Locations (Curb Stop, Hydrant, Valve, Etc.)**
- 2. Use Ground Plate for Street Surfaces, Sidewalks, and Concrete Slabs. Listen Directly Over the Pipe.**
- 3. Use Steel Rods or Iron Boring Bars in Soft Dirt and Grass Covered Areas**
- 4. Listen Every 3 - 5 feet – Do Not Adjust Volume and Listen for 5 - 10 Seconds Only – Make Quick Comparisons**
- 5. Use Meter Display (LED Meter, Dial Meter) in Last 5 - 10 feet When “Loudest” is Hard to Determine**

## Acoustic Pinpointing: How to Do It





Pinpointing Over a Hydrant Line

Pinpointing  
Directly Over  
the Pipe

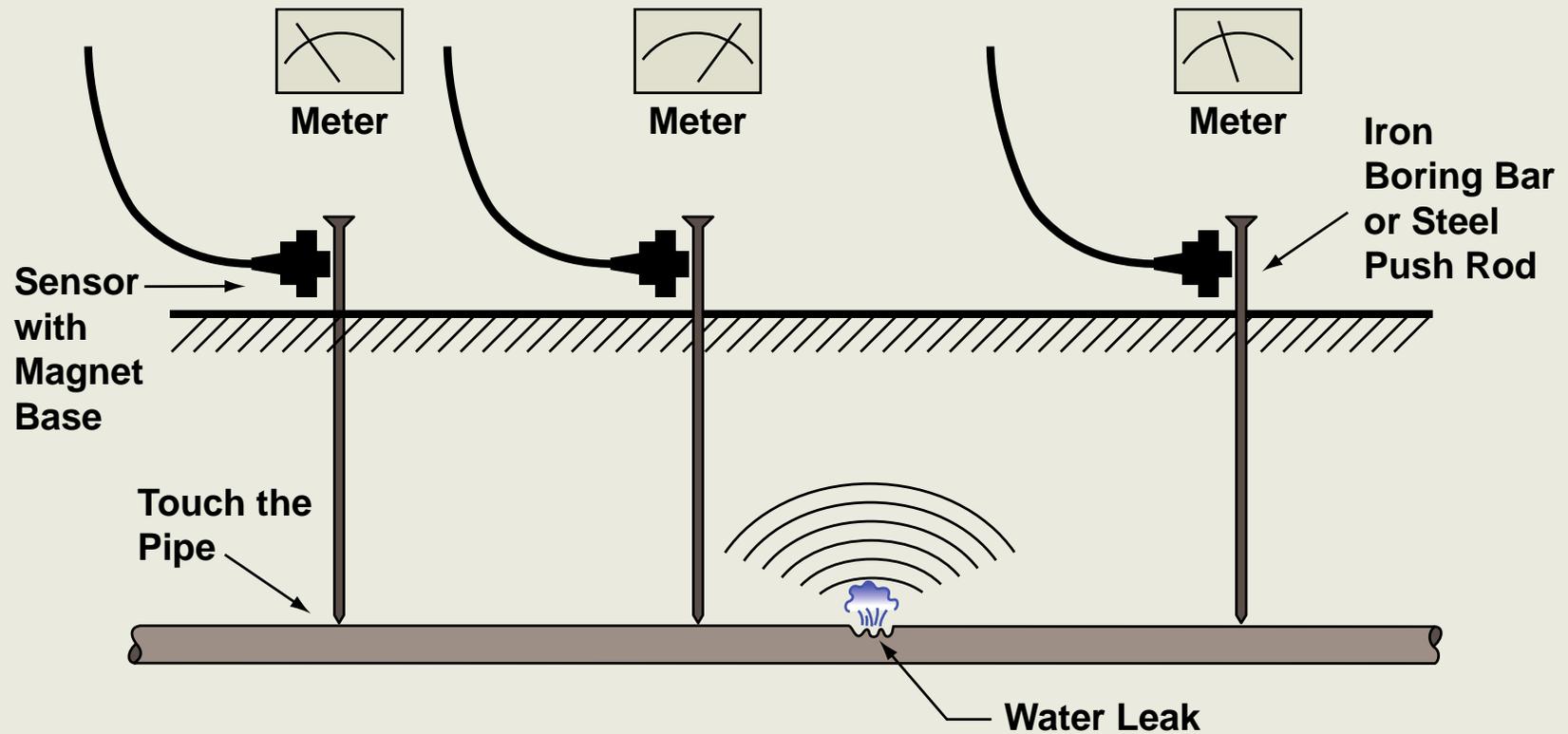


## Small Leak in New Transmission Main

- Situation:**
- 1. Long Sections with No Valves or Other Attachments**
  - 2. Loose Fill Over Top of newly Layed Pipeline**
  - 3. No Sounds at Valves or Fittings**

- Solution:**
- 1. Use 3 Boring Bars (or Push Rods) Touching Pipe**
  - 2. Use Magnet Base on Sensor Base**
  - 3. Listen on All Bars/Rods – Move Towards Loudest**
  - 4. Move Bars/Rods to 5 – 10 feet Around Leak**
  - 5. Center Bar/Rod Loudest**

## Listen for Small Leaks with Boring Bars





Push All Bars  
Down to Touch the  
Pipe



Listen on the Bar  
Close to the  
Ground (Less  
Wind)

## Leak Detection: Buy the Right Equipment

### LC-2500 Correlator: Main Processor Unit, Pre-Amplifiers/Transmitters, and Sensors



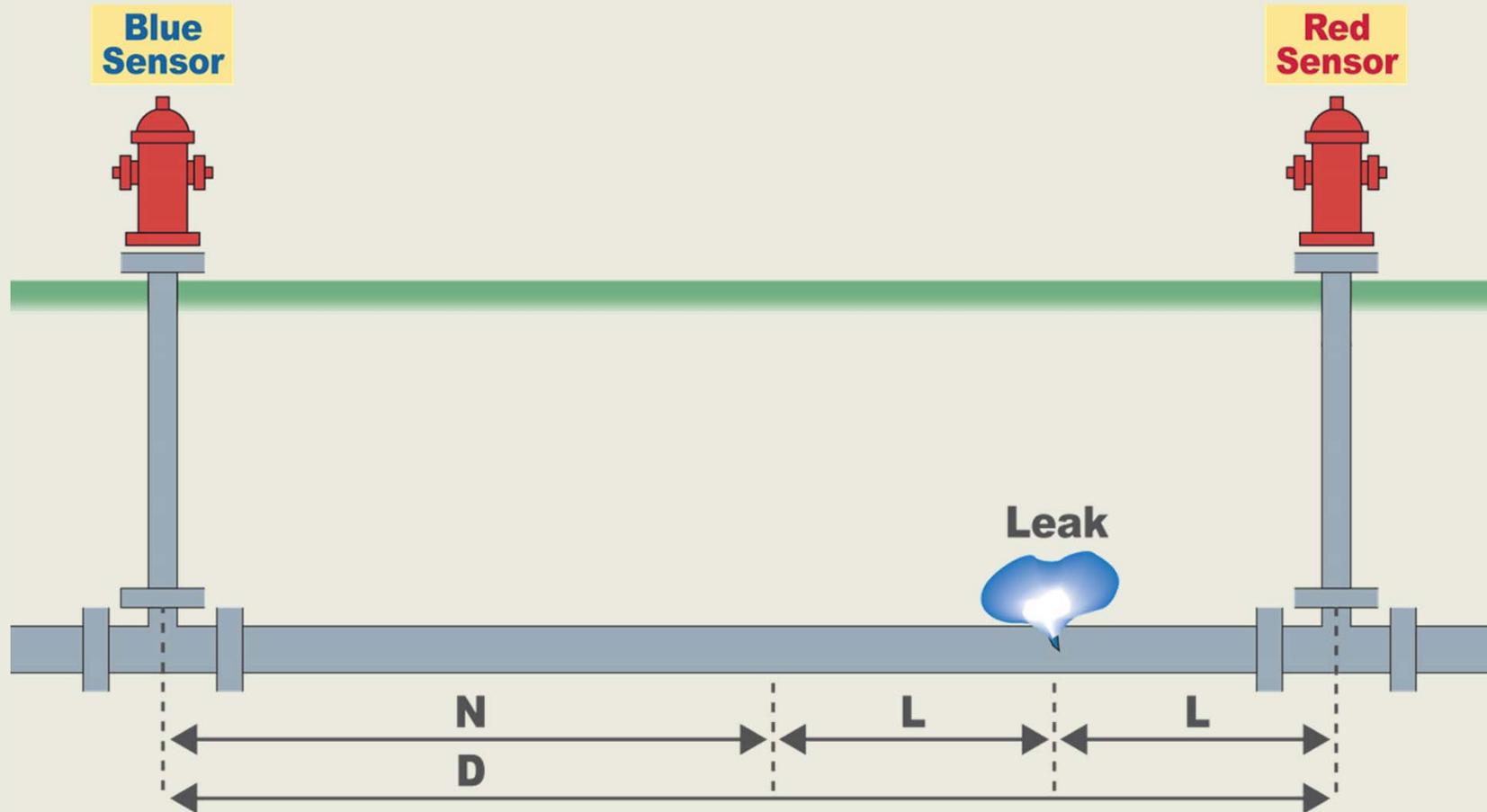
## How Does a Correlator Work?

- **Sensors (Transducers) Hear the Leak Sounds Transmitted on the Pipe Walls Between 20 Hz and 5,000 Hz**
- **Pre-Amplifiers/Transmitters Amplify Leak Sounds and Transmit Them Continuously to Main Processor/CPU**
- **Main Processor has Clock Accurate to .000010 sec.**
- **User Inputs Pipe Materials and Diameters (Determines Velocity on Pipe Wall)**
- **User Inputs Pipe Length for All Segments**
- **CPU Calculates Exact Distance from Pipe Length, Sound Velocity, and Time Difference**

## Each Pipe Material and Diameter Has a Different Sound Velocity

Pipe Material	Pipe Diameter	Velocity of Sound in Wall
<b>Ductile Iron</b>	<b>6 Inches</b>	<b>4170 ft/sec</b>
<b>Ductile Iron</b>	<b>8 Inches</b>	<b>4070 ft/sec</b>
<b>Ductile Iron</b>	<b>12 Inches</b>	<b>3770 ft/sec</b>
<b>Ductile Iron</b>	<b>24 Inches</b>	<b>3580 ft/sec</b>
<b>Cast Iron</b>	<b>6 Inches</b>	<b>4070 ft/sec</b>
<b>AC Pipe</b>	<b>6 Inches</b>	<b>3480 ft/sec</b>
<b>PVC Pipe</b>	<b>6 Inches</b>	<b>1370 ft/sec</b>
<b>Steel Pipe</b>	<b>6 Inches</b>	<b>4120 ft/sec</b>
<b>Copper Service</b>	<b>3/4 Inches</b>	<b>4070 ft/sec</b>
<b>Copper Service</b>	<b>1 Inches</b>	<b>3900 ft/sec</b>
<b>Poly Service</b>	<b>1 Inches</b>	<b>1030 ft/sec</b>

## Distances from Leak to the Sensors



## Definitions of Different Distances

- D: Total Length of Pipe Between the Two Sensors, Measured Exactly Over the Pipe With a Measuring Wheel.**
- L: Distance from the Leak to the Nearest Sensor, Calculated by Correlator.**
- N: Difference in Distance That Sound Travels to the Farthest Sensor, Calculated by Correlator.**

## Calculation of Distance to the Leak

$$D = N + L + L$$

For Red Sensor  $L = \frac{D - N}{2}$

For Blue Sensor  $N + L = D - L$

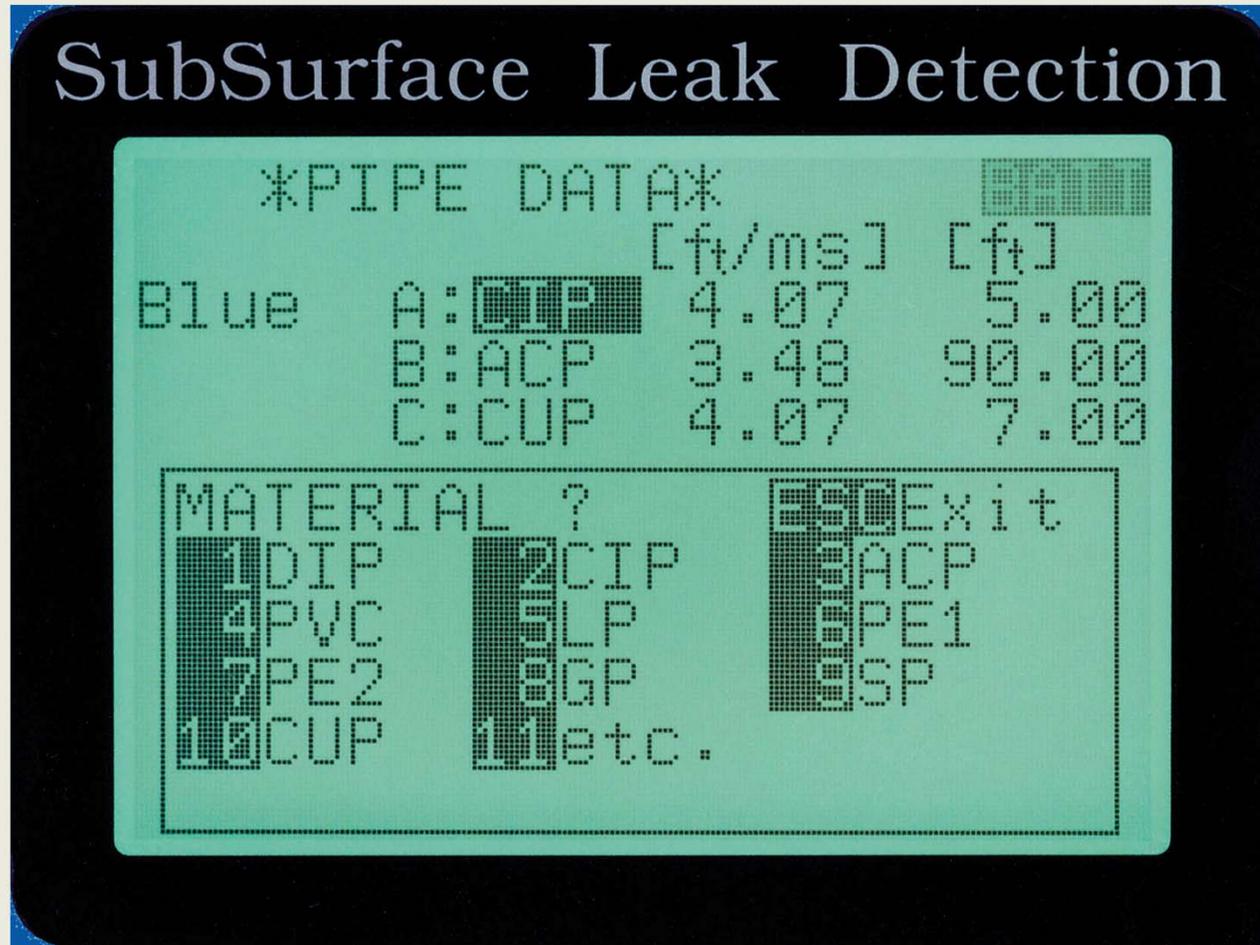
Also: **Distance Sound Travels** = **Sound Velocity x Time**

Or: **Difference in Distance** = **Sound Velocity x Difference in Time**

$$N = (V \times T_d)$$

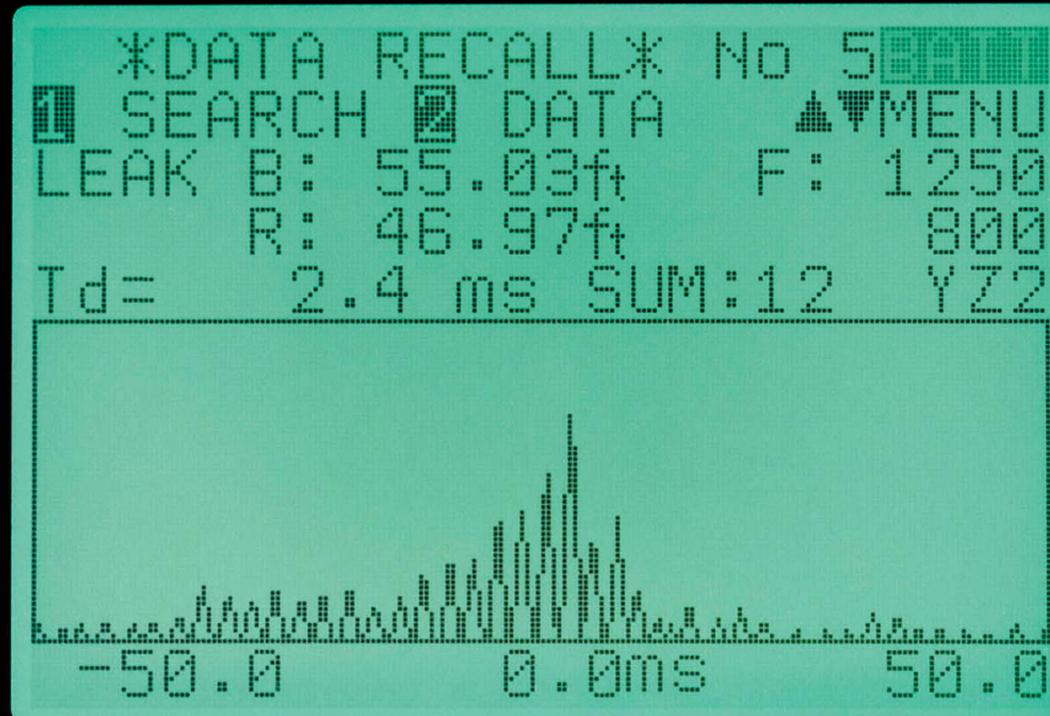
For Red Sensor  $L = \frac{D - (V \times T_d)}{2}$

## Pipe Data Input Menu:



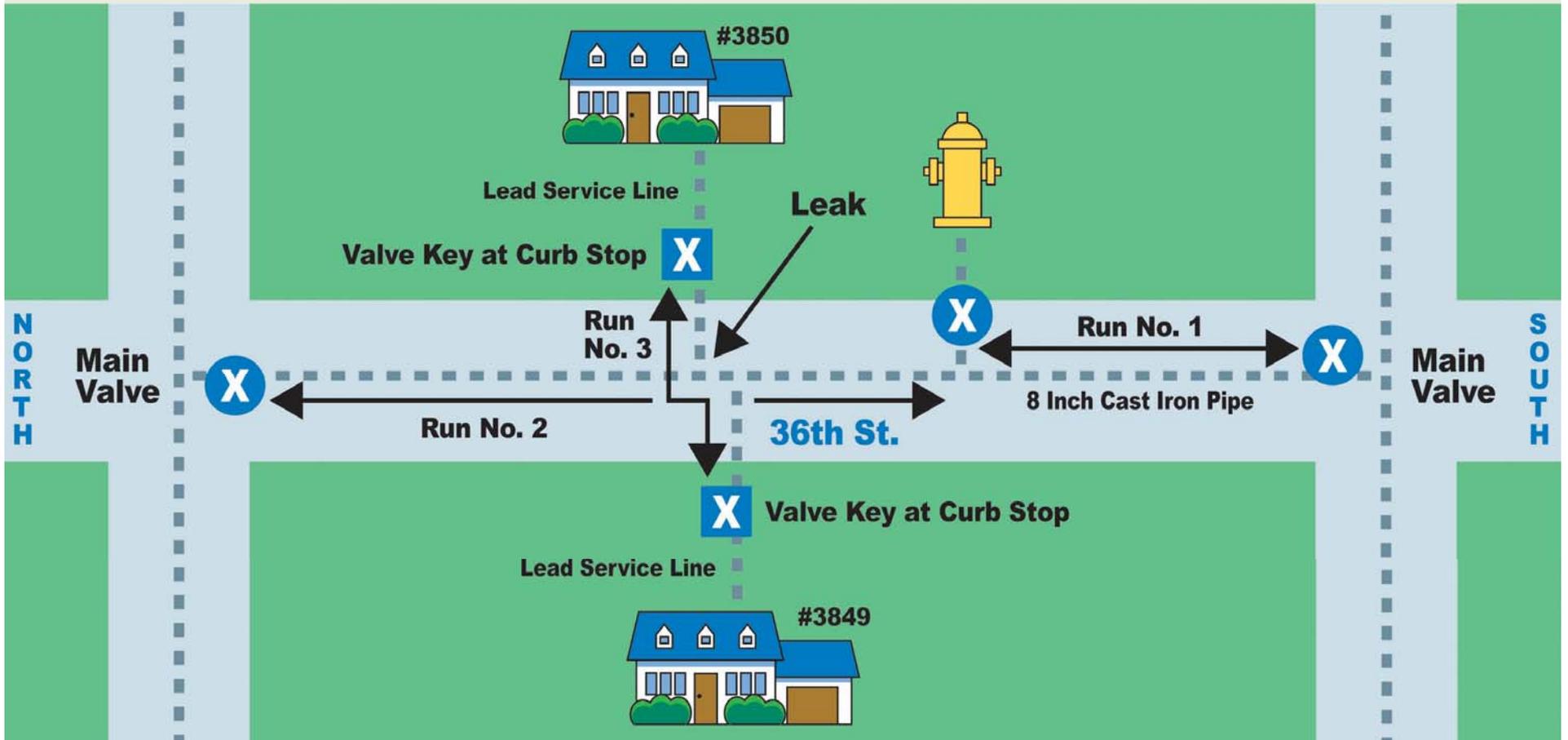
## Leak Correlation at 55 feet from Blue

### SubSurface Leak Detection



# Leak Detection: Buy the Right Equipment

## Map of Three Correlations at Milwaukee, Wisconsin, October 9, 1996



Milwaukee, Wisconsin, October 9, 1996,  
Run No. 1

Set-up: **Hydrant Valve to Main Valve in Residential Neighborhood**

Blue Sensor: **Hydrant Isolation Valve in Middle of 36<sup>th</sup> Street**

Red Sensor: **Main Valve at South End of Block**

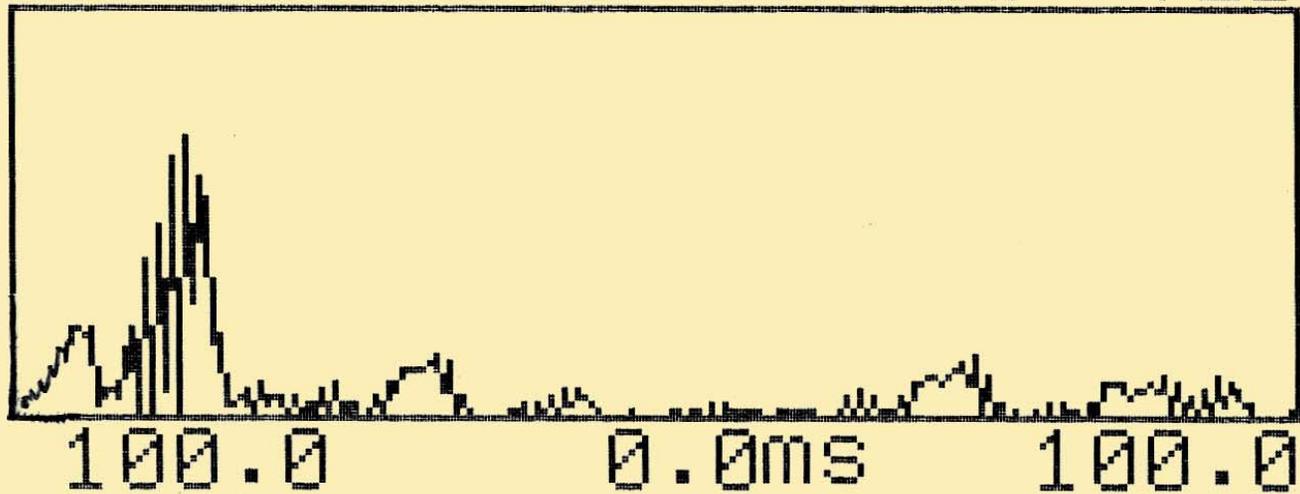
Pipe: **317 feet of 8 Inch Cast Iron**

Result: **“Out of Bracket” at Blue Sensor**

# Leak Detection: Buy the Right Equipment

Milwaukee, Wisconsin, October 9, 1996,  
Run No. 1

```
1 SEARCH 2 DATA ▲▼MENU  
LEAK B: 10.42ft F: 1250  
R: 306.58ft 80  
Td= -72.8 ms SUM: 25 YZ1
```



Milwaukee, Wisconsin, October 9, 1996,  
Run No. 2

Set-up: **Hydrant Valve to Main Valve in Residential Neighborhood**

Blue Sensor: **Hydrant Isolation Valve in Middle of 36<sup>th</sup> Street**

Red Sensor: **Main Valve at North End of Block**

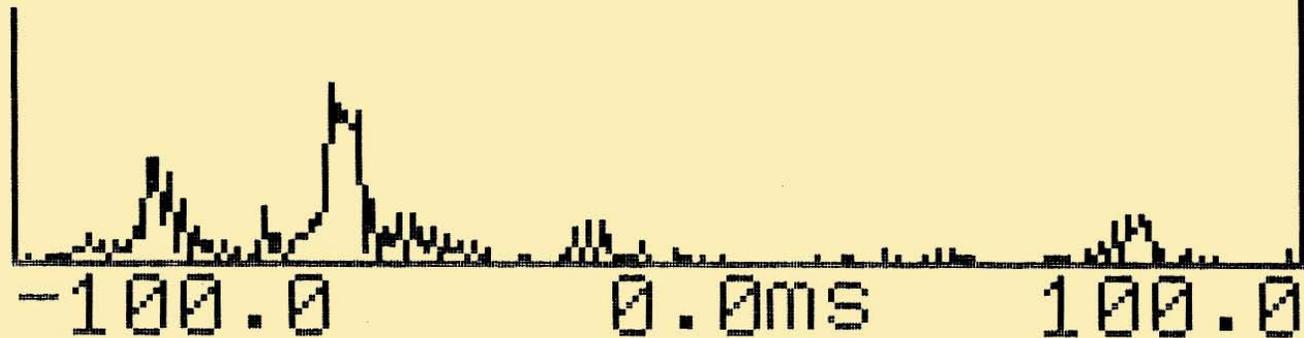
Pipe: **341 feet of 8 Inch Cast Iron**

Result: **Pinpointed Area Close to 2 Service Line Corps**

# Leak Detection: Buy the Right Equipment

Milwaukee, Wisconsin, October 9, 1996,  
Run No. 2

```
1 SEARCH 2 DATA ▲▼MENU  
LEAK B: 66.35ft F: 1250  
R: 274.65ft 80  
d= -51.2 ms SUM: 52 YZ2
```



Milwaukee, Wisconsin, October 9, 1996,  
Run No. 3

Set-up: **Valve Key to Valve Key on  
Service Line Curb Stops for Two  
Houses Across from Each Other**

Blue Sensor: **Valve Key at #3850 36<sup>th</sup> Street**

Red Sensor: **Valve Key at #3849 36<sup>th</sup> Street**

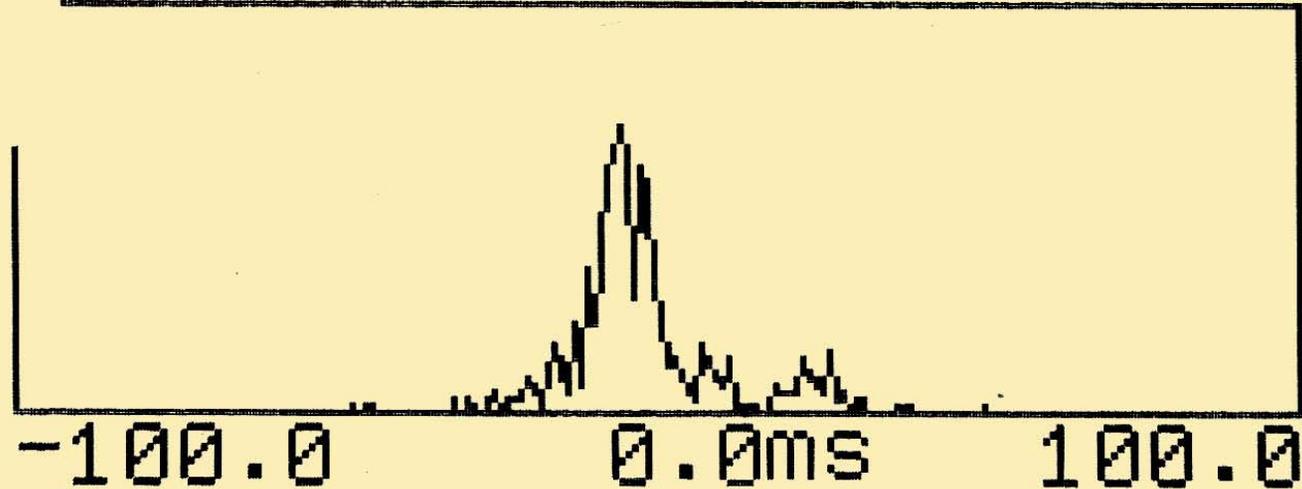
Pipe: **8 ft. of Lead Service, 2 ft. of CIP,  
27 ft. of Lead (5 ft. Steel at Ends)**

Result: **Pinpointed Corp on Short Service**

# Leak Detection: Buy the Right Equipment

Milwaukee, Wisconsin, October 9, 1996,  
Run No. 3

```
1 SEARCH 2 DATA ▲▼MENU  
LEAK B: 13.11ft F: 1250  
R: 33.89ft 80  
d= -5.9 ms SUM:64 YZ3
```



## What Are the Advantages of a Correlator?

- 1. Pinpoints the Exact Location of the Leak**
- 2. Listens at Valves, Hydrants, and Meters:  
Depth Not a Problem**
- 3. Fast to Set-up, Program, and Pinpoint Leak  
Locations in Metal Pipes and A/C Pipes**
- 4. Do 5 – 10 leaks Per Day in Good Conditions**
- 5. Operates Even With Traffic Noise If Sensors  
Attached to Valves in Boxes**
- 6. Even More Sensitive Than the Human Ear**



Marin Municipal  
Water Dist.  
Corte Madera, CA

Marin Municipal  
Water Dist.  
Corte Madera, CA



Marin Municipal  
Water Dist.  
Corte Madera, CA





Marin Municipal  
Water Dist.  
Corte Madera, CA



Marin Municipal  
Water Dist.  
Corte Madera, CA



Marin Municipal  
Water Dist.  
Corte Madera, CA

## What Are Digital Correlating Loggers?

- **Components: RAM Memory, Microprocessor, RS-232C Serial I/O, Fast Clock, Magnet Base, Water-Proof Body**
- **Records Sounds of Water Leaks Automatically**
- **Deployed: Quickly for Immediate Recordings or Overnight for Multiple Recordings**
- **Downloads to PC Computer and Special Software**

## Who Manufactures Digital Correlating Loggers?

- **Itron/Flow Metrix (ZCorr)**
- **FCS/Palmer (SoundSens)**
- **Gutermann Leak Detection**

# Leak Detection: Buy the Right Equipment

## ZCorr Correlating Loggers for Surveys & Pinpointing

### A Single ZCorr Logger:

**Height:**  
5 inches

**Diameter:**  
2.25 inches

**Weight:**  
1 lb.

**Temperature Range:**  
-20 to +140° F



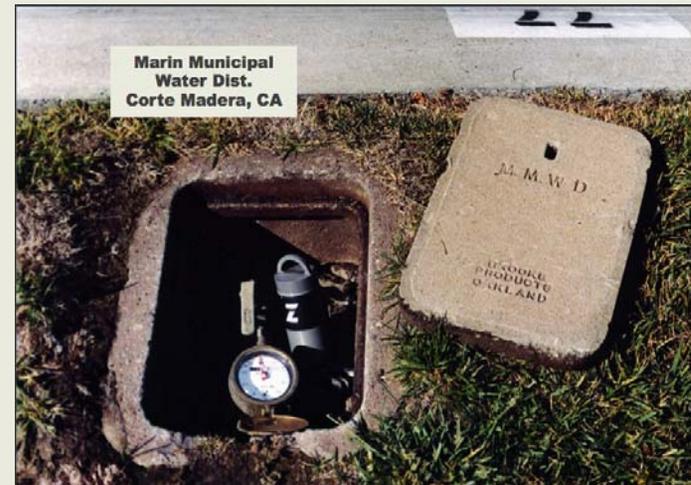
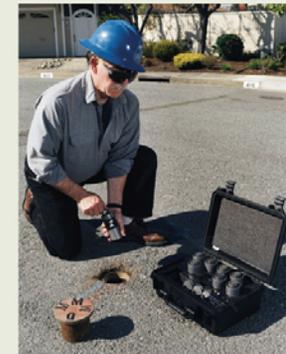
**Enclosure:**  
Aluminum, Cylindrical

**Protection:**  
Fully Submersible

**Power:**  
Lithium Battery  
(5 Year Life)

**Mounting:**  
Rare Earth Magnet  
(45 lb. pull force)

### A Set of 8 Loggers and Docking Station at a Hydrant Valve



## How Does a ZCorr System Work?

- **Loggers Have Synchronized Clocks Accurate to .000000020 Second**
- **Loggers All Listen at Exact Same Time**
- **Loggers Download Unfiltered Sounds to PC Software (Through Docking Station)**
- **PC Software Does Filtering:  
Metal and A/C Pipe: ALFA (Automatic Filtering)  
PVC and Poly Pipe: User Sets Filters (H and L)**
- **PC Software Does Correlation Analysis Between All Pairs of Loggers**
- **User Inputs Pipe Material, Dia. and Length Only if Correlation Appears**
- **Exact Distances to Leaks Like Other Correlators**

## How Does A Water Department Use ZCorr?

### Two Key Applications:

- 1. Overnight Pinpointing of Very Small Leaks**
  - **Too Much Usage Noise During Day**
  - **Only Possible at Night for Any Tool**
- 2. Overnight Survey of Downtown Busy Area**
  - **Too Much Street Noise for Day Survey**
  - **Drop Loggers on Valves Quickly**
  - **Minimal Disruption to Traffic**

## How Does A Water Department Use ZCorr?

### Two Alternative Deployments:

#### 1. Overnight Survey

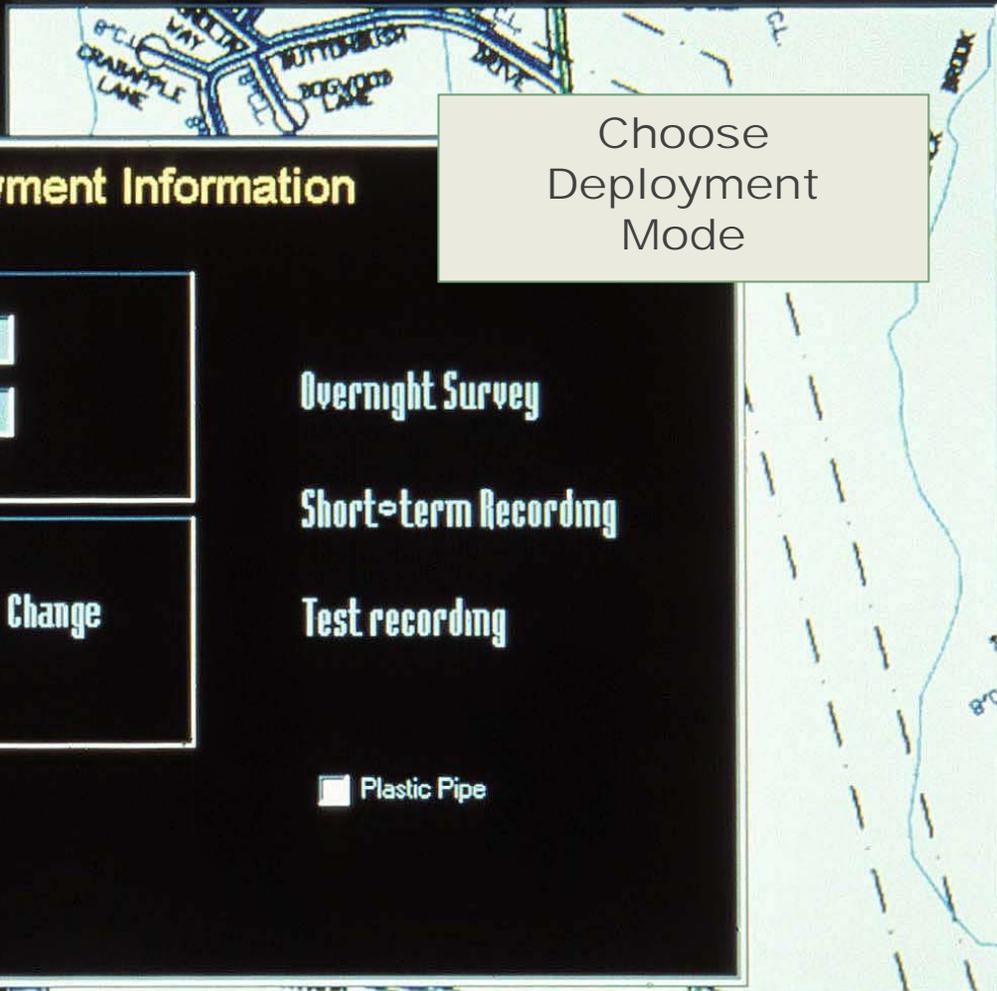
- **3 Recordings, Each 60 Seconds Long**
- **User Sets First ON Time (1 AM or 2 AM or . . . )**
- **User Sets Interval Between Recordings (15 min., 30 min., 1 hr., 2 hr., . . . )**

#### 2. Short Term

- **2 Recordings, Each 60 Seconds Long**
- **User Sets Delay Time (Minutes Required Before Loggers Turn ON)**
- **User Sets Interval Between Recordings (2 min., 3 min., . . . )**



# Zcorr Main Screen



Choose Deployment Mode

## Deployment Information

User:   
Zone:

Date:   
Time:  **Change**

Overnight Survey

Short-term Recording

Test recording

Plastic Pipe

Cancel



1. Deploy

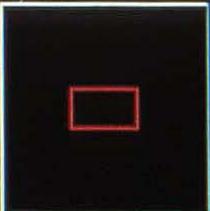
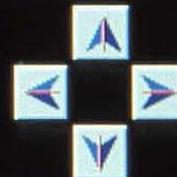
2. Retrieve

3. Analyze / Stored Data

Exit



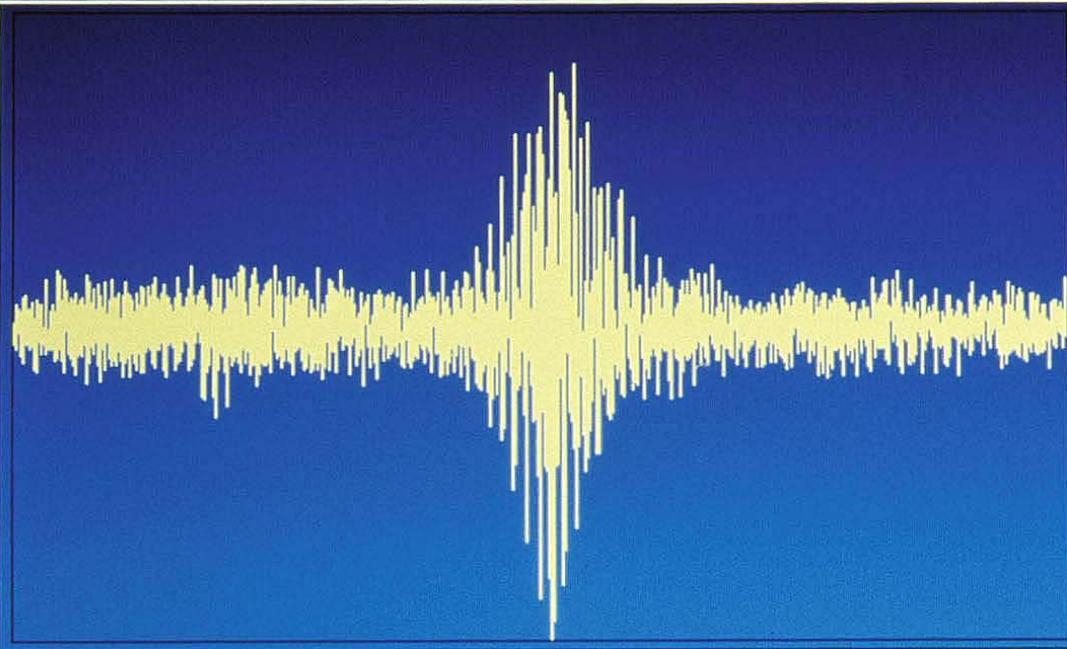
Map:







# Correlation Analysis



Three Identical  
Correlations at  
Three Times



Z1 North Pine \_4th St

Z2



239.3 ft

101.7 ft

## Pipe Information

Sensor Distance:

Pipe Material:

Pipe Diameter:

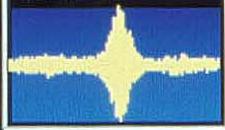
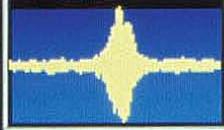
Sound Velocity:

All

1 : 00 am

2 : 00 am

3 : 00 am



Correlate

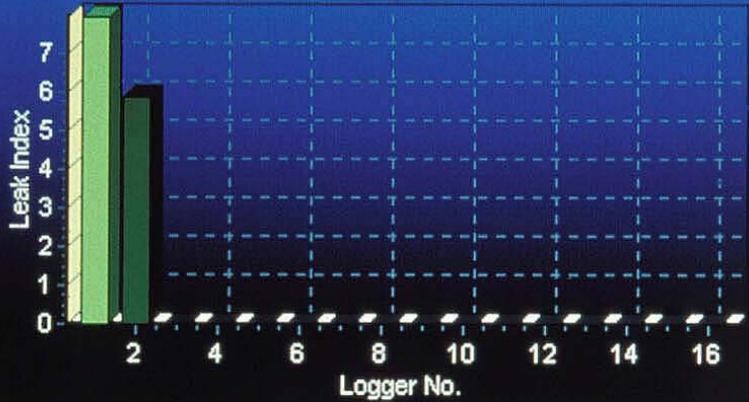
Advanced  
Analysis

Close

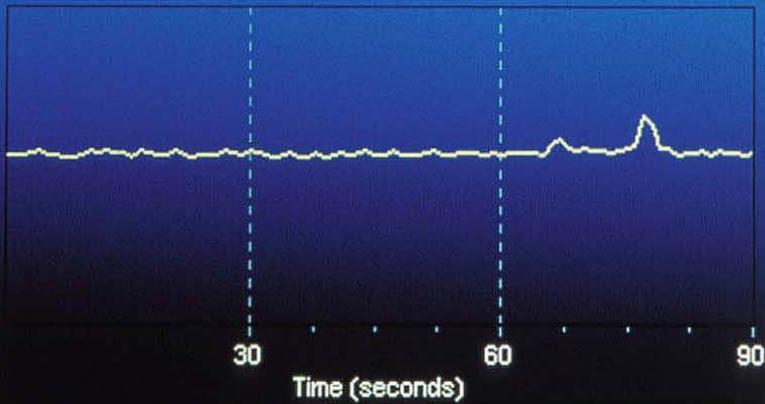


# Zcorr Recorded Data

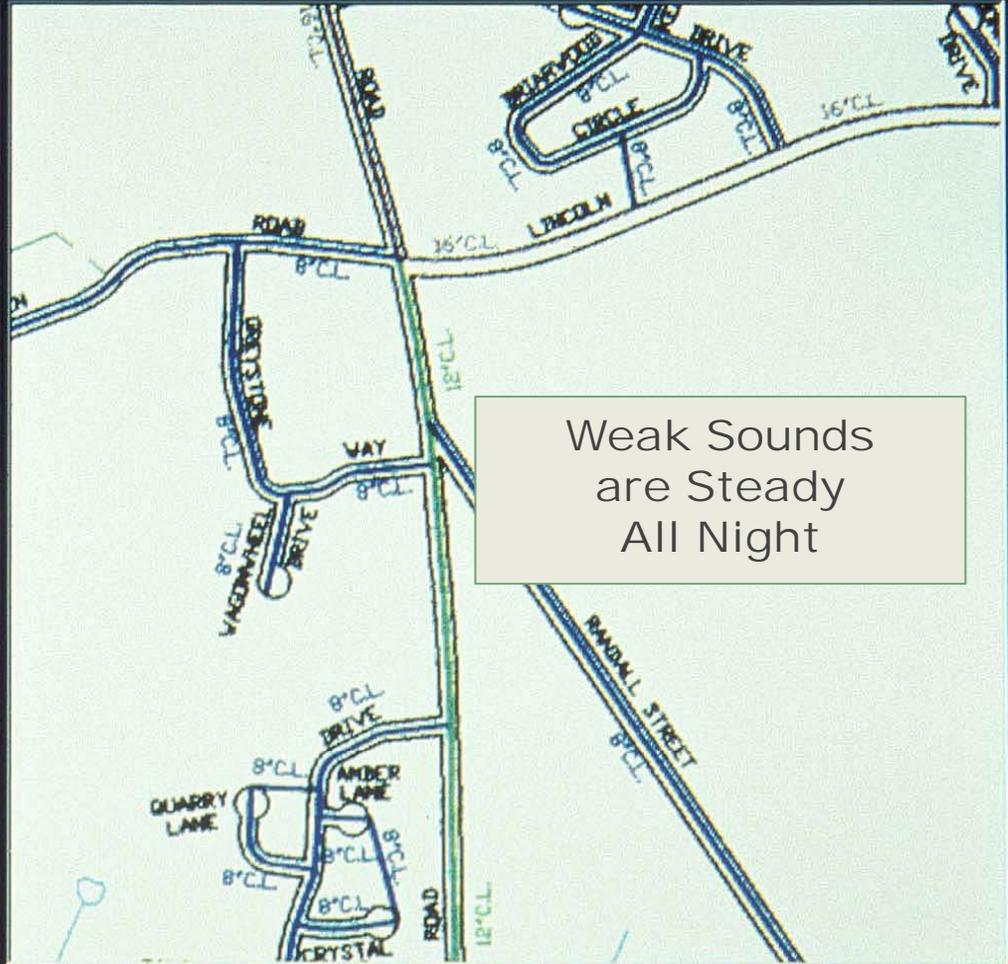
### Leak Indicator Chart



### Sound Level Graph



Weak Sounds  
are Steady  
All Night



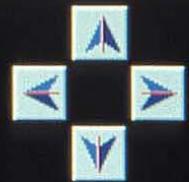
- All
- 1:00 am
- 2:00 am
- 3:00 am

Play

Close



Map: B3



## Field Results: Creekside View, Corte Madera, CA

- Situation:
- **Very new Residential Area with Town Homes**
  - **Small Wet Area on Street Over Main**

- Plan:
- **Do “Short Term Recording” With 2 Loggers**
  - **Hydrant Valve and Main Valve**
  - **263 ft. of 8 Inch Steel Pipe**

# Automatic Analysis of Zone My Zone

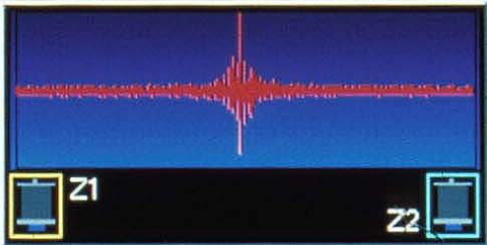
1 2

No. of loggers processed:   
No of correlations detected:

 100%

Time Remaining:

Auto Analyze Cancel



Perfect Correlation  
(Good Quality  
Sounds)



Corr. Results

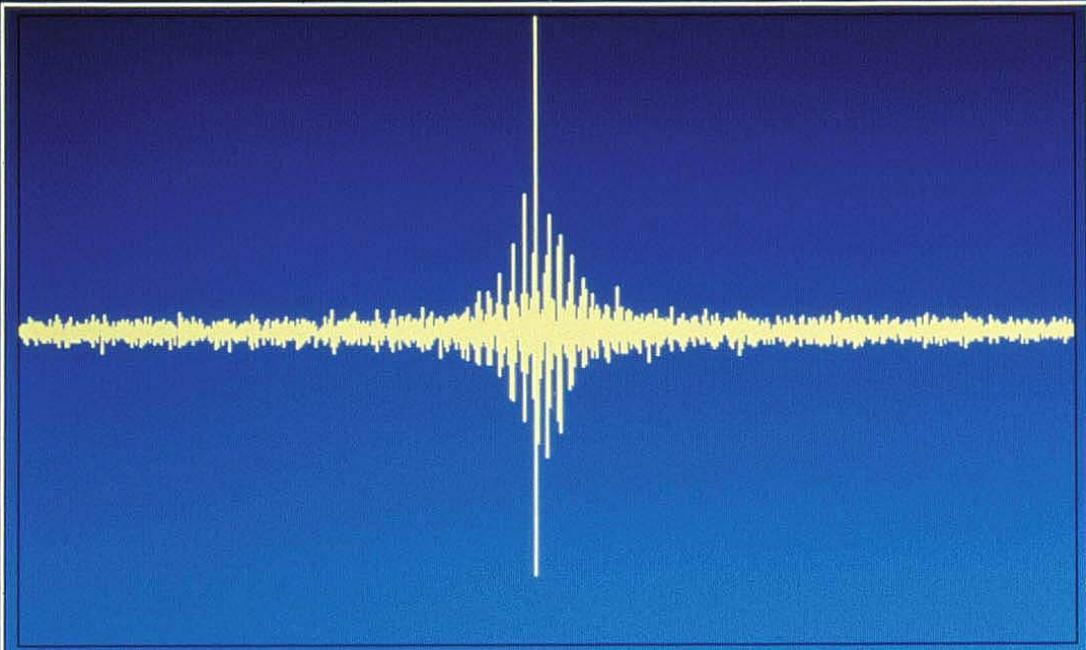
Summary

Listen

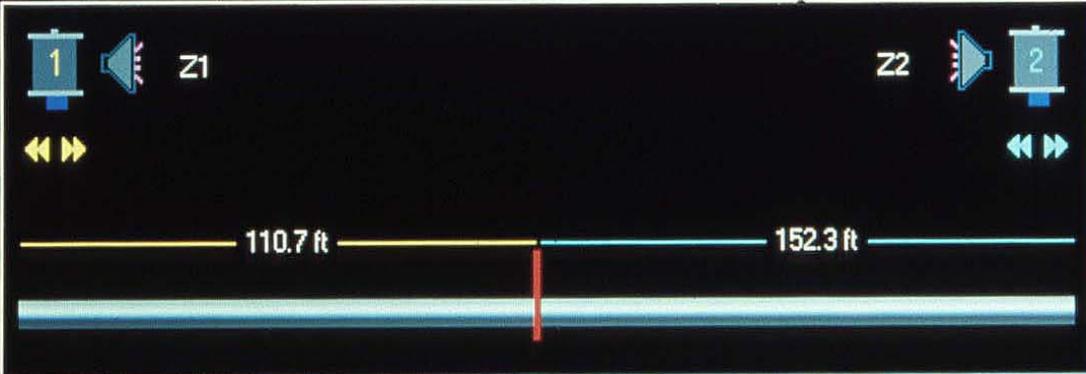
Close



# Correlation Analysis



Pinpointed at  
111 ft from Z1 and  
152 ft from Z2



### Pipe Information

Sensor Distance:	263.0 ft
Pipe Material:	Steel
Pipe Diameter:	8 inches
Sound Velocity:	4063 ft/s

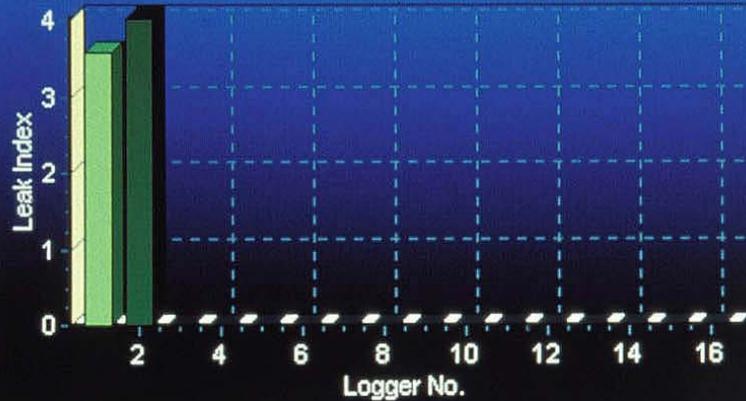


**Correlate**      **Advanced Analysis**      **Close**

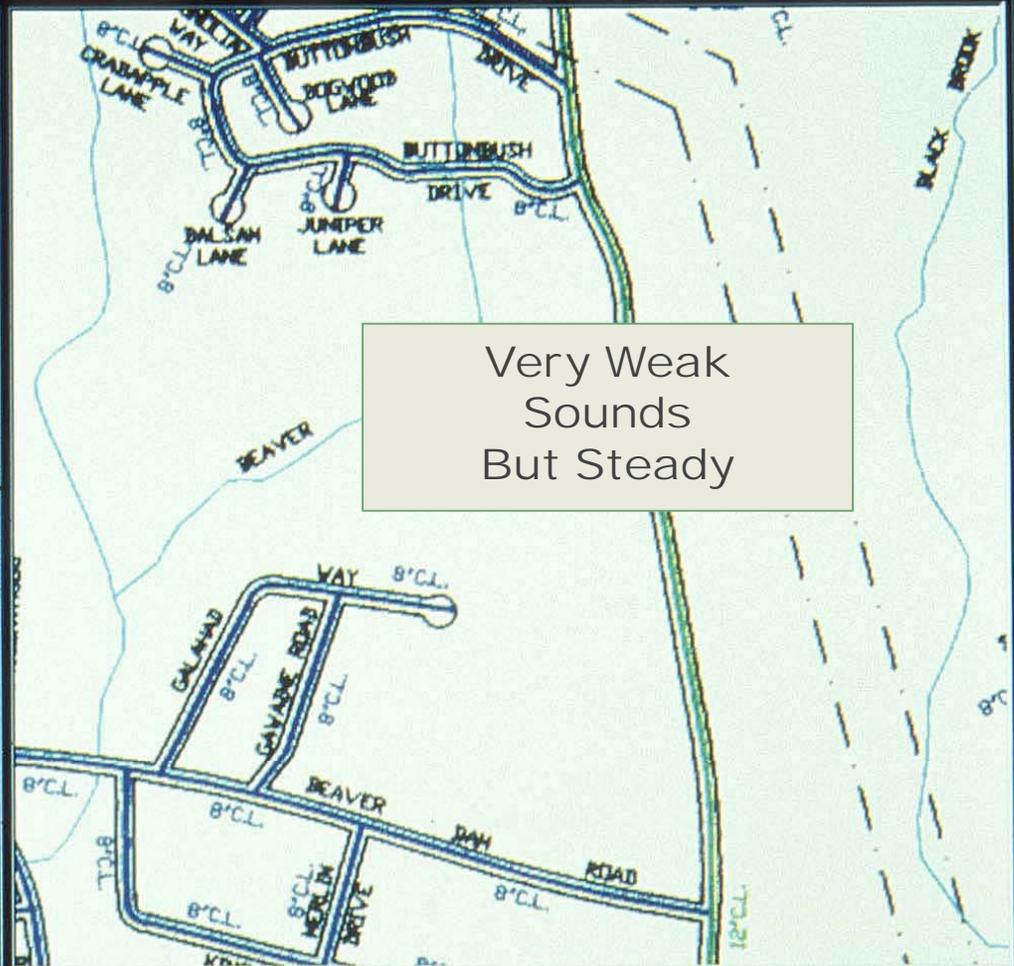
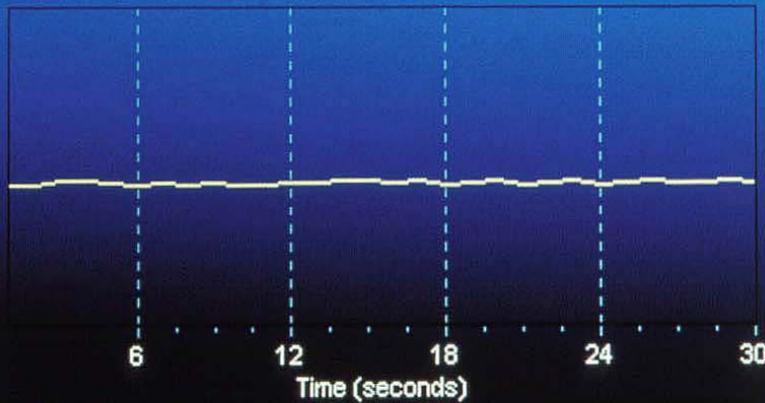


# Zcorr Recorded Data

### Leak Indicator Chart



### Sound Level Graph



Very Weak Sounds But Steady

10:55 am

Play

Close

Map: E3

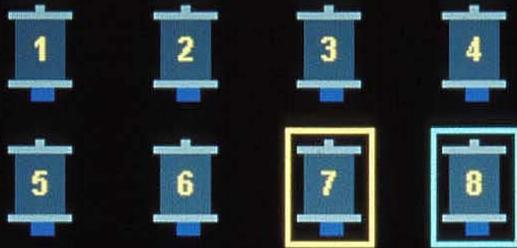
### Field Results: Bridgeway Avenue, Sausalito, CA

- Situation:**
- **No Recent Leak Surveys and No Leaks Evident**
  - **Multiple Cast Iron Mains**
  - **Downtown, Tourist Area**

- Problems:**
- **Tourist Auto and Foot Traffic All Day, Most of Night**
  - **High Usage Noise From Bars and Restaurants**
  - **Traditional Survey Techniques Not Easy**

- Problems:**
- **Put Out All 8 Loggers for “Overnight” Survey**
  - **Main Valves and Hydrant Valves, 6 Inch CI Main, Over Quarter Mile Length**

# Automatic Analysis of Zone My Zone



Many Correlations!  
One Leak  
or Several?

No. of loggers processed:

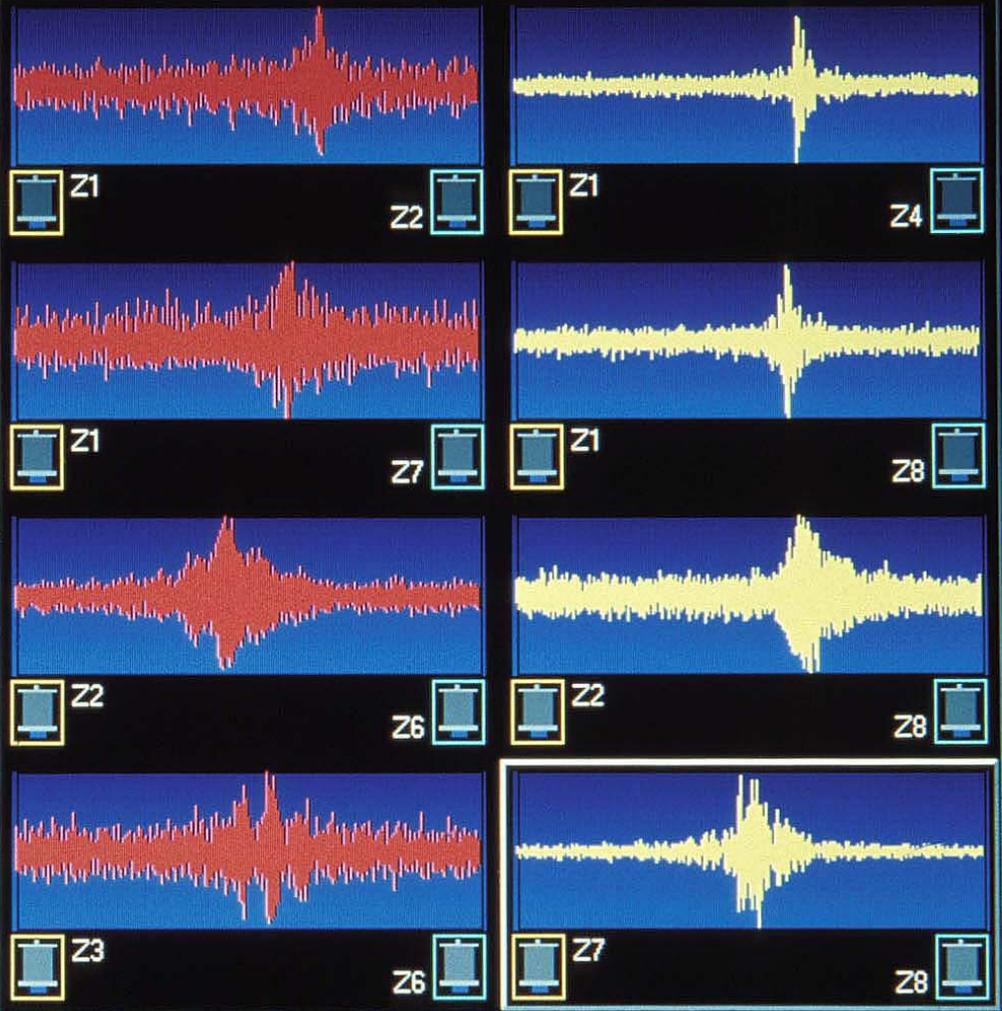
No of correlations detected:



Time Remaining:

Auto Analyze

Cancel



Corr. Results

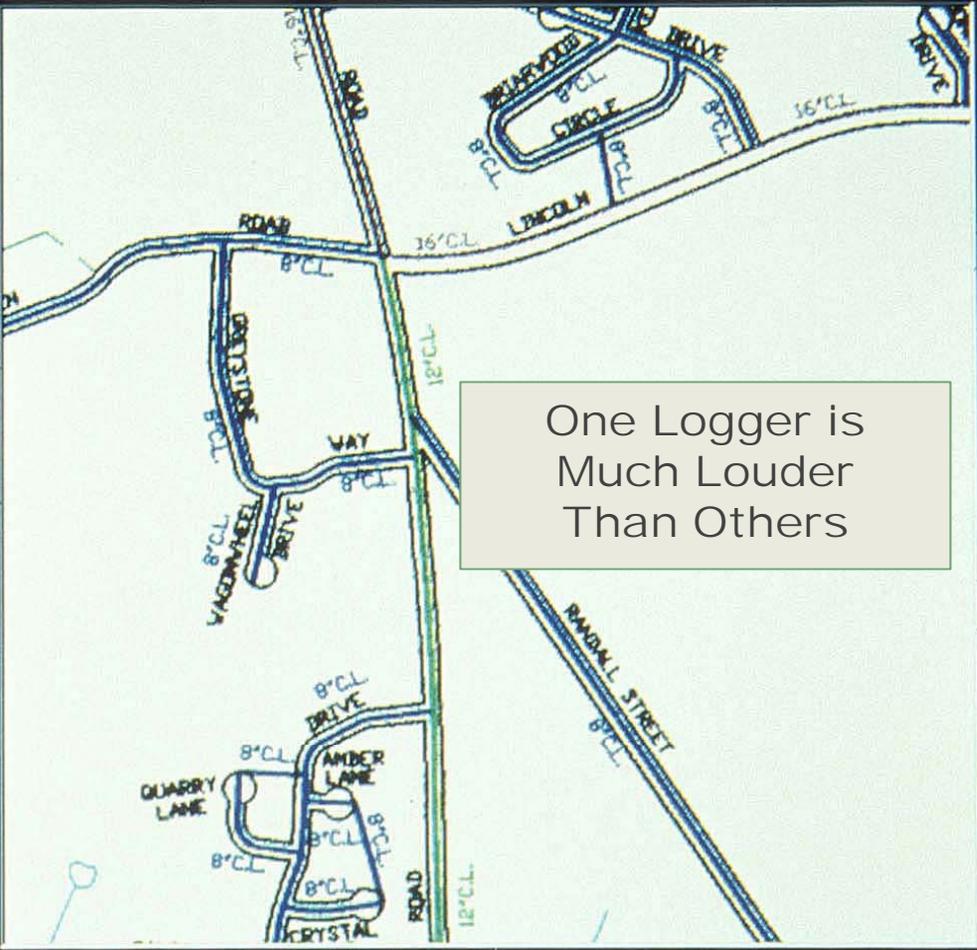
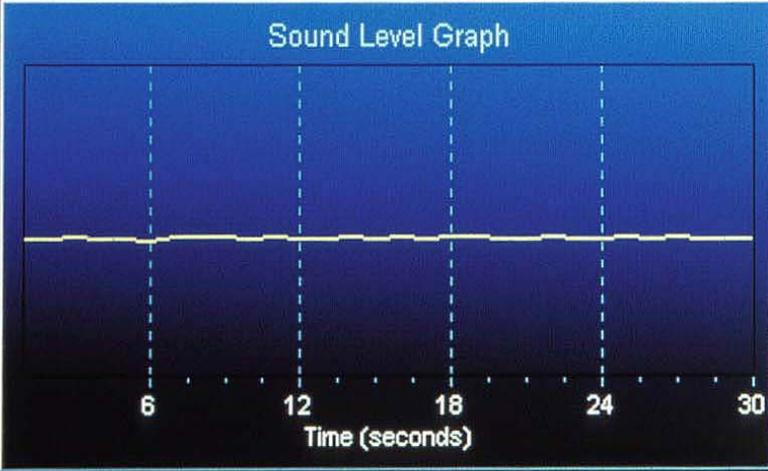
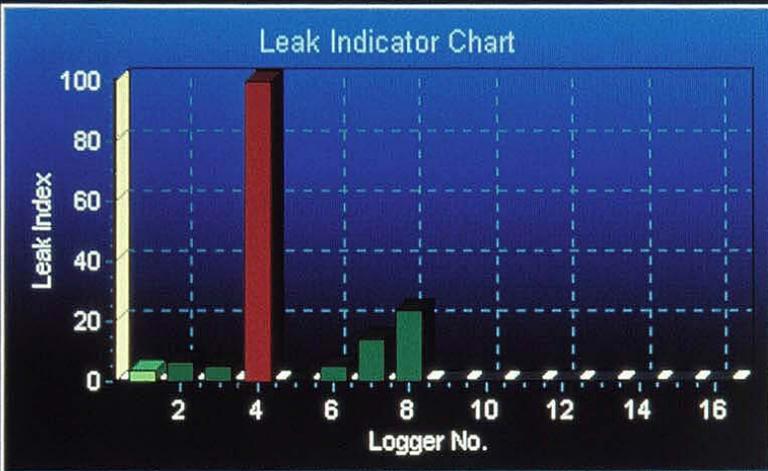
Summary

Listen

Close



# Zcorr Recorded Data



One Logger is Much Louder Than Others

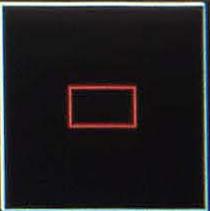
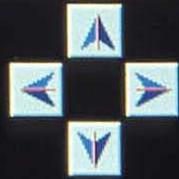
3:00 am

Play

Close

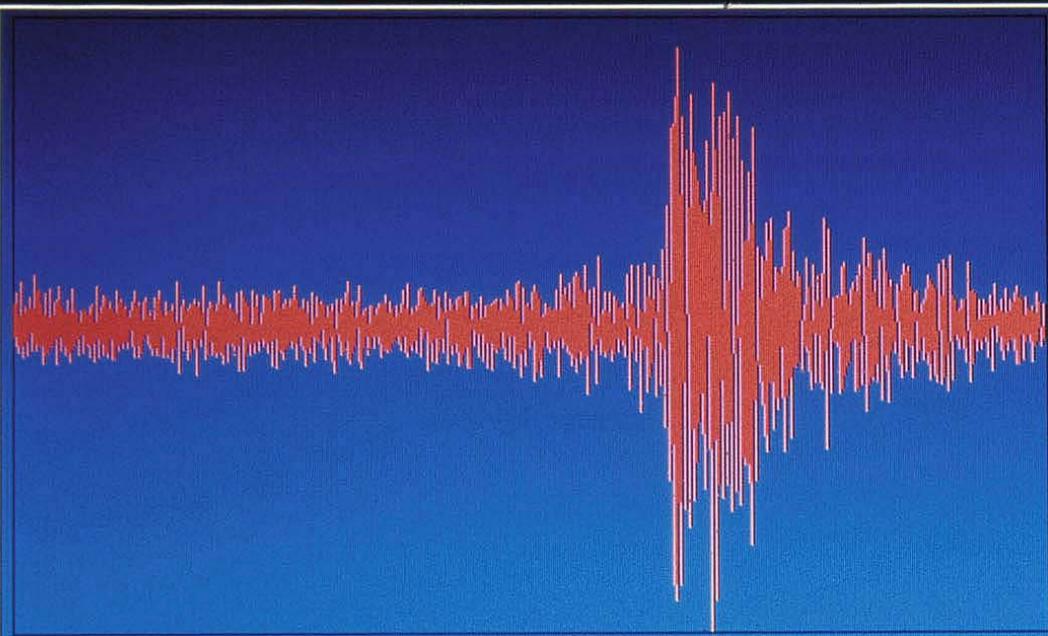


Map: B3





# Correlation Analysis



Leak Area  
Is Between  
Z4 and Z6



Z4

Z6



660.2 ft

59.8 ft



All



## Pipe Information

Sensor Distance: 720.0 ft

Pipe Material: Cast Iron (cement-lined)

Pipe Diameter: 6 inches

Sound Velocity: 4109 ft/s

Correlate

Advanced  
Analysis

Close



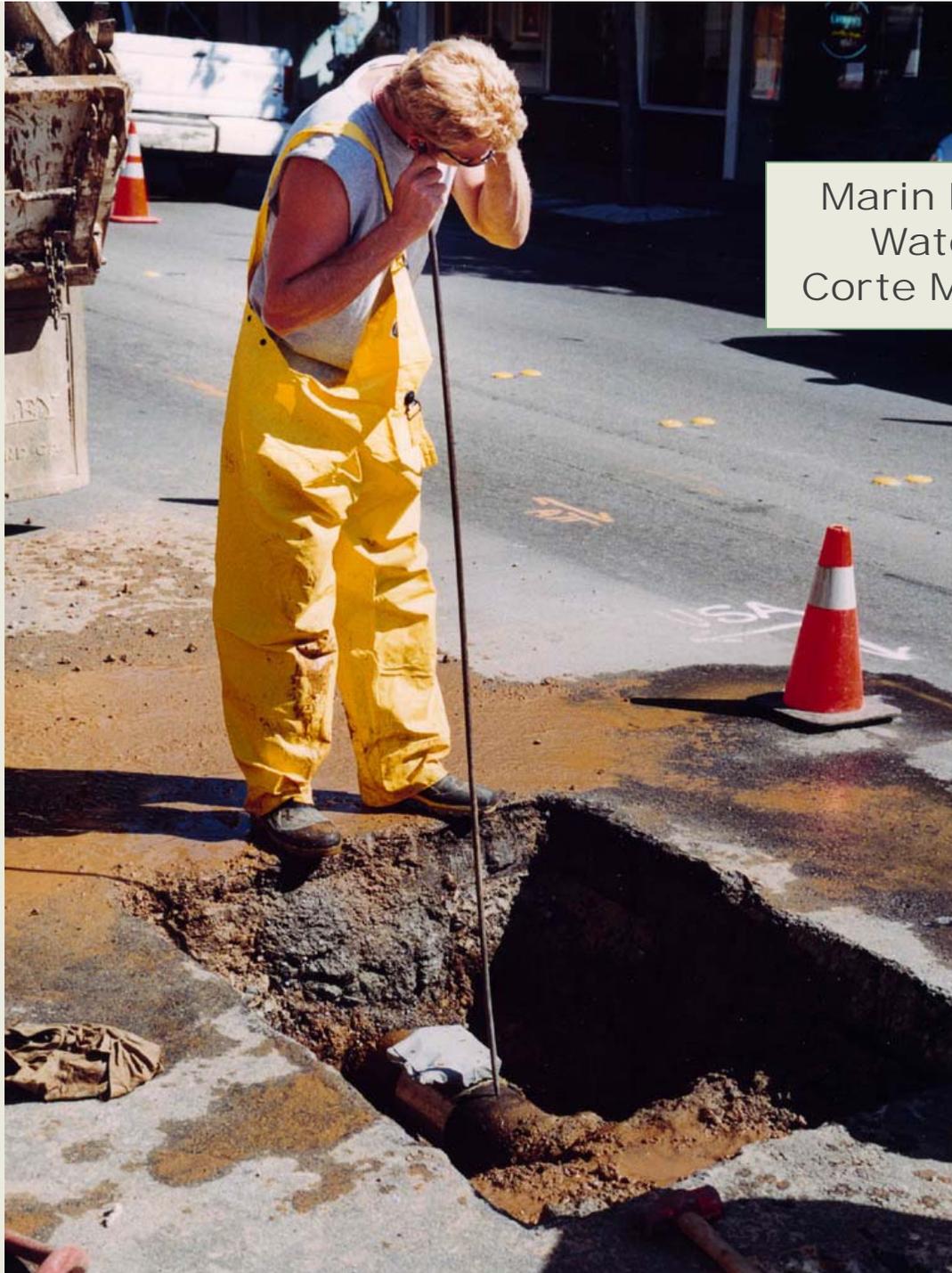
Marin Municipal  
Water Dist.  
Corte Madera, CA



Marin Municipal  
Water Dist.  
Corte Madera, CA

Marin Municipal  
Water Dist.  
Corte Madera, CA





Marin Municipal  
Water Dist.  
Corte Madera, CA

## What Are the Advantages of a Correlating Logger?

- **Performs Correlations Exactly Like a Correlator on Iron and A/C (Pinpoints Exact Distance to Leak)**
- **Can Operate at Night in “Overnight Survey” (Less Traffic and Usage Noise)**
- **Multiple Loggers Can Survey Large Areas for Leaks**
- **Can Turn ON Multiple Times With Hours Between Recordings (Best Chance to Get Leak Sounds Without Usage Noises)**
- **Can Find Smaller Leaks At Night (Less Traffic and Usage Noise)**

## Advantages of Correlators Over Correlating Logger?

With Correlator, User Watches  
Correlation Real-Time

- **Can Run Correlator For Several Minutes if Needed**
- **No Correlation Evident, Then Check Sensors, Adjust Filters, Etc.**

Correlating Loggers:

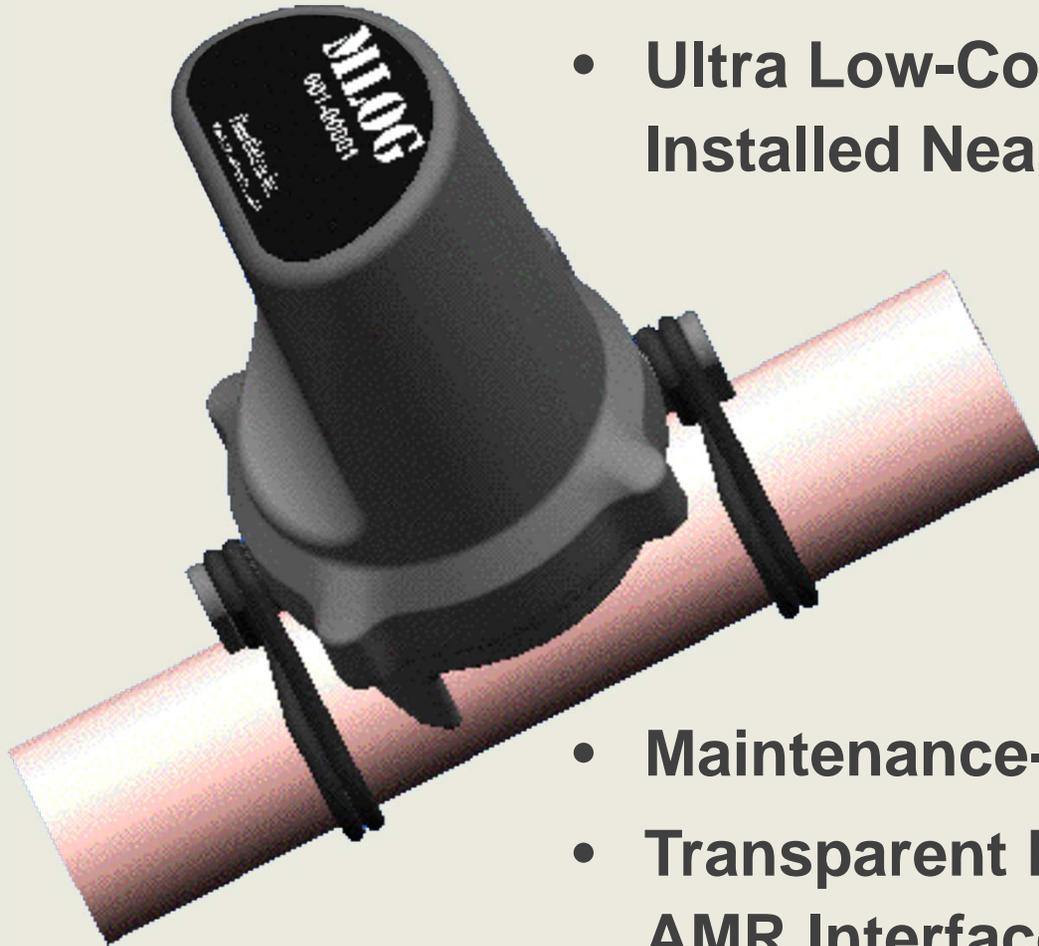
- **Recording Time Already Set**
- **No Real-Time Adjustments or Changes Possible**

Faster to Set-Up and Run

- **No Deployment and Retrieval Steps (No Downloading)**
- **Faster Correlation Results (Only One Pair)**

No Laptop PC Required, Fewer Cables

## MLOG: Intelligent Leak Detecting Sensor



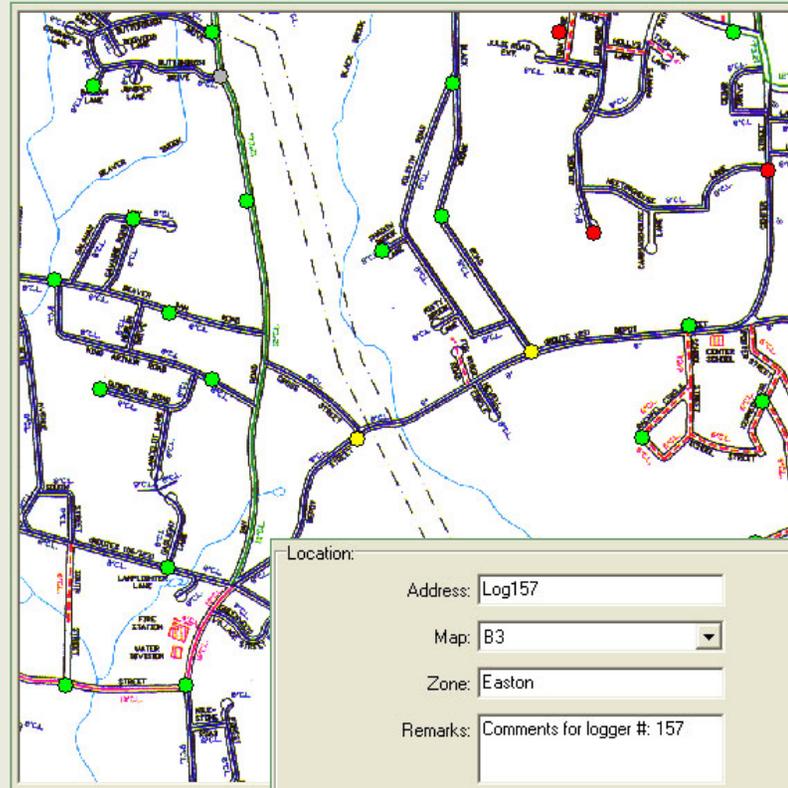
- **Ultra Low-Cost, Waterproof Sensor Installed Near a Water Meter**

- **Maintenance-Free, 10+ Years**
- **Transparent Radio-Reads or AMR Interface**

## MLOG: Location Management

- **Advanced MLOG Software Assigns Each Sensor a Leak Status**

- **Probable Leak**
- **Possible Leak**
- **No Leak Likely**



Location:

Address:

Map:

Zone:

Remarks:

Network:

Service:  Diameter:

Main:  Diameter:

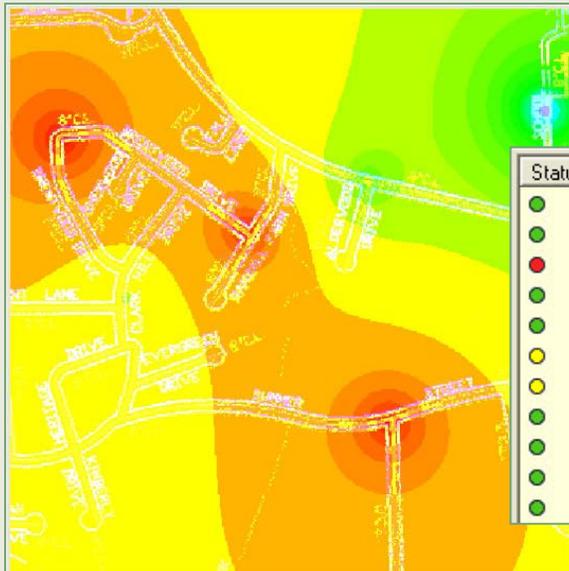
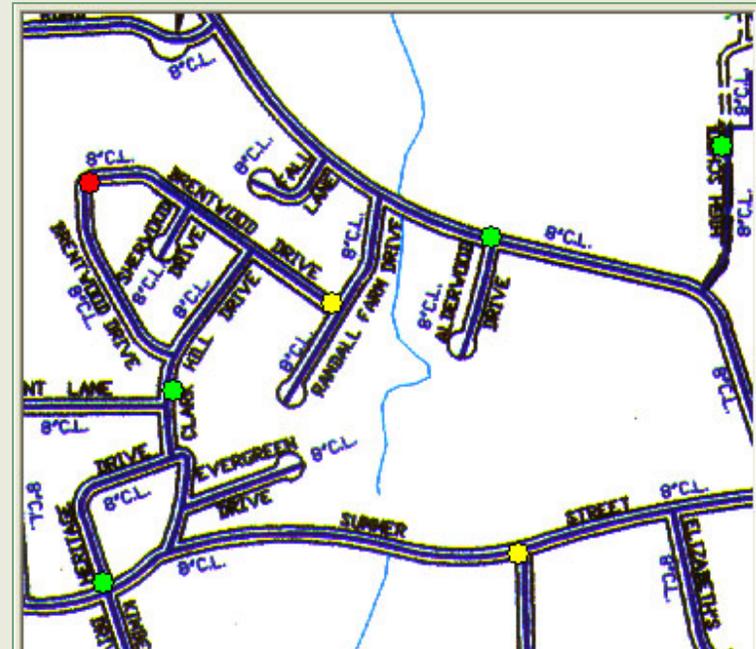
Environment:

Meter Type:

## MLOG: Data Management and Analysis

MLOG Sensors Are:

- Organized on Maps
- Have a Leak Status



Status	Log #	Log ID	Address	Zone	Map	Date Installed	Date Last Read	Leak Index
●	19	1019	Log19	Easton	B2	2/14/2002 11:29 AM	7/30/2003 7:17 PM	19
●	20	1020	Log20	Easton	B1	2/14/2002 11:29 AM	7/30/2003 7:17 PM	45
●	21	1021	Log21	Easton	B1	2/14/2002 11:29 AM	7/30/2003 7:17 PM	94
●	22	1022	Log22	Easton	B1	2/14/2002 11:29 AM	7/30/2003 7:17 PM	24
●	23	1023	Log23	Easton	B1	2/14/2002 11:29 AM	7/30/2003 7:17 PM	38
●	24	1024	Log24	Easton	B1	2/14/2002 11:29 AM	7/30/2003 7:17 PM	59
●	25	1025	Log25	Easton	B1	2/14/2002 11:29 AM	7/30/2003 7:17 PM	59
●	26	1026	Log26	Easton	B1	2/14/2002 11:29 AM	7/30/2003 7:17 PM	55
●	27	1027	Log27	Easton	B1	2/14/2002 11:29 AM	7/30/2003 7:17 PM	55
●	28	1028	Log28	Easton	B1	2/14/2002 11:29 AM	7/30/2003 7:17 PM	26
●	29	1029	Log29	Easton	B1	2/14/2002 11:29 AM	7/30/2003 7:17 PM	52

## Research Projects to Evaluate “Leak-No Leak” Loggers

- 1. Miami-Dade W&S, 80 Permalogs Versus 80 MLOGs, Fixed Wireless Radios, Downtown Miami, 2007**
- 2. Honolulu Board of Water Supply, 60 MLOGS Versus 200 Sewerin Loggers, Honolulu, 2006**
- 3. American Water, 480 MLOGs, Connellsville, PA, 2005 (Also Monterey County, CA)**
- 4. Albuquerque Bernalillo County 2007 Study, Head to Head Evaluation, Permalogs Versus Traditional Surveys**
- 5. AWWA “Leak Management Technologies,” 2007, Studies in Several Major US Cities**

# Leak Detection: Buy the Right Equipment

Analysis of  
Fluid Conservation System's Leak Detection Technology

**Phase III Report  
Head to Head Evaluation  
Active versus Passive  
Leak Detection Methods**

**Final**



**July 2007**

Prepared for



Prepared by



# Leak Detection: Buy the Right Equipment



Itron case study

## Leak Detection at California American Water

Itron Solution Empowers Customers to Conserve, in Turn, Protects Carmel River Habitat

### Opportunity

A water supply emergency—the official decree for the past 14 years by the California State Water Resources Control Board pertaining to the Carmel River and its 36 mile span along the central coast of Monterey County, Calif. The river is also home to two threatened species, the Central Coast Steelhead Trout and California Red-Legged frog. And it's all in context with Governor Schwarzenegger's declaration of a statewide water supply emergency in February 2009.

Combined, these factors create a complex operating environment for California American Water, the company responsible for delivering water to Monterey County citizens by pumping more than two-thirds of its supply from the Carmel River watershed.

To that end, California American Water has invested thousands of hours and millions of dollars to protect the wildlife and habitat of the Carmel River. Such efforts include helping customers understand what they can do to help. One example: empowering them to help stem water loss. In this case, water that has been produced and is “lost” through behind-the-meter leaks. After all, even small leaks can quickly add up to many gallons lost. Just a 1/8-inch sized leak consumes more than 3,500 gallons per day.

Working with the Monterey Peninsula Water Management District, California American Water set a goal to reduce its water loss from 9.5 percent to 7 percent.

Says Ron Scaccia, operations supervisor for California American Water, “Conservation is vital to the prosperity of our community and its habitat. Reducing our unaccounted for water is one additional way we can show leadership and stewardship in this effort.”

### Solution

Some leaks are easy to find, but many go undetected, wasting precious water and increasing associated production costs. A subsidiary of American Water, the largest investor-owned U.S. water utility, California American Water went to its “parent” for help in how to identify leaks and ultimately reduce water loss. David Hughes, an infrastructure engineer with American Water's research group answered the call. His job—to find good, practical ways to improve American Water's program for water loss, and seek out technology that is innovative and allows the utility to be more effective in proactive water management.

*“Conservation is vital to the prosperity of our community and its habitat. Reducing our unaccounted for water is one additional way we can show leadership and stewardship in this effort.”*

*Ron Scaccia,  
Operations Supervisor  
California American Water*

**Itron**  
Knowledge to Shape Your Future

## Leakage Management Technologies

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Published by:



# Leak Detection: Buy the Right Equipment

EPA 816-D-09-001  
November 2009



## **REVIEW DRAFT** **CONTROL AND MITIGATION OF DRINKING WATER** **LOSSES IN DISTRIBUTION SYSTEMS**



## Conclusions About Effectiveness of Current Tools

- **Acoustic Leak Detectors Are Still the Best Tool for Surveys (Better Than “Leak-No Leak” Loggers)**
- **Acoustic Leak Detectors Work for Pinpointing Loud Leaks and Shallow Leaks**
- **Correlators Are Very Effective for Pinpointing Leaks in Iron and A/C Pipes**
- **Correlating Loggers (ZCorr, SoundSens) Are a Powerful Leak Survey Tool**
- **PVC Pipes and Poly Services Still Difficult**
- **“Leak-No Leak” Loggers Continue to Improve at a Rapid Pace**