

To be accompanied by the slide presentation at www.metrotidal.com/thamesorbital

TAMING THE TIDES FOR GREEN-GROWTH ACROSS THE THAMES ESTUARY

For the economic benefits of the Thames Estuary growth corridor to be realised, it is widely recognised that the conurbations of North Kent and South Essex need to be connected. At the same time, climate change and rising sea levels are threatening to divide them, with over 110sq.km of the lower estuary exposed to flood risk. If considered as separate infrastructure projects, improving connectivity and reducing flood risk are very costly. A single system of integrated infrastructure would save substantial costs, reduce the risks and increase the economic benefits.

London is fortunate in that the tidal range at Tower Pier is over 7m, so London is 3.5m above mean sea level, higher than Shanghai and much of New York, and not immediately at risk, if the tides can be tamed. The Thames Estuary acts as a funnel, causing the tides to rise upstream. From Southend Pier to Tower Pier they double in height. A barrier upstream across the tideway would be shorter but requires sea walls along the estuary that become higher and longer. A barrier at Long Reach, just upstream from the Dartford Crossing, requires a 106km flood defence system, while a barrier between Southend and Allhallows across the Lower Thames Estuary is just 8km long and faces lower tides. Should sea levels rise faster than currently projected the problem would be solved by raising 8km rather than 106km of flood datum, from a lower level.

The Metrotidal Thames Orbital integrates the next generation of London's flood defences with a Crossrail orbital and a floating solar array, to provide substantial green-growth across the Lower Thames Estuary with no increase in carbon audit. The TE2200 flood defences through the 22nd century aim to provide a robust system for lower cost and environmental impact and for longer duration than the current TE2100 proposals. The green-growth is achieved through the generation of renewable energy for the 100,000 new homes already planned around the estuary, along with improved rail connectivity and efficient data storage.

The integrated infrastructure consists of an open-throttle, formed by extending sea walls across Sea Reach, which reduces the tidal range upstream in the event of a storm surge, thereby providing London and all areas downstream to the throttle with flood defences through the 21st century, while leaving the tideway open for navigation to all existing wharves and docks. The system can then become a full barrier, when required in the 22nd century, with the 8km flood datum raised as necessary to meet the rising sea levels.

A tunnel formed within the flood barrier sea walls links the eastern limbs of Crossrail to complete a twin-track rail orbital of the Lower Thames Estuary from Central London. The estuary rail orbital with a 4sq.km floating solar array, cycle superhighway and promenade, including wayleaves for data storage, distribution and utilities, provides sustainable connectivity for over a million households, generating green-growth across the Lower Thames Estuary into Essex and Kent. Just 12km of new railway line creates a 132km Crossrail orbital of the Thames Estuary from Central London. The prow of this estuary orbital at Southend is as far East of Westminster as the terminal of Crossrail in Reading is to the West.

Construction undertaken in the tideway makes use of a rail head from concrete batching and casting facilities at an aggregates wharf nearby on the Isle of Grain. Spoil from the tunnel excavations is reused locally for embankments and flood bunds, enabling the embodied energy of construction and the environmental impacts to be kept to a minimum. The sea walls protect the estuary from tidal squeeze, preventing the loss of over 800 hectares of saltmarsh and intertidal habitat, thereby postponing the need for managed retreat on the Isle of Grain.