



Thames Barrier

Price
30p

The increased frequency in operations of the Thames Barrier has recently been adduced as evidence of global warming and cause for imminent concern. This overstates the position. Nonetheless the Barrier is extremely important and will not be sufficient for ever.

1953 Flood

The 31st January 1953 East Coast floods were rated the worst ever UK peace time disaster. 307 people and 46,000 livestock died; 100,000 hectares (ha) and 24,000 houses were flooded and 32,000 householders had to be evacuated. Flooding occurred along the English coastline from the Humber Estuary to Deal in Kent. The whole of Canvey Island, where 58 lives were lost, was under water. An additional 100 lives were lost at sea and in the Netherlands 50 dykes were breached, 1835 people lost their lives and the sea reclaimed 200,000 ha of polder. A train, 500 metres out of Hunstanton en route to Kings Lynn, "collided with a bungalow floating towards it on the crest of a wave". 4000 ha of farmland were still flooded at the end of February and agricultural production took 5 years to recover from the salty dousing. The cost of damage and disruption in the UK was estimated at some £5bn at today's prices.

The primary cause was a slow moving deep depression which drifted from the Shetlands to a centre over the North Sea. Consequent high winds, recorded at hurricane force at Felixstowe, blew from the north which 'pushed' the sea level up as it was funnelled towards the narrowing gap and shallow water between Kent and the Continent.

The storm coincided with one of the 'spring' tides which

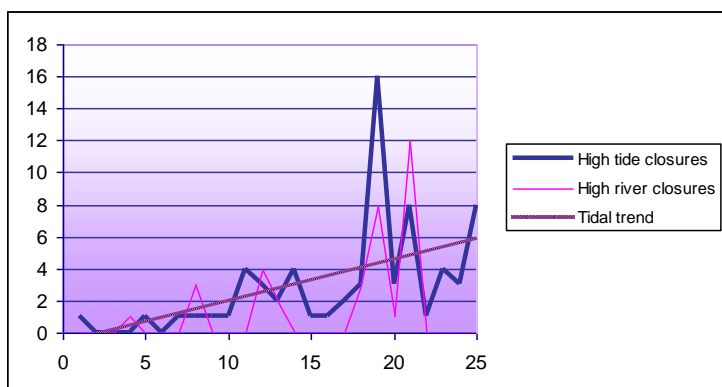
occur twice a month according to the Moon's position, whilst the sea was already around a half metre higher than usual due to the low atmospheric pressure (968 mbar) over the area. (Varying atmospheric pressure over the sea is like a person pressing down at certain points on a water bed.) The total lift or 'surge' in sea level was 2.74 metres above normal at Southend, 2.97 metres at Kings Lynn, and even higher in the Netherlands.

The disaster was worse than should occur today. The UK was recovering from the 2nd World War and flood defence had not attracted priority. Standards of the flood defences varied. Warning systems were poor. Indeed, so many telephone lines failed authorities in the first hit counties could not warn those further south. Flood forecasting was in its infancy. Computers were rare and none employed.

The 1953 floods were estimated to represent an event unlikely to arise more often than once in 250 years but improvements followed. A severe storm in 1978 cost only one life. Coastal flood protection is now the responsibility of a better prepared Environment Agency.



Thames Barrier, gates being raised during monthly tests



Thames Barrier Annual Closures

Years since 1982/3. Data from Environment Agency

The Thames Barrier

Of course it is one thing to build flood defences along the coast but rivers represent 'open doors' to land within and the 1953 flood exposed the vulnerability of property and people living well inland, especially in the tidal Thames. There are historical records of extreme flooding of the Thames: in 43, 1099, 1236, 1565 and 1663 AD, the last recorded by Pepys. Furthermore it was known that peak tide levels had been rising. At the start of the Roman occupation the Thames was not tidal above London Bridge. Records of exceptional

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This briefing note has been written by Richard Balmer and the opinions expressed are his own. It should be technically accurate but if you see errors or have comments, please contact him at richardbalmer162@btinternet.com

tides between 1791 and 1953 however showed a steady increase in height totalling 1.4 metres at London Bridge. Between 1934 and 1966 the rate was 0.77 metres/century at Tower Bridge. This was not primarily due to a rise in global sea levels, but because the UK has been tilting downwards towards the SE at about 0.2 metres/century, and the tidal range was increasing in the estuary due to the development of land and the constraining of the river making it more of a channel.

In the late 19th century regulations were introduced to require riparian owners to maintain their flood defence banks at statutory heights. In 1930, following another extreme event in 1928 which caused flooding in Battersea, Poplar, Greenwich, the Temple station and the Tate Gallery, flooded householders in Westminster and, worst of all, caused 14 deaths and made 4000 homeless near Lambeth Bridge, these were revised and, in fact, saved London itself from the 1953 floods.

It was the disaster of 1953 however which concentrated minds, aided by a high flood in 1965 which lapped uncomfortably close to some of London's riverside parapets. A report to the Ministry of Housing and Local Government in 1966 argued that though proper warning systems could minimise loss of life, the cost of disruption to businesses (which would lose months of productive time through damage and loss of utilities) as well as households, plus the cost of repairs, would be so great as to be unacceptable. It took only 6 years to decide on the best mode of defence (a barrier) and location, Woolwich Reach, 14 km downstream of London Bridge (the Thames narrows considerably upstream of Woolwich so the surge height there would be higher) and obtain authority (The Thames Barrier Act 1972). The Barrier (plus 8 smaller ones down river) became operational 10 years later.

The engineering details can be found in Reference 1 but the key facts are that the barrier gates lie flat, level with the river bed, when not required so navigation is not affected; that any one of 3 independent sources of electrical power can raise the gates in 60 minutes when needed; and that the gates will protect London from tidal surges up to 4.5 metres higher than anything ever recorded before. The barrier can operate as a 'sluice' with some water passing under the gate reducing the flow rather than stopping it completely and the barrier will still protect London even if one gate fails.

The Thames is tidal as far upstream as Teddington and the Barrier actually serves 2 purposes. First and most obviously it prevents surge tides coming up the river to flood London. Second it is raised when the Thames itself is in flood to prevent the incoming high tide 'backing up' the river coming downstream and flooding land back to Teddington. The Barrier operates only between September and April. As the

chart shows, in the 25 winters after 1982/83 it closed 69 times against high tides (blue line) and 34 times for high river levels (pink line). It operates once a month for maintenance.

Global Warming

The Barrier was commissioned before global warming was recognised. Global warming will raise sea levels and the maximum strength of storm winds. Its impact so far is negligible though, in the longer term, it will render the Barrier inadequate earlier than expected. Currently the Barrier is operating as planned with an average of some 30 closures a year expected in 2030 compared to about 6 for high tide and 3 for high river now.

The future

The co-incidence of spring tide, very strong winds in exactly the right direction, exceptionally low atmospheric pressures and heavy rainfall giving rise to high river levels in the Thames itself, represent rare occurrences. With far more 'real time' measuring points (including sea levels at oil rigs in the North Sea) and modern computing power, forecasting accuracy is greatly improved over 1953. It is also easier to put statistical probabilities to the protection afforded. Currently the Barrier should protect London against a surge of such severity it should only occur once in 2000 years. By 2030 AD the protection will have reduced to once in 1000 years. Though nothing can be guaranteed absolutely (including no human errors), it is extremely unlikely the Barrier will be found inadequate within the lifetimes of children born today.

Nonetheless, the Environment Agency continues to study the problem. Their Thames Estuary 2100 project has concluded that a new barrier could be needed at Long Reach near Dartford after 2070. Other sites, including one at the entrance to the estuary itself, have been discounted on cost and other grounds. In addition the Agency wants to designate some flood 'spill' areas downstream of the Barrier. Water surging up the Thames would be allowed to overtop special lengths of flood defence banks into these areas reducing the volume surging upstream. The Agency is also keen to ensure local authorities divert developments from vulnerable land. Work is now beginning to get all relevant parties (farmers, developers, local councils) to *agree* which areas are to be set aside for flooding and left for low value uses such as pasture, sports pitches, camp sites, wild life reserves and so on, because it will be in the teeth of immense pressure for housing and other development in the Thames Gateway area.

As the 1953 loss of life and damage showed however, flooding, though rare, must never be treated lightly. The sooner lines are drawn on maps and fixed by legislation, the better. Global warming increases the urgency a little.