

Metrotidal Lower Thames Pool – a vision

Mark Willingale presents a vision for a carbon neutral infrastructure project in the Thames Estuary

The Metrotidal Lower Thames Pool is a system of integrated infrastructure that provides London’s next generation of flood defences while generating substantial growth across the Lower Thames Estuary into Essex, Kent and Central London.

The integrated infrastructure provides economic growth without an associated increase in carbon audit. This green-growth is achieved through the generation of sustainable, zero-carbon energy for over 200,000 homes with improved rail connectivity, data storage and distribution for over one million households.

The Metrotidal Lower Thames Pool integrates the following infrastructure to reduce the planning and construction costs and increase the agglomeration benefits:

- 1 the next generation of London’s flood defences
- 2 sustainable, zero-carbon energy generation
- 3 rail orbitals for the Lower Thames Estuary, Essex and Kent
- 4 Central London Estuary Express Services via Ebbsfleet and Southend Central
- 5 efficient data storage and distribution for the Lower Thames Estuary and beyond
- 6 a new rail freight connection under the Lower Thames Estuary
- 7 new utility connections across the Lower Thames Estuary
- 8 ancillary sustainable residential and commercial development

General arrangements: the pool, throttle, tunnel and rail orbital

The integrated infrastructure consists of an impounded flood-storage pool and tideway throttle on Sea Reach, which

in the event of a storm surge-tide reduces the tidal range upstream by over one meter, thereby providing London and all areas downstream to Sea Reach with sea-flood defences well into the 21st century, while leaving the tideway open for navigation to all existing wharves and docks including the Port of Tilbury and the London Gateway Port.

The impounded pool operates during normal tides as a tidal and floating-solar power plant that generates sustainable energy on regular astronomical cycles. The pool and impoundments reduce the cost of a rail tunnel under the Lower Thames Estuary that links the recently upgraded Shenfield-Southend Victoria Line with a dualled Isle of Grain Line to complete a twin-track rail orbital of the Lower Thames Estuary between the eastern limbs of Crossrail at Shenfield and Gravesend. The new rail orbital services with wayleaves for data storage, distribution and utilities, improve the connectivity between over a million households generating substantial economic agglomeration benefits across the Lower Thames Estuary into Essex and Kent.

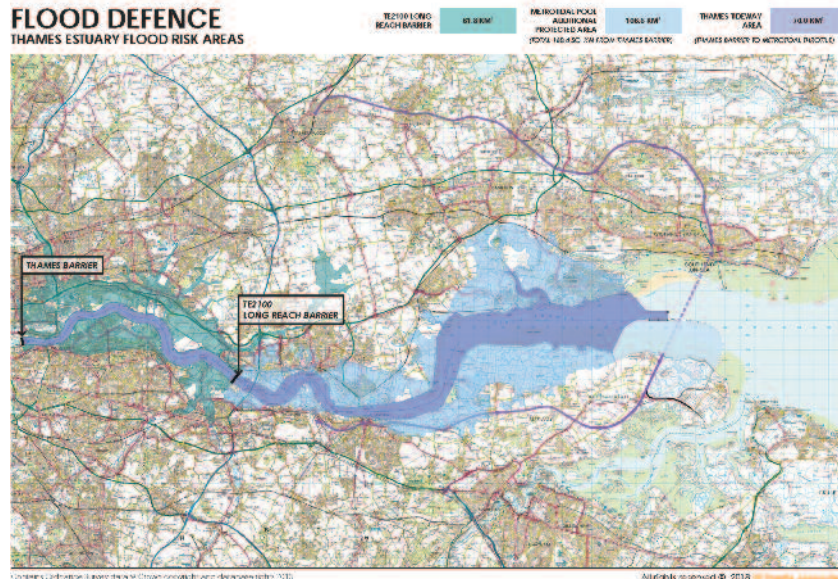
1 London’s flood defences

The impounded pool and throttle configuration is designed to protect all flood risk areas upstream from a storm surge tide. The current Thames Estuary 2100 (TE100) proposals consider a Long Reach Barrier just upstream from the Dartford Crossing to protect an additional 61.8sq.km of metropolitan flood risk land than the existing Thames Barrier system. The Metrotidal Lower Thames Pool protects an additional 168.4sq.km of flood risk land, 106.6sq.km more than the area of a Long Reach Barrier, while leaving the tideway open for navigation. The substantial reduction

in flood risk enables the Government’s Flood Re agreement to be renegotiated to reduce flood-risk insurance premia and release a large area of land for safe redevelopment well into the next century.

2 Sustainable energy generation

The tidal mill at Thorington in Essex was built in 1831 to generate energy from a one-hectare pool with a tidal range of less than 2m, applying cast iron, oak and apple-wood water-wheel technology to the ebb tides only. The Metrotidal Lower Thames Pool applies modern

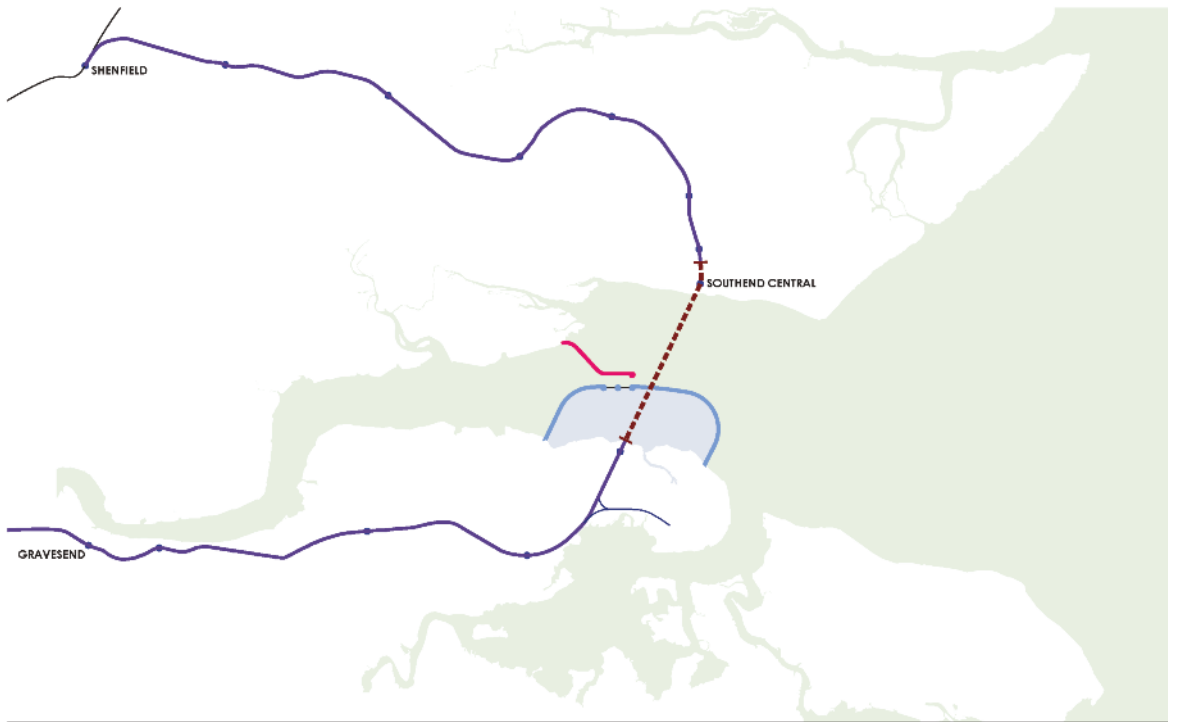


Mark Willingale is director of Willingale Associates

GENERAL ARRANGEMENTS

THROTTLE, POOL, TUNNEL AND RAIL ORBITAL

THROTTLE — POOL — TUNNEL - - - ORBITAL —



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turbine technology to an impounded pool of some 1650 hectares with an average tidal range of 4m to generate energy from ebb and flood tides equivalent to the output of 26,400 Thorringtons. The 1650 hectares of sheltered estuary within the impoundment accommodates 500 hectares of floating solar arrays over existing sub-tidal areas and up to 1,000 hectares subject to modest dredging of intertidal areas within the pool.

The solar energy is generated on a regular daily cycle with an annual output assessed from the precedents set by the Malmaynes Hall Solar Farm on the Hoo Peninsula, only some 4km from the pool, and by the projected annual output of the 360-hectare Cleve Hill Solar Park nearby in North Kent.

The natural tidal range is sustained within the pool to maintain the existing shoreline and the floating solar arrays prevent solar-gain from overheating of the impounded pool water. The combined tidal and solar power generation is sufficient to meet the energy demands of the new rail connectivity including the tunnel M+E systems, the data storage and distribution system and the demands of 200,000 homes. With modest dredging of the pool this may be increased to 300,000 homes.

3 Lower Thames and Crossrail orbitals

The pool and impoundments reduce the cost of the rail tunnel required to complete an orbital service between Shenfield in Essex and Gravesend in Kent with a connection at Southend Central to the C2C Services and new stations at Allhallows, Kingsnorth, Cliffe and Hoo Junction.

This can start as an independent service using the same specification of rolling stock and the same sidings at Hoo Junction as the projected extension of Crossrail from Abbey Wood to Gravesend. In due course the services can be merged to provide a Crossrail Orbital of the Lower Thames Estuary from Central London accompanied by an Essex-Kent Orbital service between Tonbridge and Shenfield formed by extending the Medway Valley Line from Strood through the tunnel to Shenfield. The Essex-Kent Orbital extends agglomeration benefits across the South East Local Enterprise Partnership (SELEP) region.

RAIL CONNECTIVITY

CENTRAL LONDON ESTUARY EXPRESS



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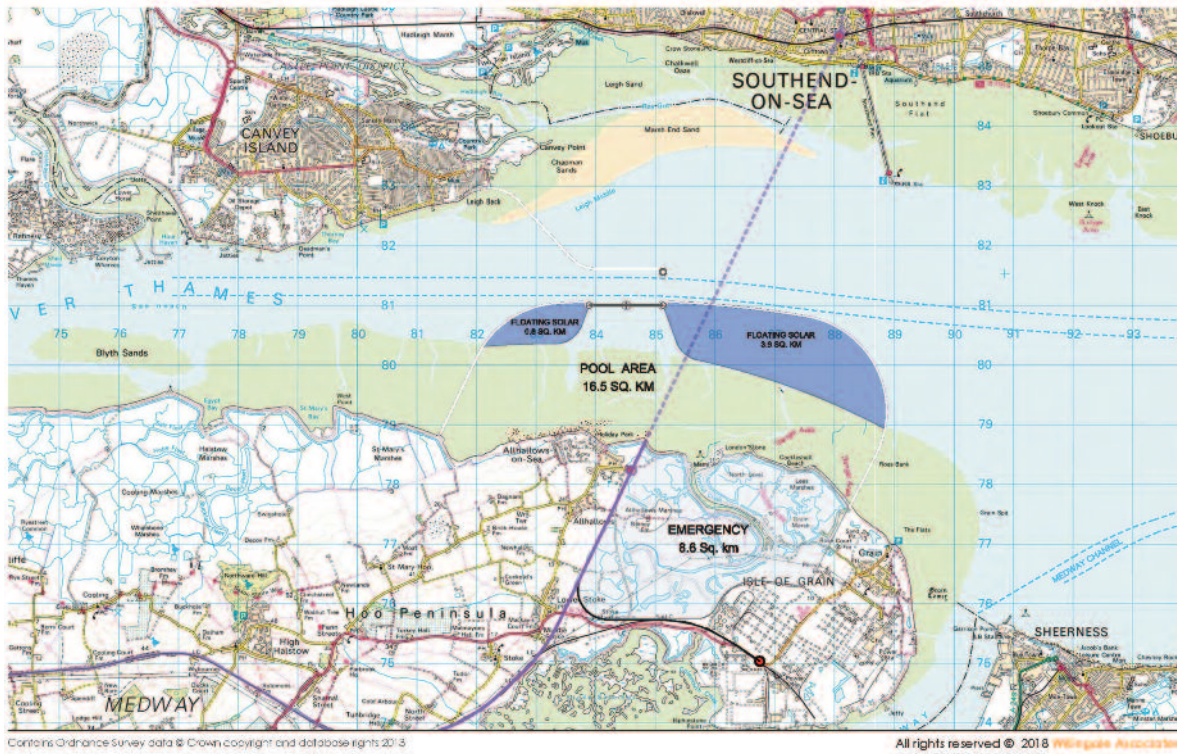
4 Central London estuary express services

Once the Lower Thames Orbital is merged with Crossrail services and accompanied by an all-stops Essex-Kent Orbital the Crossrail services need only stop at Wickford, Southend Airport, Southend Central and Ebbsfleet to provide a Crossrail Orbital Express for the Lower Thames Estuary. The merging of services to form the Crossrail Orbital Express allows the rail depot and terminus at Southend Victoria to be designated for redevelopment. A connection to HS1 at Ebbsfleet provides a high-speed Javelin service between St. Pancras International and Southend Airport with stops at Stratford, Ebbsfleet and Southend Central providing an overall journey time between West London and Southend Airport of 34 minutes.

The combination of the Crossrail Orbital Express, Essex- >>>

SUSTAINABLE ENERGY

METROTIDAL LOWER THAMES POOL – TIDAL & SOLAR FOR OVER 200,000 HOMES



>>> Kent Orbital and Central London Estuary Express services unites the conurbations of Southend in Essex and the Medway Towns in Kent to provide agglomeration benefits across the Lower Thames Estuary into Essex, Kent and Central London over an area with a larger population than Greater Manchester.

5 Data storage and distribution

A location beside the pool is ideal for a substantial new, energy-efficient Tier 4 data storage and distribution centre: -

- the tidal and solar energy generated from the pool along with local wind power from the London Array provides a resilient and diverse stream of local, zero-carbon energy backed up by the National Grid

- the uniformly cool temperatures of sea water pumped from the tidal power plant provide efficient datacentre cooling loads throughout the year
- the wayleaves of the new rail connectivity, data storage and distribution centre extend across the Lower Thames Estuary into Essex, Kent and Central London to serve a region with over 2 million residents and associated businesses.

6 Rail freight

A new rail chord to the Great Eastern Mainline at Shenfield opens night freight services between the ports at Felixstowe, Harwich and Thamesport on the eastern seaboard of England that bypass congested routes into Central London. The new chord also completes a new link between Chelmsford and Maidstone, the principal towns of Essex, Kent and the South East Local Enterprise Partnership (SELEP).

7 Utility connections

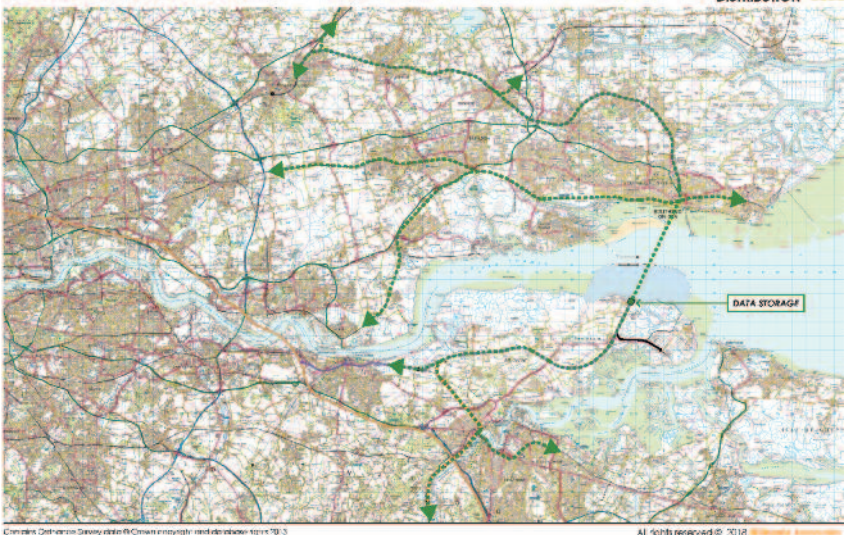
The rail tunnel provides new utility wayleaves between Essex and Kent that improve the management, resilience and distribution of electricity, gas, mains water and telecommunications.

8 Ancillary development

The integrated infrastructure of the Metrotidal Lower Thames Pool stimulates and supports sustainable ancillary development for over 200,000 homes and associated businesses across the Lower Thames Estuary into Essex and Kent by providing: -

- the additional 168.4sq.km area of land protected from surge-tide flood risk

DATA STORAGE AND UTILITIES



SUSTAINABLE DEVELOPMENT RESIDENTIAL GROWTH ZONES FOR UP TO 200,000 HOMES



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SUSTAINABLE DEVELOPMENT COMMERCIAL GROWTH ZONES



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- the reduced insurance premia for development of this land
- the improved connectivity of the rail orbital services
- the zero-carbon energy, data storage, distribution and utilities required for the new homes and businesses

The new sustainable development is focused around existing and proposed railway stations including the locations of the Stoke Harbour Masterplan by Shelter for accommodating up to

150,000 people on the Hoo Peninsula, the Ebbsfleet Garden City Masterplan, Peters Village on the Medway and other substantial residential development sites. The new rail orbitals also serve significant commercial growth zones at Southend Airport, Southend Victoria, the Isle of Grain, Kingsnorth and Hoo Junction with a combined development area of some 6.9sq.km.