METROTIDAL TUNNEL AND THAMES REACH AIRPORT

EAST CONFIGURATION (REV.A) **MAY 2014**

CONTENTS

1 INTRODUCTION

The East Configuration for the airfield is described with reference to the April 2014 Transport Connections text, associated surface access diagrams including the Isle of Grain Connections May 2014 map and to the two long runway configuration described by the following East Configuration May 2014 drawings:-

- Airport, East Configuration May 2014
- Airfield Footprint, East Configuration May 2014
- Airfield Tundra, East Configuration May 2014
- Crossrail Plus Orbital, East Configuration May 2014
- Dedicated Local Surface Access, East Configuration May 2014
- Bird Strike Protection Zone, East Configuration May 2014

2 SURFACE CONNECTIONS

The wider surface access connections are those described by the Transport Connections April 2014 text and associated surface access diagrams. The immediate connections on the Hoo Peninsula consist of rail and road chords from the southern approach to the Metrotidal Canvey-Hoo Tunnel on the route that passes to the west of Northward Hill. For the East Configuration of the airfield the chords merge to run on the axis of the airfield, serving passenger terminal, cargo and maintenance areas at each end these being separated by 12No. infield satellites.

Crossrail Plus services stop at the first passenger terminal area (PTA), then the far PTA and administration area (AA) before returning to the first PTA on platforms opposite those of arrivals, thereafter re-joining the rail orbital. In this way airport passengers and employees who have missed their stop can re-circulate on the next train, or those preferring to bypass the airport can shorten their journey around the orbital, by changing trains at the first stop. Subject to the relative demand and

frequency of the Crossrail Plus orbital and airport services some Crossrail Plus trains may in any event bypass the airport spur.

To save time the TRAX services and other predominantly airport passenger services would stop only at the two PTAs, the first on arrival, then the far PTA and again at the first PTA on the return journey.

A rail and road link is also provided between the Isle of Grain Line near Lower Stoke and the airport axis with chords at both ends in each direction, to link the cargo, maintenance and administration areas of the airport with the industrial and port areas on the Isle of Grain. This link provides operational and maintenance staff access, a manufacturing and logistics freight link and emergency access in the event of an accident affecting the main umbilical.

Accordingly the only dedicated surface access provided for the airport on the Hoo Peninsula are the chords and axis of the spur from the southern approach of Metrotidal Tunnel into the airport and the link from the Isle of Grain Line, with the cost of the latter shared by Thamesport and the other industrial operators on the Isle of Grain.

On night surface access the Thames Reach Airport July 2013 text notes under section 3.7:-

> The surface access during night hours for Thames Reach Airport would be led by express rail services on HS1 to and from Central London and some air-rail substitution on HS1 with improved noise protection for households affected along the line. Night-buses, taxicabs and private transport would provide a higher proportion of the direct surface access to and from the airport through the night hours when the roads are not congested. Similarly night-buses, taxicabs and private cars will conclude night-time journeys to and from the Central London termini. In this way Thames Reach Airport can provide a 24-hour service with the market free to decide how to make use of the additional runway capacity.

In summary apart from services on HS1 to Ebbsfleet International, Stratford International and St. Pancras International through the night hours, with noise on this route already well attenuated by the

tunnels and other measures, there is little requirement for other public transport to provide the surface access except for the provision of airport night buses and coaches that will benefit from the relatively uncongested road network through the night hours.

3 AIRPORT FACILITIES

Set out below is an outline of the infrastructure on and beside the airfield of the Thames Reach Airport Two Long Runway East Configuration May 2014:-

On the Airfield:-

- airfield 2,070m wide x 7,600m long; area 15.73sq.km
- airfield centred on OS gridlines 79 and 84, at mean sea level over the central area of satellites, rising from the passenger terminal areas to 8m datum at the ends
- 8m datum perimeter flood bund
- infield 990m wide x 7,600m long; area 7.52sq.km
- runway separation centreline to centreline 1,710m
- each 7,600m long runway consists of two in-line 3,420m runways separated by 760m
- rapid exit taxiways (RETs) at 1,520m, 1,900m, 2,280m and 2,660m
- 2No. passenger terminal areas (PTAs: 2 x 810 x 570m) accommodating dual, symmetrical north and south terminals each with a capacity for 50mppa providing an overall capacity of 200mppa
- axial rail and road access umbilical with 12No. satellites spaced at 380m centres between the PTAs separated by 4.94km
- 2No. PTA multi-level stations with freight passing on the lowest level flanked by car parking, passenger platforms on an intermediate level flanked by highways access and with the axial airport transit platforms on the upper level, just below the airfield pavement
- 8No. axial airport transit stops, one for each PTA and at 760m intervals between them 6No.transit stops each serving a pair of satellites. The furthest passenger transit stop centre-

to-centre is 2.28km from a PTA. The longest walk to reach a satellite is some 160m (190m separation of satellites plus half the length of the transit train say 200m, less half the width of the satellite say 60m, and with assistance from a 100m travellator, one in each direction discharging into the sides of the adjoining satellites.)

- 12No. satellites separated by 380m, each 990m long accommodate either 22No. gates, (11No. x 90m wide stands each side), or 24No. gates serving 12No. 90m wide stands at the middle of the satellite, six each side close to the axial transit platforms, and 12No. 75m wide stands, arranged six each side at the ends of the satellite. The two long sides of the PTAs have the same capacity as a single satellite and in addition there are 6No.90m wide stands on each flank of each PTA. As a result there are 27.9km of airside frontage that accommodates either 310No. gates all 90m wide or 336No. gates of which 180No. are 90m wide and 156No. 75m wide. The distribution of the 90m stands at the middle of the satellites and 75m stands at the ends helps to reduce the average walking distance within the satellite. With a satellite length of 990m, transit station width of say 30m, the end gates 75m wide and assistance provided by 240m travellators in each wing the furthest walk within the satellite to a gate is also around 160m.
- employee circulation and linked airport baggage handling systems pass under the ends of the satellites to the PTA and Cargo + Maintenance areas
- central control tower
- 4No. cargo and maintenance areas (405 x 780) with a total frontage for aircraft maintenance on the north and south sides of 3.12km (4 x 780)

Beside the Airfield:-

- administration areas (A) including hotels (2 x 710 x 300), each side of the transport link to the south side of the airfield, on a platform levelled to 8m datum beside the Hoo hillside, within the bird strike protection zone
- reservoir (R) 0.2sq.km between the southwest corner of the airfield and the Hoo hillside, within the elliptical bird strike protection zone,

- water treatment works (T) 0.2sq.km beside the southeast corner of the airfield, on the Isle of Grain within the elliptical bird strike protection zone
- fuel depot beside the Thamesport and/or the Oikos site on Canvey Island by Hole Haven (not shown on drawings)
- park-and-ride car parks beside Crossrail Plus stations (not shown on drawings)
- manufacturing and logistics facilities; occupying 30.8sq.km of existing, local commercial and industrial development sites as listed in the July 2013 submissions

4 CAPACITY

Extract from the April 2014 Transport Connections text:-

Set out below are the current facilities and capacity of Heathrow (LHR2) compared with those of three hub options being considered by the Airports Commission:-

- a third runway at Heathrow (LHR3),
- Heathrow Hub 2 long-runway configuration (HH-2LR),
- Thames Reach Airport 2-long-runway configuration (TRA-2LR)),

The figures are based on the following assumptions:-

- all options are assumed to operate for 9hours at peak capacity and 9 hours at 75% peak when approaching their comfortably manageable peak capacity
- Thames Reach Airport can operate 24-hours, which is assumed to add another 6 hours at 40% capacity, equivalent to a 15% uplift in capacity, this mostly for long-haul, charter, freight and other night flights, which can be wholly accommodated on one long runway allowing the other to close for maintenance, the closed runway alternating each day
- Air-rail substitution of 5mppa at Heathrow and 20 – 25mppa for TRA
- Maximum load factor of 175, with a lower option of 150 illustrated for TRA

	LHR2	LHR3	HH-2LR	TRA-2LR
'000 s ATM's pa	480	740	920	1060
Peak ATM's per hour	90	128	160	160
Stands	174	248	310	310 to 336
Load factor	175	175	175	150 (175)
Mppa	85	130	160	160 (185)
Air-rail substitution	5	5	5	20 (20)
Total Mppa	90	135	165	180 (205)

For Heathrow, with 740,000 ATM's on three runways generating 130mppa, the assumed load factor of just over 175 is high and demonstrates the airport will again be squeezing out short haul flights as it approaches a capacity of only 130mppa. 700,000 ATM's is quoted as the more likely operational frequency, which then reduces capacity to 123mppa, still on a load factor of just over 175. This capacity may well be further reduced by the recent reduction in width of the third runway infield.

5 MINIMUM CONNECTION TIMES, ENERGY CONSUMPTION AND CARBON AUDIT

Set out below are some factors that will enable Thames Reach Airport to achieve exceptionally low transfer and transit times, energy consumption and carbon audit per passenger, enabling it to draw in passengers from a larger catchment area:-

Construction:-

- low embodied energy and carbon audit for construction
- solar, tidal and wind power for the airport mechanical and electrical systems
- a heat sink provided by the sea for smoothing winter and summer HVAC demands

Land-side transport:-

- sustainable surface access led by rail, for passengers and employees
- direct access to HS1 and the East Coast Main Line
- frequent Crossrail Plus services

- single, compact infield arrangement for the airport facilities
- single, axial airport transit system
- low energy consumption of the surface access, offset by wind and tidal power
- low energy consumption of the airport transfer and transit, offset by wind and tidal power
- a tidal pumped-storage system serving peak and prevailing demands

Air-side transport:-

- minimum aircraft taxiing distances, to save fuel and time
- no queuing for take-off and no stacking to land
- relatively flexible Noise Preferential Routes (NPRs) for departures

The new-build system will be purpose-designed to provide minimum connection times some 20-minutes lower on average than those that may be achieved by a fully-enhanced configuration of Heathrow. Similarly the new-build system will be purpose-designed to provide a much lower energy consumption and carbon audit than can be achieved by a fully-enhanced Heathrow.

6 HUB MANAGEMENT SYSTEM

With prevailing winds from the southwest planes will normally approach from the east across the estuary and depart to the west, this being reversed for days when strong winds are from the east. For the first phase of the airport the planes use two conventional widely-spaced runways taxiing into and back out from the infield stands on the satellites and PTAs as required. The runways are not offset so there is some taxing-time inefficiency in the first-phase system. For later phases planes can either arrive and depart on the same pair of in-line runways, without crossing the infield, or pass between runways across the infield. A hub management system (HMS) allocates gates to minimise the taxiing distance to and from the runways. With the long runways planes do not need to taxi across the infield but can head directly to take-off from the same long runway. As a result there are fewer benefits from offsetting the long runways and this has been dropped from the current two long-runway configuration to reduce the platform and runway construction costs. The HMS will allocate aircraft to stands to provide minimum transfer times train-to-plane and minimum transit times plane-to-plane. The stands are arranged so that larger aircraft have gates close to the axial transit system, where their longer dwell on the stands will not impede smaller aircraft using the 75m stands at the ends of the satellites.

Maximum transit distance from PTA to satellite is 2.88km and the furthest walk, after assistance from travellators is 160m from transit stop to satellite and 160m within the satellite. To make efficient use of the system passengers can check-in their baggage on the Crossrail Plus and TRAX trains, and are advised by mobile app on their way to the airport of PTA where they should alight and then informed in the PTA of the satellite and gate for their departure. In this way the HMS directs both planes and passengers to the most efficient gate. With the PTAs and satellites all within a single infield served by just 8No. transit stops, the train-to-plane transfer times will be over twenty minutes shorter on average than those for a fully-enhanced Heathrow, still served by a distant rail hub and where Terminal 4 will still be off to one side. Crossrail trains are already being designed to carry luggage for Heathrow, so their adaptation for the Crossrail Plus check-in should be straightforward.

There is still a case for investigating the alternative infield arrangement with the two passenger terminal areas arranged back-to-back at the centre of the infield, where they can both be served by the same station. All passengers would then alight at this central station where they would then be directed to their terminal, satellite and gate. A mobile app or similar advance directions are required to realise the advantages of the passenger terminals located at the ends of the infield, separate by the regular array of satellite gills.

7 AIRFIELD CONSTRUCTION

Section 3.9 of the Thames Reach Airport July 2013 text provided a description of the airfield being raised on a platform (pp17-18) constructed to 8m datum above mean sea level. On the basis that Schiphol already sets a precedent for an airfield some 3.9m below sea level the proposals have been revised to provide adequate flood protection around and drainage within the perimeter of an airfield constructed at mean sea level. Accordingly the airfield and its proposed construction are designed to:-

- minimise the airfield area to reduce costs and impacts
- maximise the efficiency in terms of MPPA per sq.km; see the capacity section below

- minimise the impact on habitats, heritage, housing, landscape character, environment and existing infrastructure
- minimise the bird strike protection zone
- minimise the volume of material required including volume brought from off site
- minimise the movement of materials to form the airfield and flood bunds
- minimise the embodied energy of construction
- minimise the carbon audit for construction by using tidal power to excavate, convey and pump the materials as required
- maximise the percentage of material sourced from within the pool impoundments and from the adjoining Hoo shore

The volume of material required for the airport platform is reduced by the following points:-

- the Metrotidal pool impoundment is costed separately and does not form part of the airport agenda
- the Metrotidal pool impoundment precedes construction of the cut-and-cover and immersed-tube tunnels so that spoil from Metrotidal Tunnel can be used for forming the airport perimeter impoundments
- most of the airfield within the Metrotidal pools is located over areas that are above the low tide line. Only a small area of the platform towards the northeast corner extends beyond the low tide line into water that is on average some 6m deep at low tide.
- the full airfield perimeter is formed for the first phase of the airport
- the location, configuration and width of the airport and pool channel are adjusted to balance the volume of useful material excavated from the Hoo shore and hillside with the volume required to form the airfield perimeter impoundment and to level the airfield
- the surface access umbilical, passenger transit and baggage handling systems and the basement levels below the PTAs and satellites are all below the runway level and contribute material to levelling the airfield
- where they cannot be sourced on or close to the site, aggregates required for construction and any shortfall in construction materials can be dredged from the outer estuary and shipped

to site. Regular maintenance dredging of the shipping channel to Tilbury can contribute to this supply

- the airfield is doubly protected from flooding by the outer pool impoundments, providing protection from storms, storm surges and waves, and by the airfield perimeter impoundment from changes of level within the flood storage and tidal-pumped-storage pools. The datum for construction of the airfield is chosen to minimise the volume and the distance of moving material. Since much of the airfield falls on intertidal areas the datum is likely to be set to around mean sea level, this being some 2.28m below sea level during an average high tide
- the airfield perimeter impoundment is raised to flood datum level of say 8m, this also being sufficient for protection from the doubling of the tidal range within the high-and-low pool system. The result is an airfield with a perimeter impoundment some 8m high, which along the flanks usefully helps to screen airport noise from the environment. However an 8m impoundment would need to be set well back from the ends of the runways. This is avoided by raising the airfield from the PTAs to the ends so the runways are level with the perimeter flood bund.
- for a truly level runway 7,600m long placed on the curvature of the Earth the ends are already some 1.16m higher than the middle, which helps reduce the volume of material required for building up the last 1,330m at each end to reach the 8m datum of the perimeter flood bund.

Phased Platform Construction:-

For the Thames Reach Airport long runway configuration the full airport impoundment is first formed within the Metrotidal pools and the airfield and runways then built in three phases; (1) a conventional two-widely spaced system completing the eastern half of the system, (2) the west extension of the north runway followed by (3) the west extension of the south runway, with both these phases provided with associated facilities when required. A fourth phase for the addition of a 5th runway on the north pool impoundment can be formed by construction on piles, like the runway at Madeira, so the volume and operation of the pools is not affected. The airfield construction works can be continuous through these phases to manage overall costs and to match the rate of construction with the tidal energy

available, thereby minimising the embodied energy and carbon audit of the construction. For the first phase of construction the materials are provided from the Metrotidal Tunnel spoil and from excavation of the Hoo hillside to form the airfield at mean sea level. This minimises the volume and distance for moving materials and also minimises the volume of material and time required for surcharging the airfield to create the stable platform.

This account leaves open the question of the material required to form the Metrotidal pool impoundment. Crossrail spoil would have been useful but the construction programmes are no longer suitable. There is still scope for use to be made of the materials generated by the Thames Super Sewer. This and other construction material from London developments can be delivered by barge for use in the construction of the Metrotidal pool impoundment. Dredged sea aggregates would be an alternative.

We recommend that H.R.Wallingford are commissioned to study the direct and indirect effects of impounding into the tideway for various airfield configurations and also assess the flood storage and tidal power outputs that can be generated from impounded pools. Subject to the results of this study the location and configuration of the airfield would be determined enabling the volumes of material required for each phase of construction to be assessed from hydrographic charts and OS maps. Previously the proposals envisaged raising an airport platform to 8m datum requiring many millions of cubic metres of material. The revised proposals with the airfield at mean sea level radically reduce the volume of material required so that it is much more likely to be found entirely within the system perimeter and consist of a few million cubic meters, comparable to the volume of material generated by construction of the Metrotidal Tunnel.

8 ANCILLARY DEVELOPMENT ZONES: MANUFACTURING AND LOGISTICS

The closest existing industrial sites to the airfield, on the Isle of Grain, are suitable for airport support services such as the fuel depot and catering. The other 30.8 sq.km of existing industrial and development land within 30km of the airfield via Metrotidal Tunnel, shown on maps of the July 2013

submission, is suitable for accommodating the manufacturing and logistics that will develop around the new hub airport.

A hub airport is for transporting people and goods around the world. Air-freight manufacturing and logistics at a hub airport gathers high-value lightweight components from around the world for assembly into bulkier, heavier finished products that are then shipped by container back around the world to consumer markets. The integrated airport, ports and manufacturing facilities of Incheon, Hong Kong, Shanghai and Singapore serve these functions. Heathrow as a hub cannot provide this function as it is not located near a container port and the transport networks in the vicinity are already too congested to accommodate growth in manufacturing. Heathrow has understandably focused on people but goods are just as significant, especially for a Government whose strategy is to diversify away from services into high-end manufacturing. Thames Reach Airport served by Metrotidal Tunnel, close to Thamesport, the London Gateway Port and Port of Tilbury and with be direct rail connections to Sheerness and the Haven Ports, will have the integrated facilities and space to become a leading centre for air-freight manufacturing and logistics in Europe. Incheon sets a precedent for the proposed manufacturing and logistics in the Thames estuary. It is worth noting that the main port complex at Incheon is some 30km from the airport terminal via the new transport umbilical across the bay and that the manufacturing areas extend to Ansan as far as 50km from the airport. The identified ancillary development zones for Thames Reach Airport are all within 30km via the Metrotidal Canvey-Hoo Tunnel, the furthest being Coryton if reached via the new London Gateway Port, with other industrial sites located within 10km of the airport. Accordingly the proposed logistics and manufacturing for Thames Reach Airport would be relatively compact compared with Incheon and this helps to justify restrictions on development of the Hoo Peninsula immediately outside the airport perimeter.

The only Thames Reach Airport investment in the ancillary industrial areas would be for the fuel depots and catering facilities on the Isle of Grain. Investment in the ancillary development zones for the development of manufacturing and logistics would be market led by the private sector.

9 WIDER BENEFITS

- relief of congestion at the Dartford Crossing
- the next generation of flood defences for London
- the pumped-storage tidal power output of the two pools
- new data storage and utilities
- a transport network that can accommodate the growth in London's population
- a dry dock
- ancillary industrial and commercial developments
- Stansted and Gatwick regional rail access benefits
- new GC gauge European rail freight connections north of the Thames
- Thames Estuary Region and |UK agglomeration benefits
- growth in air-freight manufacturing and logistics

10 SHIPPING

Again we recommend that H.R.Wallingford are commissioned to study the direct and indirect effects of impounding into the tideway for various airfield configurations, their study to also include the effects on shipping. Their study would optimise the configuration for the flood defence and tidal pool impoundment to mitigate and manage adverse long term effects on the Thames and Medway shipping channels and tideways. Western and eastern configurations for the elliptical pool and airfield template have been mooted to define a range for analysis. Subject to analysis the East Configuration May 2014 indicates a likely easternmost configuration for the airfield and pools. There is some north-south tolerance for the footprint, subject to whether the Grade 1 listed church of St. James Allhallows is retained or relocated, with the East Configuration retaining the church. There will need to be some temporary navigational diversions during construction of the immersed tube tunnel across the shipping channel but as these occur in Sea Reach there is sufficient area to accommodate them without difficulty. The recently dredged shipping lane for the London Gateway Port passes north around the elliptical impoundment and heads gently west-south-west and east-south-east upstream and downstream respectively. The degree to which this occurs stays outside the 4km exclusions of the flight path approach and departure corridors.

The Metrotidal July 2013 text describes how some restrictions may have to be applied to shipping passing through the Canvey throttle at times of peak storm surges but these are rare events and the restrictions are unlikely to last longer than 24 hours.

11 ENVIRONMENTAL IMPACT ASSESSMENT

Once the airport configuration has been determined an environmental impact assessment would be undertaken to quantify the direct and indirect impacts and to plot the noise, NOX, and risk contours. For the long runway configuration the noise contours fall mostly on the estuary so that in effect it is similar to an off-shore scheme. The combination of the Metrotidal pools impoundment and the airfield flood protection impoundment helps to reduce the propagation of surface noise from the airport operations, including noise from taxiing aircraft. Noise contours would also be applied to the 24-hour surface transport, where the numbers of properties affected are not expected to be high, as most of the HS1 route is already well protected and the new connection from Ebbsfleet to the airport would pass through sparsely populated areas.

With prevailing south-westerly winds the NOX and other emissions are dispersed over the Thames Estuary. The risk contours also fall largely on the estuary.

12 DIRECT IMPACTS

The extent of intertidal and subtidal areas directly affected is defined by the areas of habitat within the elliptical pool system, the configuration of which will be resolved following the H. R. Wallingford study we have recommended is undertaken. On the “metrotidal proposition” that the tunnel and pools are independently viable, with cost/benefits that balance their impacts, to assess the direct impacts we may set aside the pools and consider the direct impacts of the airfield footprint. Accordingly the 15.70sq.km airfield takes a 0.52sq.km subtidal area, 10.08sq.km intertidal area and 5.09sq.km of the

Hoo Peninsula. The loss of subtidal area is more than made up by the subtidal areas proposed within the pools. The 5.09 sq.km loss of land area on the Hoo is made up by the 5.27sq.km of airfield tundra and by the additional flood protection provided for the low-lying habitats upstream. So we are left with the 10.08 sq.km loss of intertidal area. If the hydrographic analysis can demonstrate that up to say half of this loss is offset by the net reduction in tidal squeeze then the net intertidal remediation required would be some 5.04 sq.km, on a one-for-one basis.

There will also be the direct impacts on the Hoo of the administration areas, reservoir and water treatment works, which may accumulate to around 1.0 sq.km subject to more detailed assessment in due course. These areas are located within the elliptical bird strike protection zone where the habitat will in any event require some suppression to reduce the bird strike risks.

The shoreline is an important intertidal habitat. Part of the existing shoreline on the Hoo is enclosed by the pools. However a new coastline is formed on the Hoo and on the new impoundments formed for the pools and these provide a significant increase in coastline from the pools and airport system. While this will be mostly within the airport protection zone where birdlife will be suppressed there will be a substantial increase in the extent of intertidal shoreline habitat.

13 BIRD STRIKE PROTECTION ZONE

An elliptical bird strike protection zone of 31.9sq.km is shown across the East Configuration May 2014 airfield, consisting of 15.7sq.km on-field and 16.2sq km off-field. For the 2003 SERAS consultations the DfT had commissioned a report by asking what the bird strike risks and impacts on bird life would be if an airport were opened in the Thames Estuary today (2003). The research by Jenny Bell showed that the main attractors to bird life were the landfill sites around the estuary notably at Mucking and Shakespeare Farm and the intertidal areas. The report analysed the populations and relative bird strike effects of various species to assess an overall bird strike risk. The questions that should have been asked were, what impact would the airport development have on the attractors to birdlife, what would be the best plan for managing and remediating the impacts on birdlife and what would be the

resultant bird strike risk in at least ten years' time subject to implementation of the plan and airport? Jenny Bell had agreed in 2003 that a positive report could have been prepared in response to these questions instead of answering what the impacts would be "today". We are now in 2014 and there will no doubt be surveys to show how there is a greater range and population of birdlife in and around the estuary today than in 2003. This would be readily explained by the extensive work undertaken by the RSPB and others over the last decade to improve the habitat of the estuary and create wildlife reserves from remaining areas of low-lying meadows and marshland, and on this they should be congratulated. What should also be recognised is that this has been achieved quite economically by active habitat management. The skills of the RSPB and others can be similarly applied over the next decade to relocate the birdlife to more attractive new habitats created by active management further out in the estuary and along the coast.

The questions that should have been asked in 2003 are answered in principle as follows:-

- what impact would the airport development have on the attractors to birdlife? The Jenny Bell report for the 2003 SERAS Study identified the landfill sites around the estuary as major attractors of the bird population. These would be closed thereby substantially reducing the local bird population. Similarly construction of the airport on the intertidal areas and formation of the pools over intertidal areas removes major attractors resulting in a further reduction of the local bird populations before any active suppression is required.
- what would be the best plan for managing and remediating the impacts on birdlife? A substantial part of the £4bn allowed for environmental impacts would be directed to creating over the next decade substantial new attractive habitats further out in the estuary and along the coast, by managed retreat and the creation of new islands with intertidal areas.
- what would be the resultant bird strike risk in a decade's time subject to implementation of the plan and airport? In addition to providing flood storage and generating tidal power a key role for the pools is to cover the local intertidal areas immediately around the airport so that they are not attractors for birds. If there were no pools substantial sums would have to be spent dredging intertidal areas beside the airport to remove them as attractors. Hence the pools are an efficient and economical way of addressing the issue. A bird strike risk report would be

commissioned to demonstrate the cost, feasibility and effect of the closure and removal of existing attractors along with the decade of active management to direct the bird populations to more attractive habitats elsewhere in the outer estuary and on the coast from Ramsgate to Lowestoft, and the implementation of the pools and airport accompanied by the airport protection zone.

The strategy for Thames Reach Airport, in lieu of a 13km habitat management zone around the airfield, is to provide stricter management and suppression within a bird strike protection zone to achieve the required reduction in bird strike risk so that habitat management beyond the zone can be light. The intention is that wildlife reserves around the estuary outside the airport protection zone, managed by the Essex Wildlife Trust, RSPB, PLA, London Gateway and others, will continue unmolested and while growth in their bird populations would not be encouraged there would not need to be harmful suppression. This nevertheless represents a significant change of strategy for these sites with emphasis switching from attracting more bird life to providing leisure and recreational uses. Compensation would be paid for this change in the strategy and use of the sites with the sums coming from the £4bn allowed for environmental management.

14 FRESHWATER HABITAT

The freshwater habitat benefits may be quantified by the EA/TE2100 team following the H. R. Wallingford study that we have recommended in undertaken. The freshwater habitats are those of the existing low-lying meadows immediately upstream of the Metrotidal pools on both sides of the estuary up to and including the Higham Marshes, Shorne Marshes and East Tilbury Marshes. The Metrotidal flood protection system postpones the requirement for a permanent barrier by reducing estimated storm surge levels through use of the flood storage capacity. The period over which a permanent barrier may be postponed, say for over 100 years, will be assessed by the EA/TE2100 team. The habitat gain of subtidal area within the airport protection zone would not be for birdlife such as waders but for marine ecology including ragworms etc. There is no managed retreat provided within the tidal pumped storage system. The tidal pools provide extensive new shoreline habitats over the full tidal

range on the impoundments both within and without the pools though these will require control to prevent attracting birds.

15 REMEDIATION

As there is a gain in subtidal area the emphasis of remediation is on replacing the lost intertidal habitat areas to balance the net losses of 5.09 sq.km land and of 10.08 sq.km intertidal area as described above. There are three strategies for providing replacement land and intertidal areas:-

- conduct an audit of existing low-lying undesignated coastal agricultural land from Ramsgate to Lowestoft that is vulnerable to a surge tide and protected by sea walls that require substantial investment, to determine sites where managed retreat would be an economical solution to provide new designated land and intertidal area without loss of existing Natura 2000 designated sites
- research sites in the outer estuary away from the airport platform where a stable new island wildlife habitat with land above high tide and extensive intertidal areas can be formed by raising a wind-powered tidal pumped storage impoundment on or beside existing shallows using tidal pumped-storage energy from the London Array and other local wind farms. Spoil to form the island would be pumped by the wind and tidal power over a couple of years to form a stable configuration and augmented in due course by the excess spoil from surcharging the airport platform carried to the island site by barge. Research and environmental assessments will identify two leading sites for these new island reserves in the outer estuary formed on or beside existing shoals that dry at low tide, for example Buxey Sand off the Dengie Peninsula and Margate Sand or the Kentish Flats off the North Kent coast. The assessment for the locations of the two islands will take account of bird migration along the east coast to encourage a migration route across the outer estuary thereby further reducing bird movements and populations near to the airport.
- Compensation for the loss of 5.09 sq.km of low-lying meadows on the Hoo is provided by planting a bespoke “airfield tundra” on the airfield areas, designed to match the local meadow

fauna rather than the typical airfield grass. Similarly the green roofs of the airport buildings and satellites are provided with an “airfield tundra”. The East Configuration May 2014 airfield plan indicates that airfield tundra planting and green roofs can provide up to 5.27sq.km of replacement habitat, making up for the area lost from the Hoo. The flood protection provided for the low-lying areas upstream in effect adds to this area.

The cost of this remediation forms part of the £4bn allowed for environmental management.

16 PROPERTY IMPACT

The areas of the Hoo Peninsula and Isle of Grain to be taken for the airfield and surface access are indicated by the East Configuration May 2014 map. The loss of dwellings and other buildings is largely confined to Allhallows-on-Sea as follows:-

Allhallows-on-Sea:-

- the single-storey chalets of Kingsmead Park on the former Allhallows Station site
- The British Pilot pub with ancillary residential accommodation
- the former short shopping parade now flats on Avery Way
- two buildings at the Allhallows Golf Club
- 4No. dwellings Avery Close
- 110No. dwellings Avery Way including a post office
- former petrol station Avery Way
- Allhallows Leisure Park including 5No. buildings and yard, single-storey chalets, trailers, clubhouse and golf range
- Allhallows Yacht Club
- the stables, listed buildings and WW2 gun emplacements of Slough Fort
- 29No. dwellings Queensway
- Allhallows Surgery

- Allhallows Primary School

The residential accommodation and other buildings at Allhallows-on-Sea provide contractors' accommodation for the initial stages of the works and thereafter a proportion of the chalets and trailers can be dismantled for relocation elsewhere.

Properties in Allhallows, south of the Allhallows Primary School, are not taken by the airfield construction but are shown as forming part of the administration area raised on a platform levelled to 8m datum. The location and timing of the administration area may be adjusted to reduce the direct impacts on Allhallows and avoid the loss of property though the proximity of dwellings to the runways would remain a challenge and require substantial compensation including noise insulation. The Grade 1 listed church of St. James' Allhallows including the churchyard and the buildings on Stoke Road would be retained.

As the proposed transport connections mostly follow existing routes fewer than 10No. dwellings elswhere are taken for the surface access provisions.

The cost of acquiring land and buildings and of paying compensation where required again comes from the £4bn sum allowed for environmental management.

17 COMMERCIAL

The Metrotidal Tunnel and Thames Reach Airport are independent private sector investment opportunities with the Metrotidal tunnel and pool integration designed to be viable with or without the airport. Accordingly the direct investment for Thames Reach Airport is reduced to the cost of constructing the airfield within and beside the pool system and the associated local dedicated surface access links, as illustrated by the East Configuration May 2014 plans. The separate tunnel and airport agendas help to significantly reduce the hub airport start-up costs funded by the aviation market. In broad terms the costs are still estimated in the region of £5bn for the core Metrotidal Tunnel

integration and £23bn for Thames Reach Airport including the local dedicated surface access, with some discretion on how the environmental management costs of £4bn would be shared, between the acquisition of land and buildings, third party compensation, staff and training costs and the environmental remediation.

Support is required from Government for the planning and legal frameworks required to implement the project:-

- Encouraging a responsible green-growth economic strategy with lower carbon audits
- Encouraging the carbon market to control emissions
- Encouraging the advance of the One Sky initiative and new airspace design
- Supporting renewable electrical generating capacity with minimum tariffs
- Appropriate national planning framework
- Appropriate national infrastructure planning
- Support for a multimodal Lower Thames Tunnel
- Support for advancing the second generation of London's flood defences
- Reconciling a new hub with aviation market competition
- Support for a new hub on or beside the Isle of Grain/Hoo Peninsula
- Legal support for the Ramsar/SPA/SSSI/Natura 2000 site reconciliation and remediation
- Providing regulatory support throughout the planning and funding process
- Hypothecation of the Dartford Crossing toll revenues to the Metrotidal system
- Regulating the balance of road toll charges for the Dartford Crossing and the Metrotidal Tunnels to make most efficient use of the highways network
- Regulate the balance of road tolls and rail tariffs to encourage the mode shift from road to rail and a green-growth economy

With this support both the Tunnel and the Airport can be funded by the private sector. The flood storage system reduces the flood risk to very substantial property and infrastructure assets upstream, enabling the ABI to redirect a proportion of the premia raised under the new Flood Re agreement towards investment in the flood storage system. The balance of the construction cost can be made up

by riparian rates and government grant at a level that would not exceed and preferably be significantly lower than that required for the TE2100 proposals.

Set out below are the assumed sources of revenue:-

Metrotidal Tunnel:-

- the separate road tolls for the Metrotidal Tunnel system
- the separate rail tariffs for the Metrotidal Tunnel system
- hypothecation of the Dartford Crossing toll revenues to the Metrotidal system in lieu of the Dartford A, B and C options that are dropped
- a proportion of the premia raised by the ABI under the new Flood Re agreement, in proportion to the reduced flood risk upstream on the Thames Estuary, put towards investment in the flood storage system
- riparian rates and government grant at a level that would preferably be significantly lower than that required for the existing TE2100 proposals, put towards investment in the flood storage system
- energy sales from the tidal pumped-storage system
- lease or sale of the data storage and distribution operation
- lease or sale of utility way-leaves through the two tunnels
- lease or sale of the new dry dock on the Medway Estuary beside Thamesport
- a potential BID to be approved by the ESSEX/KENT LEP and applied to the ancillary commercial and industrial development sites identified close to the tunnels, to share some of the substantial uplift in their development and rateable values

Thames Reach Airport:-

- aeronautical charges comparable to those of competitor hub airports in the UK and Europe
- park-and-ride charges
- airport retail rentals

- revenues from integrated air-rail substitution ticketing arrangements
- a potential BID to be approved by the ESSEX/KENT LEP and applied to the ancillary commercial and industrial development sites identified close to the airport, to share some of the additional uplift in their development and rateable values

An overall risk matrix for the project would be formed by merging and calibrating the following subsidiary risk matrices:-

- applied by DfT Dartford Crossing team to their road-only Options A, B and C
- applied by Network Rail to rail investments
- applied by Crossrail to their system
- applied by TfL to their London system
- applied by the TE2100 Team to their flood defence investments
- applied by data storage developers
- applied by utility providers
- applied for development of a dry dock

18 OPERATIONS

With reference to the East Configuration May 2014 map and an inner horizontal surface of the Thames Reach Airport long runway configuration at 45m OS datum, the following obstacles need review though they can be resolved in due course:-

- the vent pipework or upper parts of the three larger LNG storage tanks
- if not removed the Isle of Grain Power Station stack
- the two chimneys of the new gas-fired power plant on the isle of Grain
- with new water supplies provided to the Hoo Peninsula and the airport through the Metrotidal tunnels the water tower and tank at Windhill Green on the Hoo hillside will be removed
- the church tower of St. Mary Hoo and chimneys of Moat Farm nearby

- the cranes of Thamesport and the new London Gateway Port and the flare stacks of the former Coryton refinery will be beyond and below the inner horizontal and conical surfaces
- subject to further minor adjustment of the airport long runway configuration the trees of the Northward Hill nature reserve and farm buildings located above the 50m contour on Clinch Street will need review

19 LOCAL EMPLOYMENT

The employment and services for a new hub airport in the Thames Estuary require the support of a conurbation the size of Manchester. Metrotidal Tunnel results in the agglomeration of the South Essex and North Kent conurbations including the Medway Towns where the combined population within 20km of the airport is just under 1m. This is sufficient to serve the new hub with growth beyond the scale of current operations at Heathrow. The Crossrail-Plus orbital extends the commuter catchment into the metropolitan boroughs of Central London so that no new urban development or substantial migration is required to support the high-capacity phases of Thames Reach Airport. The new East Coast Continental Line and Medway Valley Line, together with the Regional Rail hubs, further extend the commuter catchment around the northeast and southeast quadrants of London enabling the percentage of employees travelling by rail to reach the higher levels within the 60-80% range.

In summary the airport employees will live in the existing settlements of just under 1m population within a 20km range from the airport via the Metrotidal system. The Crossrail Plus orbital, East Coast Continental Line and Medway Valley Line will also contribute employment from existing settlements. No new development is required. LUTI modelling of the network in due course will provide greater resolution of the distribution of employment over the proposed surface access.

20 PROGRAMME

A key issue is the decision to locate the hub in the Thames Estuary. With that set for 2015 design work needs to be advancing now to meet a programme for opening in 2024. Accordingly the programme provided to date represents the shortest time to opening of the first phase requiring optimum co-ordination of the various activities. A more robust programme would allow more time for advancing the design through a two year period for the planning approvals to a conditional consent followed by a year for compensation, mobilisation and clearances during which time the conditions are discharged. This postpones the first phase opening to 2026, still leaving time for the rest to open by 2030 subject to critical path analysis including the airfield construction in one or a number of phases. This requires geotechnical investigations and groundworks engineering to minimise the volume of material required while allowing sufficient time for the settlement of each phase, so again 2026 for the first phase and 2030 would be more robust. To meet this programme the works programmes for Metrotidal Tunnel and Thames Reach Airport need to be integrated and merged starting with construction of the Metrotidal pool impoundment then making an early start on the tunnels, which generate spoil for the pool and airfield impoundments. Excavation of the Hoo hillside provides the material to form the airfield at mean sea level and raise the ends to the height of the perimeter flood bund as described above. Accordingly for construction of the airport in three phases, excluding for now the fifth runway, should be manageable with the timetable previously provided as there is now a much lower volume of material to be procured and moved for the airfield construction.