



# Thames Water

EMPLOYING RESERVOIR PROFILERS TO REDUCE COSTS

Application Note  
A545 - Rev. B



a xylem brand

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YSI Environmental Monitoring Systems  
Application Note A545 Rev. B

## BACKGROUND

Water quality profiling systems from YSI were first installed in the Queen Mother Reservoir near London's Heathrow Airport back in 2006. These systems are able to measure through the entire water column, taking and recording water quality measurements automatically, thereby helping to improve water management decisions.

London lies in one of the driest parts of Britain, and the average annual rainfall is only 601.7 mm (24 in), eleven inches less than Dallas, TX.

Between November 2004 and July 2006, the Thames Water region received only 68% of expected rainfall and experienced below average levels for every month except one. 2010, 2011, and 2013 also saw extended periods of limited precipitation.

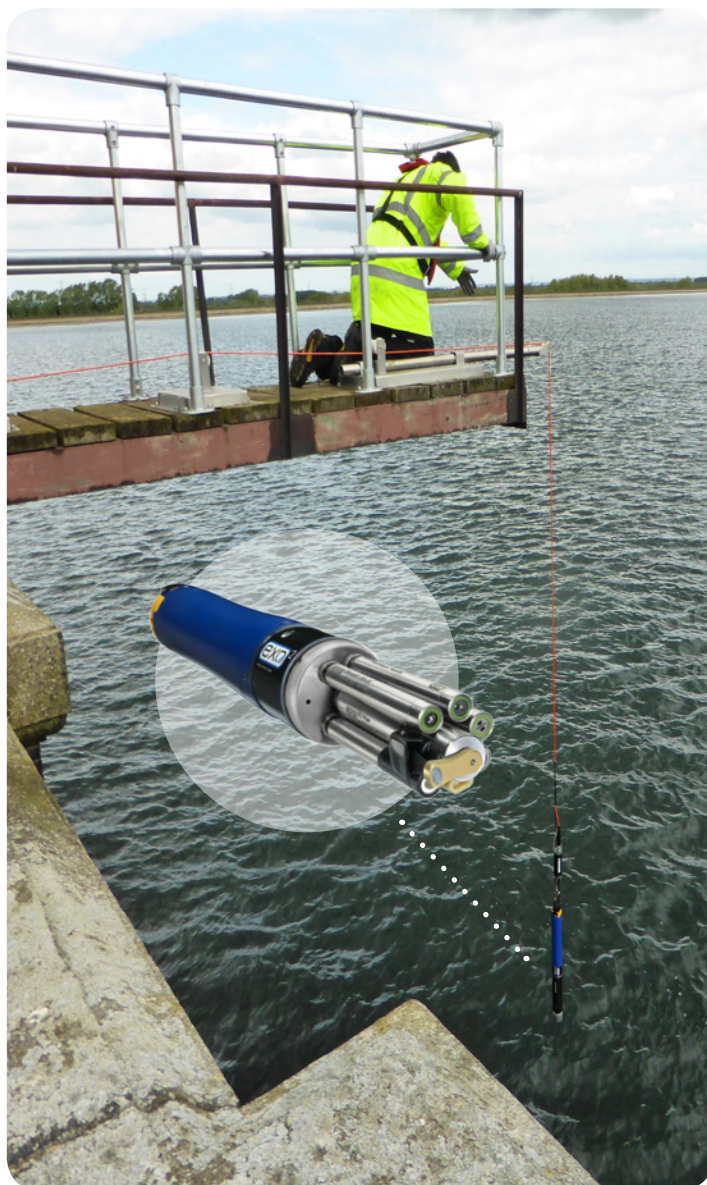
These droughts resulted in a depletion of water reserves and the company had to implement a number of measures in order to protect the region's resources.

Naturally, droughts have served to increase focus on the efficient use of water resources; one of the measures that staff at Thames Water have been able to implement has resulted in significant improvements in the efficiency of abstraction, storage, and production. This has been facilitated by the installation of new profile monitoring technology coupled with a compressed air mixing system.

Thames Water is the largest water company in England, supplying water to around eight million people in London and the Thames Valley. The Queen Mother Reservoir was built in 1976. In conjunction with a number of other reservoirs, it fulfils a crucial role in the drinking water supply to the west of the city.

Reservoirs form an important step in the water supply chain because, through sedimentation and natural enhancement of biological quality, they represent a low-cost method for water quality improvement. Therefore, Thames Water has a minimum retention time for reservoir storage of ten days.

**“Reservoirs form an important step in the water supply chain because...they represent a low-cost method for water quality improvement.”**



Fixed vertical profiling with a YSI EXO2 sonde.



## PROFILING ENTIRE WATER COLUMN INFORMS ABSTRACTION

Commenting on the monitoring equipment, Terry Bridgman, Field Scientist in the water quality team at Thames Water, says, "We have always wanted a technology such as the Profiler because knowledge of water quality throughout the entire column helps to improve decisions on water abstraction. Water can be drawn from different depths and if we know the position of the best quality water we can minimize water treatment costs."

Bridgman continues, "For example, if we are able to ensure that the algal load in water supplied to the drinking water treatment plants remains low, we can save costs by optimizing the treatment process."

The YSI Team initially installed the Profiler system in the Queen Mother Reservoir back in May 2006; as a result of the success of the system, additional Profilers with EXO sondes have also been installed at other strategic reservoirs. The data that these systems provide enable Thames Water to not only choose a depth for the abstraction of the best quality water, but also to choose the most appropriate reservoir.

Thames Water's largest drinking water treatment works are generally designed to treat stored water, which will typically have a low turbidity. The Profiler enables the company to analyze water quality data and determine the areas of low turbidity. Consequently, continuous monitoring helps to maintain the continuous provision of drinking water.

Xylem is able to deliver YSI profilers across a number of differing platforms, including buoy-mounted, pontoon-mounted or, in the case in the Queen Mother Reservoir a fixed-site solution. Furthermore, individual elements of these monitoring solution can be customised and tailored for each applications specific needs.

YSI Profilers are able to interface with any of YSI sondes, including the digital EXO monitoring platform and as such offer the opportunity to record a wide variety of water quality parameters.

The YSI Profilers can be configured quickly and easily with the help of the 'Profile Wizard' software and data management and export is achieved with 'ProFile Manager' software.

The multiparameter sonde is automatically lowered and raised throughout the water column by a non-corrosive mechanical winch and drive mechanism located above the water surface. Data can be stored on the sonde's internal data logger and transferred by any of the latest communication technologies.



A YSI buoy-mounted profiling system.



A YSI pontoon-mounted profiling system.



A YSI fixed-site profiling system.

**"We have always wanted [a profiler] because knowledge of water quality throughout the entire column helps to improve decisions on water abstraction."**



## WELL-TIMED MIXING IMPROVES QUALITY, REDUCES COSTS

The sondes in the Queen Mother Reservoir records Total Algae (combined Chlorophyll and Blue Green Algae sensor), dissolved oxygen, temperature, pH, conductivity, and turbidity. However, now with EXO's Total Algae probe installed, Thames Water can monitor phycocyanin, which is a good indicator of blue-green algae levels.

**“We have been looking for a way to continuously monitor the entire water column for nearly thirty years.”**

This will provide useful information to Terry Bridgman and his colleagues because, while storage improves the turbidity and microbiology of water, algal growth can have a serious deleterious effect on water quality.

At certain times, Thames Water is able to suppress algal growth with ‘active mixing’ within the reservoir by jets and aeration. Diatom algae levels peak in spring and autumn and should be detected by the chlorophyll sensor. The blue-green algae peak in mid to late summer, but do not have the impact on filtration that filamentous diatoms do. However, they can lead to a host of other issues including taste and odour problems, as well as the release of potential toxins.

Active mixing does not suppress diatoms, but does assist with the control of green and blue-green algae. This process consumes energy and thereby increases costs; therefore it is important that mixing is employed in a timely and efficient manner. YSI profiler data plays a key role in managing these systems.

In summary, Terry Bridgman says that he and his colleagues have been looking for a way to continuously monitor the entire water column for nearly thirty years and he is delighted that, at last, his search has come to an end.



A YSI EXO2 Water Quality sonde.  
Complete with Total Algae sensor.



YSI also offers site selection, instrument setup, and maintenance.



Preparing a floating water quality platform for installation.



Deploying an autonomous profiling platform at the Thames Water reservoir.



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Xylem Analytics UK manufactures environmental monitoring instruments and systems. Formerly known as YSI, the group is a market leader with a reputation for high levels of accuracy and reliability. The company's water quality measuring instruments are designed for both laboratory and field use. In addition to bench top and hand-held instruments, Xylem Analytics also builds monitoring systems and wireless networks that are able to operate in remote locations and challenging environments. The company's water quality monitoring sondes can be fitted with a wide variety of sensors including dissolved oxygen, PH, temperature, turbidity, conductivity, salinity, ORP, chlorophyll, open-channel flow, vented level, ammonia, chloride, rhodamine, depth photo synthetically active radiation.

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