SewerBatt
acoustic sensing technology

SewerBatt

Rapid determination of sewer serviceability using acoustics

Richard Long www.acousticsensing.co.uk

FWR Wastewater Research & Industry Support Forum
&
CIWEM Wastewater Management Panel
9 July 2014

What is SewerBatt?

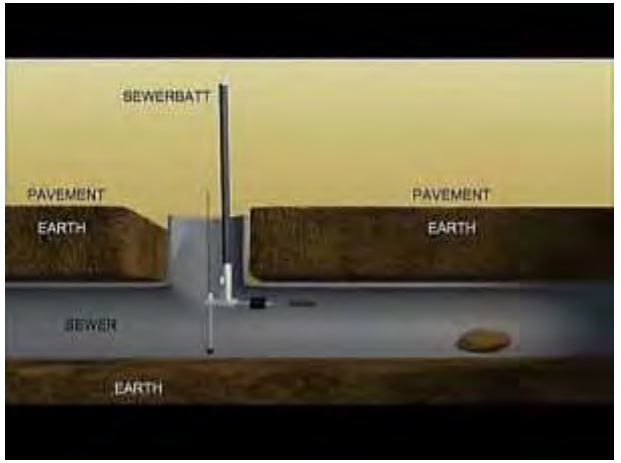
SewerBatt
acoustic sensing technology

Sewer serviceability assessment at the speed of sound .

- Acoustic sensing enables a rapid assessment of sewer serviceability
- Shows which sewers are in serviceable condition and which need in-depth CCTV survey.
- Traffic light display
  - Green = serviceable condition (WRc condition 1 or 2)
  - Amber = keep an eye on future deterioration
  - Red = CCTV survey now. (WRc condition 4 or 5)

- Reduces costs
- Locates blockages and structural defects
- Increases visibility of sewer network condition
- Extends use of budget for better customer service
- More data for improved asset management

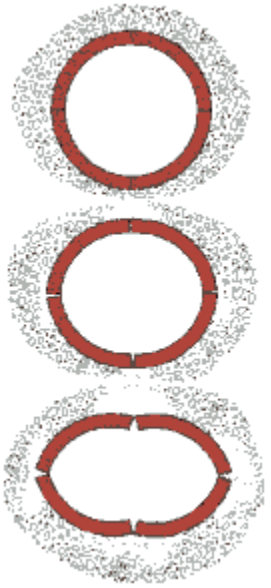
(lightweight, quick and easy to deploy, 2 minutes to do survey)

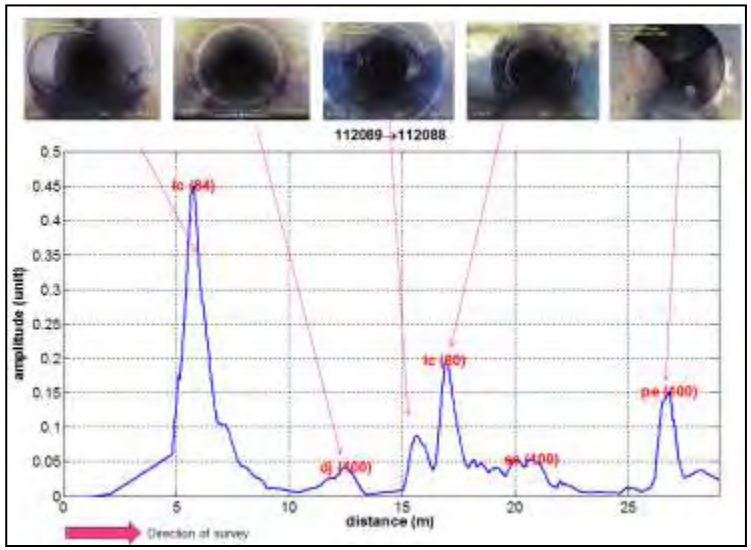


How Does it work?

SewerBatt
acoustic sensing technology

- Product of 10 years development at University of Bradford
- SewerBatt detects changes in shape and measures reflected energy and energy lost.
- Reflections can be matched against a library of acoustic signatures.
- Sees round bends and past obstructions.
- Identifies connections, blockages etc.
- Information immediately available on screen to the operator on site
  - no delays caused by remote processing
  - data only a few Mb
  - accurate lateral position
- One da[illegible]f training – no specialist skills needed.



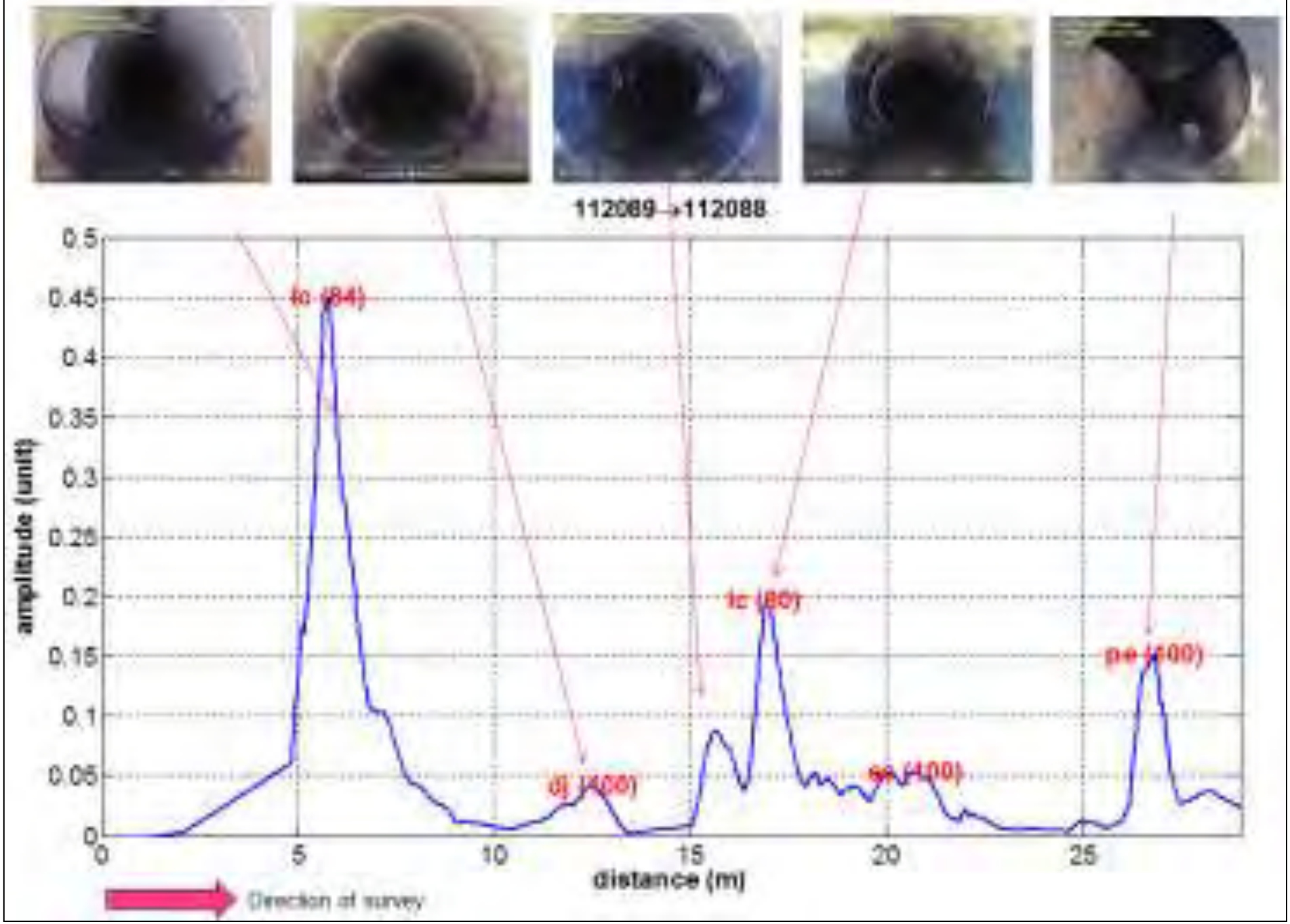


Traffic light output

Red maps to Condition Grades 4 & 5

Amber maps to Condition Grade 3

Green maps to Condition Grades 1 & 2

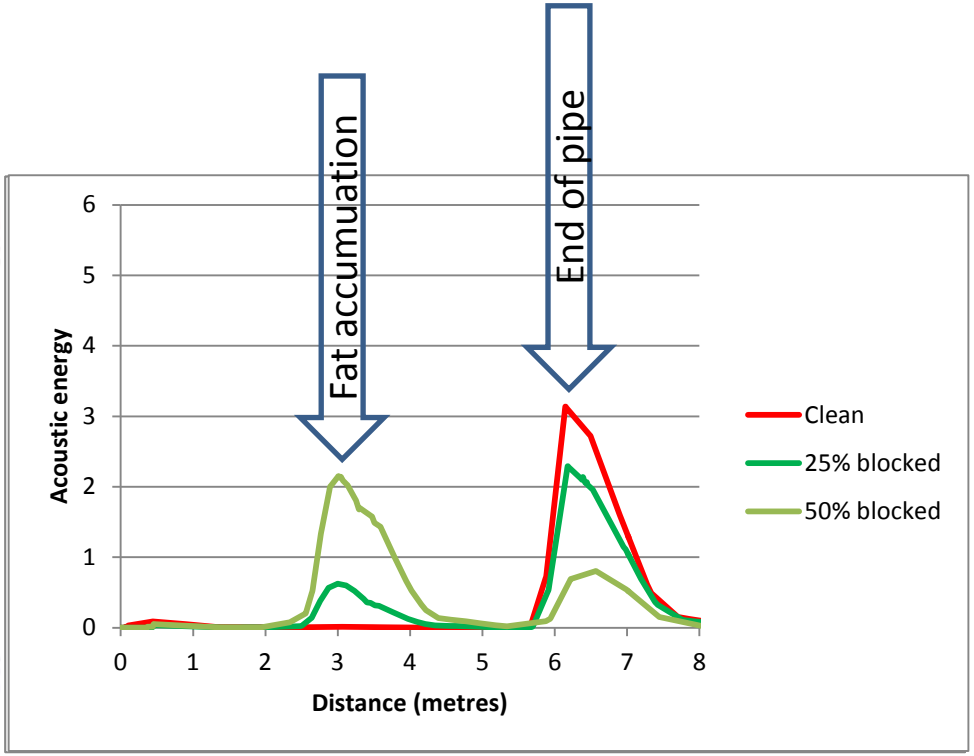

112089→112088
amplitude (unit)
distance (m)
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0
5
10
15
20
25
Direction of survey

Project timeline

2002	Concept
2003	Initial trials
2004	Obtaining water industry support (Thames Water and Yorkshire Water)
2006	Bradford University project commences with £220,000 EPSRC grant.
2008	EPSRC £180,000 follow-on funding granted.
2008	Royal Society 'Brian Mercer' award for innovation £155,000 grant
2008	Development funding for first commercial application obtained
2009-present	Field trials, assessment and development
2010 – 2012	£600,000 EPSRC award for Advanced Numerical Modelling Techniques
2013	Acoustic Sensing Technology (UK) Ltd established with £650,000 investment from the North West Fund for Energy and the Environment
2014	SewerBatt in production with sales in UK water and rail sectors and overseas.

Detecting blockage growth

SewerBatt
acoustic sensing technology



150mm diameter pipe 6m long

Experience in use

- US EPA – 2013/14 extensive testing of the use of acoustics for rapid sewer survey. ‘ *These acoustic based technologies have the potential to provide information in a matter of minutes to assist an operator in determining whether a sewer pipe might be partially or fully blocked and require cleaning or renewal. The speed of the assessment, using minimal equipment, has the potential to result in significant cost-savings compared to traditional methods, such as CCTV inspection.’* EPA said 1/15th cost of CCTV

- Collaborative trial in Australia through Isle Utilities and 10 collaborating water companies. Completed 2013. ‘*This technology represents a step-change to traditional CCTV methods currently used for inspection of sewers. Benefits include rapid determination of sewer faults and features and it is also much cheaper and easier to operate.’*

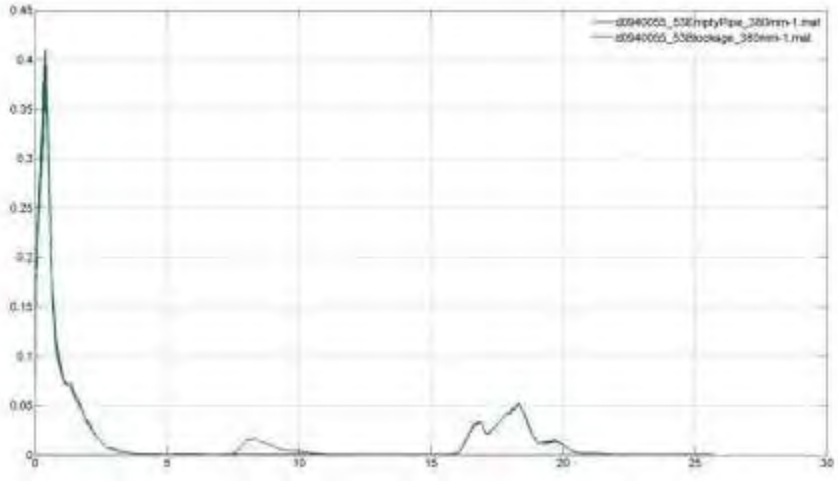
- Numerous trials in the UK for water companies, network rail, highways and London Underground.
- Recent demonstrations to water utilities in Netherlands and Spain

- Numerous trials in the UK for water companies, network rail, highways and London Underground.
- Recent demonstrations to water utilities in Netherlands and Spain

Experience in use

SewerBatt
acoustic sensing technology

- Sales to several UK water companies.
- Intensive trials on-going with several other UK water companies
- Sales to Network Rail and London Underground
  (picture and scan right is a 450mm drain between 2 running lines, scan shows a small accumulation and then the next manhole. Access time is limited and collapse would be disastrous so quick and easy survey is very beneficial)
- Sales in Australia and New Zealand
- Appointment of agent for US west coast expected soon.
- ‘WRc Approved’ scheme in progress
- UKWIR SW01 PPM approach for managing sewer blockages



SewerBatt in AMP 6

Ofwat '*Setting price controls for 2015-20 – final methodology and expectations for companies' business plans'. July 2013*

- 'Drive clear and significant benefits for customers and the environment'
- 'Encouraging companies to develop innovative, efficient solutions to long-term delivery for their customers…and for the environment'
- Risk-based approach focussing on Outcomes and Costs for customers and the environment.
- Companies held to account for what they deliver, not the way they choose to deliver it
- Totex approach - less interest in how companies spend between opex and capex.
- SIM to continue for all household customers

Extracts from WaSC AMP6 Business Plans

- Customers also supported a limited number of enhancements to service; these being reductions in the number of incidences of blockages …
- The package includes financial penalties for underperformance (up to almost £110m) and, in limited cases, rewards for outperformance relative to target (up to £10m) for the following measures: Sewer flooding incidents, other causes – (financial reward or penalty) Pollution incidents, category 1-3 (financial penalty only), Asset health – infrastructure and non-infrastructure (financial penalty only).
- For example, our performance against our customer service targets we envisage will impact on the overall Service Incentive Mechanism (SIM).
- pre-emptive rather than re-active interventions
- Challenged our plans to identify further opportunities to deliver efficiency savings to make sure bills go up by no more than they need to. We will now make savings of £189 million from 2015 to 2020
- Between 2015 and 2020, we'll replace or refurbish about 224 kilometres of sewers. Because of the very high cost of replacing sewers, we'll target the parts of our network where we know we can bring about the greatest benefits. We'll also carry out more sewer cleaning to prevent blockages.
- We'll put more resources into keeping our drainage plans up-to-date
- We'll focus on reducing the risk of blockages, which are a major cause of flooding from sewers, by:
  - Carrying out targeted surveys of our sewers using cameras
  - Carrying out regular sewer cleaning work, targeted at areas with particular issues
  - Removing tree roots that have pushed through into our sewers

Ofwat SIM Survey 2012/13 Annual Report

McCallum Layton

Reason for Contact

The top ten most common reasons for contact are as follows:

	Number of Respondents	Proportion of Respondents	Proportion Satisfied
About a blockage in the sewer/drains	1,561	10%	89%
Due to a recent move, or planning to move	1,510	8%	95%
Payment plan/direct debit set-up/query	1,388	8%	93%
To make a payment	1,294	7%	92%
No supply/water gone off	999	6%	88%
A query about a water bill	918	5%	84%
Because of a water leak/burst on the road	757	5%	79%
Because of a water leak/burst on my property	756	5%	81%
About defective/dangerous water equipment†	680	4%	88%
Regarding the low pressure of tap water	677	4%	86%

†Including stop taps, manhole covers, hydrants, raised/sunken chambers

Ofwat SIM Survey 2012/13 Annual Report

McCallum Layton

Visits

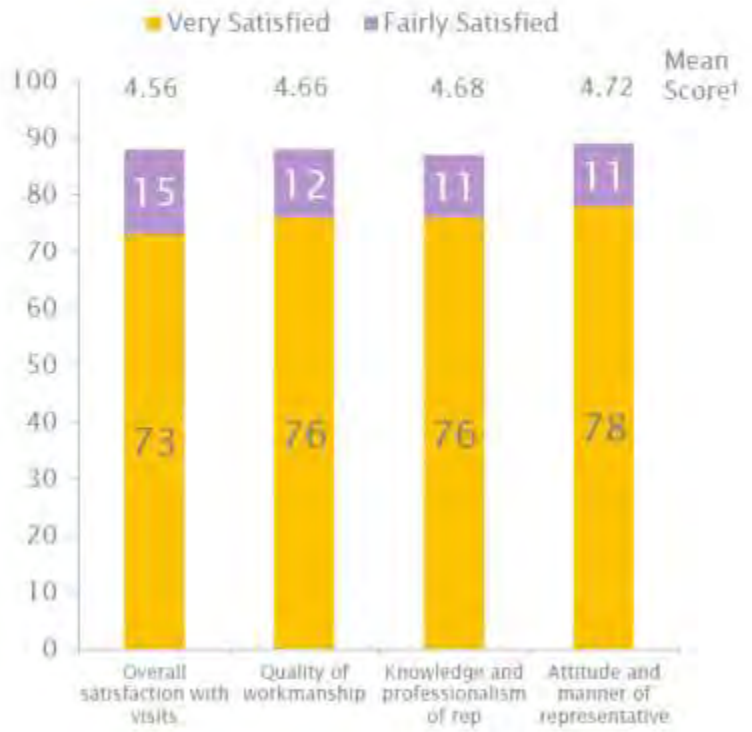
Satisfaction with visits is a key driver of overall satisfaction

The most common reasons for receiving a visit were:

- About a blockage in the sewer/drains (23%)
- Because of a water leak/burst on my property (10%)
- Because of a water leak/burst on the road (7%)
- About flooding with sewage or foul water (7%)

Customers tended to be satisfied with the way in which their visit was handled.

Overall visit satisfaction was significantly higher in 2012/13 than 2011/12 (88% vs 86%).



† Where 5=very satisfied

Sewer renewals and renovation

SewerBatt
acoustic sensing technology

- Example – in AMP5 one UK water company is renewing or renovating 206km of sewers, out of the 32,000km of main sewers that they manage. This implies an expected 776 year average life. This figure excludes the recent private to public sewers. Are we approaching the 'cliff edge' where many sewers will reach the end of their useful lives at the same time?

- Long-term stewardship requires water companies to
  - do the right thing
  - in the right place
  - at the right time
- This requires information on the rate of deterioration of sewers
  - Need to survey more sewers
  - Need to survey them more often
  - Need to control survey costs
  - Need to target surveys intelligently

Using SewerBatt

Sewer jetting – check the job's been done right first time.

Proactive investigation of sewer flooding hot spots

Asset renewals planning – measuring rates of deterioration and reducing CCTV costs

Proactive blockage control – reduced pollution incidents

First response to customer flooding incidents

Sewer flooding investigations

What are the benefits?

acoustic sensing technology

SewerBatt provides usable decision making information leading to enhancements in network performance. Fewer flooding other causes, collapses and pollution incidents. More achievement of outcomes and customer service.

- Gives an instant picture of sewer condition and serviceability
- Light weight and easy to move around to difficult locations – transferred sewers, rail and highway industries
- Targets use of expensive CCTV to pipes in poor condition.
- Focus on outcomes – eg checks jetting done properly
- Management of Flooding Other Causes - improved customer service
- Digital data for quick and easy analysis, storage and post-processing
- Compatible with InfoNet and other GIS systems

SewerBatt
acoustic sensing technology

SewerBatt

Rapid determination of sewer serviceability using acoustics

Works in the dark and uses sound