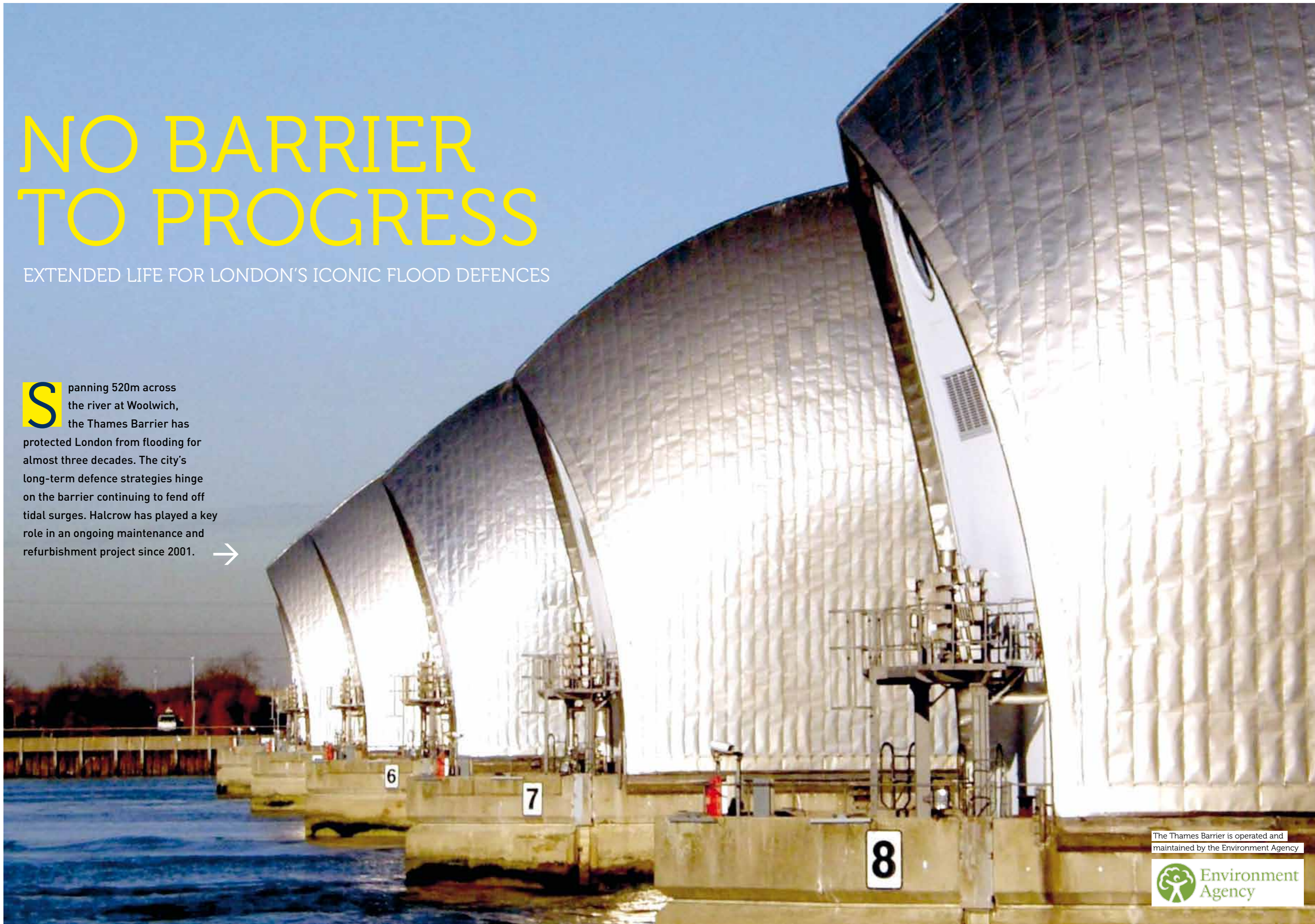


# NO BARRIER TO PROGRESS

EXTENDED LIFE FOR LONDON'S ICONIC FLOOD DEFENCES

**S**panning 520m across the river at Woolwich, the Thames Barrier has protected London from flooding for almost three decades. The city's long-term defence strategies hinge on the barrier continuing to fend off tidal surges. Halcrow has played a key role in an ongoing maintenance and refurbishment project since 2001. →



The Thames Barrier is operated and maintained by the Environment Agency





A 2m-wide trunnion being milled in the 1970s

Image courtesy of the Environment Agency

**HALCROW HAS PLAYED A KEY ROLE IN AN ONGOING MAINTENANCE AND REFURBISHMENT PROJECT SINCE 2001**

Stretching from its source in Thames Head, Gloucestershire, the Thames winds eastwards through London before emptying into the sea. The river has sustained human activity for thousands of years, but also poses the greatest threat to those living in its floodplains. Fourteen people drowned and thousands made homeless in 1928 when flood waters swamped the Thames Embankment. Then in 1953, a devastating tidal surge swept in from the North Sea. Water levels rose up to 3m higher than normal in some areas and 307 people lost their lives. Central London escaped unscathed, but the event set the ball rolling for a concerted debate on how to manage flood risk in the capital.

Construction of the Thames Barrier began in 1974 and the project was completed just under a decade later. It was called into action almost 40 times during the 1980s and 1990s. In 1997 MV Sand Kite – a dredging ship sailing in thick fog – crashed into one of the piers, dumping its 3,300-tonne load of aggregate as it sank. Swirling around in the rushing tides, the gravel scraped and damaged the gates' protective coating.

The Environment Agency is responsible for managing the barrier, and initially commissioned Halcrow in 2001 to inspect the structure and supervise necessary repairs to the damaged coating. As well as assessing changing structural loads, the team also carried out a series of trials to explore the scope for improvements, from



The closed barrier with the gates set in underspill position

### London's flood risk

Around 1.25 million people live or work below the average high-tide level. Flooding would have a disastrous impact on the capital, with potential damage costs estimated at £30 billion. Much of metropolitan London would be at risk of flooding without the Thames Barrier and associated flood defences. This includes:

- a 340km<sup>2</sup> area of land
- 500,000 properties
- £80 billion worth of assets
- 30 mainline and 68 Underground / Docklands Light Rail stations
- 400 schools and 16 hospitals

developments in cathodic protection to applying new coatings using crawler robots. This kicked off Halcrow's work to support the Environment Agency, which has continued over the ensuing decade. "Inspections served as the catalyst for a much broader assessment of the barrier's condition," said water Europe regional director Roland Grzybek. "With the structure approaching the midpoint of its 50-year design life, our role also expanded to help the Environment Agency extend this, from 2030 to 2100."

Following the four-year assessment and upgrade project, Halcrow was retained in 2008 to assist the Environment Agency as it undertook repairs on the main rising sector gate bearings. The barrier's four main gates, each 62m long and weighing 3,500 tonnes, rotate around a 2m-wide



Flooding in east London, 1953

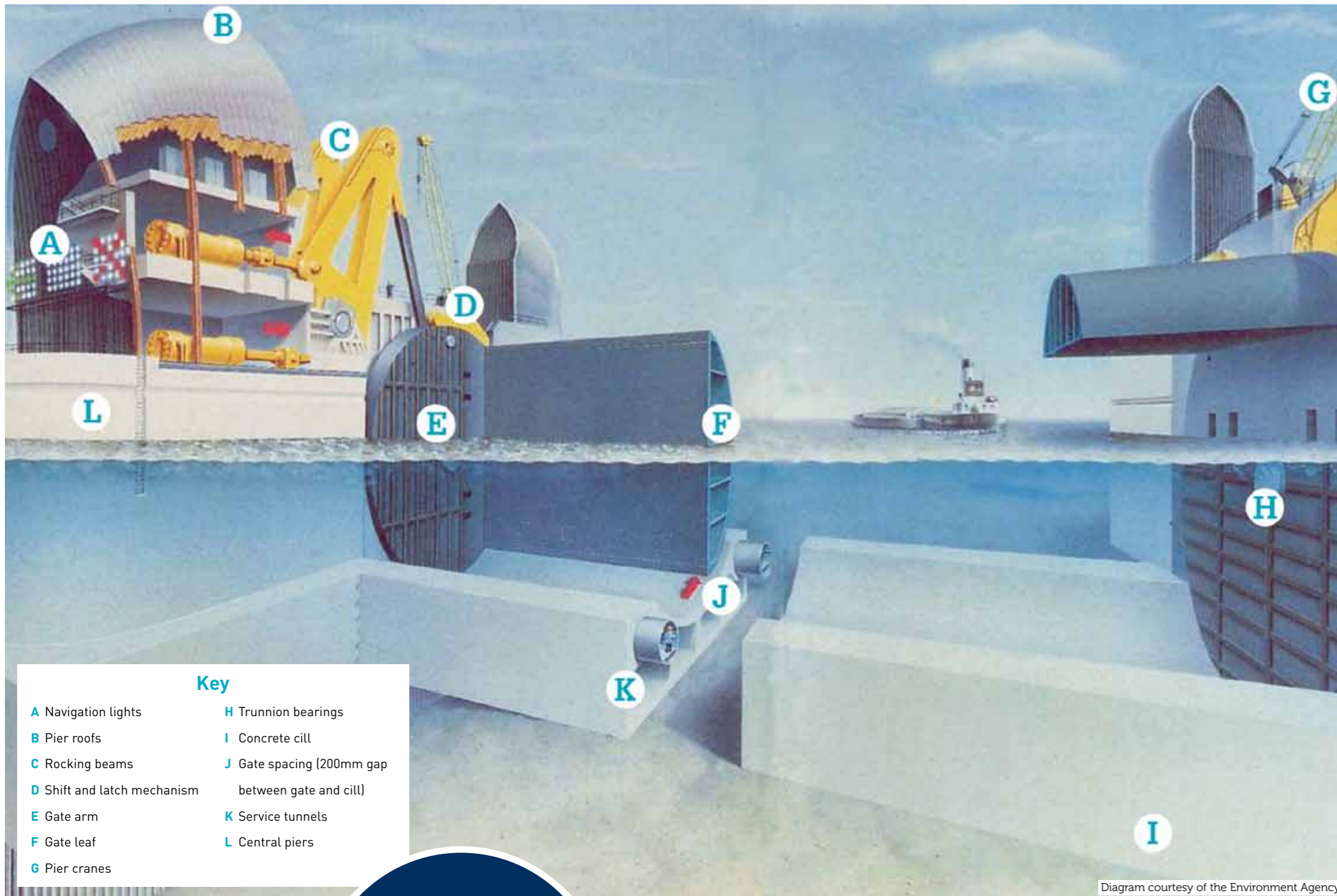


Diagram courtesy of the Environment Agency



The limpet dam (yellow structure) in place on the circular gate arm



Coating specialists assess the condition of the gates by rope access

**INSPECTIONS SERVED AS THE CATALYST FOR A MUCH BROADER ASSESSMENT OF THE BARRIER'S CONDITION**


bearing mounted on a steel cone, or trunnion. The trunnions are fixed to the river piers by three post-tensioned bar systems, each capable of taking the full load of the closed gates.

A specially developed limpet dam provided safe access to the bearings, which sit below the low-tide water level. "We found that some of the post-tensioned bars no longer met the performance requirements," said senior project manager Jon Holland. "We worked closely with the client and the contractor, VolkerStevin, to safely re-tension or replace these during

fixed possession times while the barrier remained operational."

As well as a full inspection and refurbishment of the barrier's components, the project team developed and installed a series of monitoring devices, including water and pressure sensors. Remote monitoring gives the Environment Agency a much clearer picture of the barrier's performance, in turn enabling a proactive, long-term approach to maintenance. Reducing the number of physical inspections required also brings considerable cost savings and slashes safety risks.

"This series of projects has proved highly successful," said Environment Agency technical specialist Edward Morris. "Extending the barrier's serviceable life pushes back the need for replacement defences, providing a sustainable, cost-effective approach to flood management for London."

In March 2011, the Thames Barrier trunnion and bearing refurbishment project won the heritage prize at the Institution of Civil Engineers London Civil Engineering Awards, reflecting the asset's past, present and future protection of the capital. 

### Inside the limpet dam

With work being undertaken below the low-tide mark, a specially designed limpet dam was used to allow the team access to the bearing for assessment and re-stressing. The structure is submerged against the gate arm and the water pumped from its body to provide dry working access.

The dam is equipped with ventilation, lighting and power, as well as mechanical handling equipment for the bearing cover plate and tensioning tools.