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# Summary

## i Reasons

This project investigated the effect of the installation of water meters in lead pipes on the lead concentration in drinking water.

Lead service pipes that connect water mains to customers' premises are the principal source of lead in drinking water in the UK. Phosphate dosing and/or pH adjustment are used in water treatment to control plumbosolvency, forming an insoluble layer on the internal surface of the pipes which can maintain the concentration of lead below the 10 µg/l UK standard. Installation of a water meter (or similar fitting) into a lead pipe is expected to disturb the protective layer, potentially causing a transient increase in lead concentration. Due to metered supplies becoming more common it was important to gain a better understanding of such effects.

## ii Objectives

- To understand the likely impact of the installation of a water meter (or similar fitting), to a property supplied through a lead pipe, on potential for increased exposure to lead via drinking water.
- In the event that consumers are subject to increased exposure as a result of installation activities, to identify possible actions and/or advice to companies and/or consumers to reduce the risk.

## iii Benefits

This project elucidates the potential extent and duration of an increase in the concentration of lead in drinking water following the installation of a water meter (or similar fitting) in an existing lead pipe and identifies possible actions to mitigate the risk of increased exposure to lead by the consumer in these circumstances.

## iv Conclusions

The overarching conclusion from this study is that installation of meters or other fittings into lead pipes can lead to transient increases in lead concentration in the water. These elevated concentrations, mainly of particulate lead, can last for about 3 days and can be effectively removed by flushing.

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### Pipe rig trials

- Total lead concentration in drinking water increased to a concentration substantially greater than the regulatory standard (10 µg/l) following the installation of water meters in test pipes. Values of up to 278 µg/l in first flush samples and 419 µg/l in 30-MS samples were recorded for tests *without* induced air disturbance. Values of up to 612 µg/l in first flush samples and 286 µg/l in 30-MS samples were recorded in tests *with* induced air disturbance.
- The increase in lead concentration was principally due to particulate material.
- The increase in lead concentration was reduced substantially by flushing, and total and dissolved lead concentrations were reduced to approximate pre-installation values (<10 µg/l) after the passage of 900-2,700 litres of water, equivalent to 3-9 days of typical domestic water use for a household of 2 people.

### Field trials

- Installation of a water meter to old lead supply pipes resulted in a subsequent temporary increase in the concentration of total lead in the water supply. The degree of increase varied substantially between the sites monitored, peaking at between 573 and 9,700 µg/l. The observed increases were markedly greater than those observed in the controlled pipe rig tests. The reasons for this are most probably a combination of the age of the lead pipes in the field study, with associated accumulations of lead compounds on the pipe wall, together with the greater disturbance as a result of manual manipulation of pipes in the process of meter installation.
- The degree of increase in total lead concentration did not appear to be consistently related to the degree of pipe disturbance, indicating that other factors were also important.
- The concentration of dissolved lead also increased subsequent to the meter installation, but to a far lesser degree, peaking at between 5 and 22 µg/l.
- For the 2 sites where a 100 litre flush was applied on Day 0, total lead concentration measured less than 10 µg/l in the final samples taken on Day 0.
- The total concentration of lead remained at less than 10 µg/l in both the RDT and 30-MS samples taken on Days 1, 3 and 8 after meter installation, at the 3 properties where this was measured, with a single sample exception. This represented a volume of between 200 and 400 litres used between meter fitting on Day 0 and sampling on Day 1.

- Flushing of the water supply to waste immediately following installation of a water meter into an old lead supply pipe is clearly an effective method of reducing the potential for customer exposure to elevated concentration of lead. The flushing requirement will depend upon a range of factors:
  - Internal pipe condition
  - Degree of manipulation of the pipe during installation
  - Degree of disturbance during repairs to the ground around the newly installed boundary box
  - Length of the supply pipe.
- Very limited tests using a proprietary jug type water filter indicated that this could be an effective additional temporary measure, in the week following the installation, to further reduce the total and dissolved concentration of lead in water.

## v Suggestions

### Post installation flushing regime

Where the installer determines that the service pipe is lead, the consumer should be informed of this fact and offered the standard company advice on lead pipes. In addition they should be advised to flush their cold water supply immediately following the installation, for a minimum of 10 minutes, and to flush again for 2 minutes at the first use of the kitchen tap, for the next 3 days.