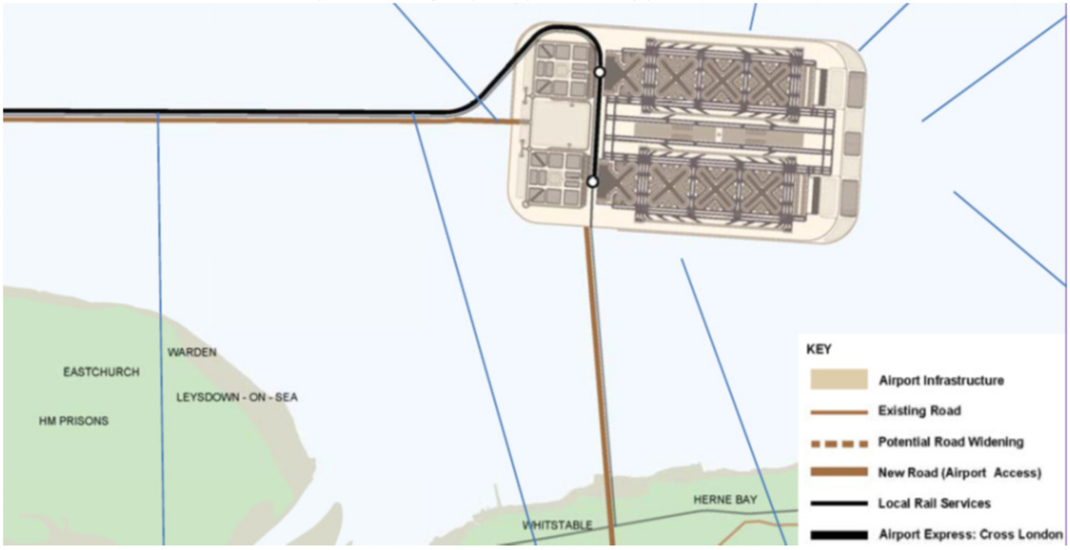
PROPOSAL TITLE:	**Outer Estuary**	Group:	**New**
SUBMITTED BY:	**Mayor of London**	Reference No.:	**52**

PROPOSAL

New four runway airport, developed off the north Kent coast, as a direct replacement for Heathrow. Constructed on reclaimed land with a total site area of 55km^2. The proposed airport includes four independent parallel runways in an East/West orientation, each 4,000m long. The proposal requires the construction of supporting infrastructure (road and rail links, utilities, etc) including settlements (with supporting infrastructure) to accommodate direct and indirect employees.

Essentially a Government led initiative with the eventual sale of the airport and the land at Heathrow offsetting the upfront cost. Phase 1 of construction is from 2020 to 2029 and delivers infrastructure to support 90mppa. Phase 2 begins from 2026 to 2050, ultimately delivering capacity of 180mppa.



ASSESSMENT SUMMARY

Broadly similar scheme to others in the Thames Estuary or on the Hoo Peninsula, proposing an east London replacement for Heathrow. All schemes offer a substantial reduction in noise affected populations due to the closure of Heathrow, with off-shore proposals minimising the number of people adversely impacted by noise. However, such proposals require the removal of protected habitats which would require replacement and demonstration of no alternative and overriding public need to construct over.

Located beyond the coastline and further from existing transport networks, off-shore proposals have high capital costs, although the cost of this option is marginally lower than other off-shore options, yet it remains substantially higher than the cost of proposals based on the development of existing airports or at new sites with better existing surface access.

The early phases of proposed development only replace the lost capacity at Heathrow, with the fuller build-out required to add capacity to the system. The four-runway configuration provides the largest capacity of the estuary options.

Although the scheme adds capacity its cost, location and environmental impact are challenging.

PROPOSAL TITLE:	**Outer Estuary**	**Group:**	**New**
SUBMITTED BY:	**Mayor of London**	**Reference No.:**	**52**

OVERVIEW

Approach	Government led initiative to acquire Heathrow, construct the new airport and supporting infrastructure, transfer operations and redevelop Heathrow site before sale of both assets.	Opening Year 2029

Capacity	The general approach in the submission appears reasonable, but underestimates optimism bias.		Airport	Net
		Runways	4	2
		ATM	1,000,000	520,000
		pax	180	90

Cost (£bn)	The off-shore location and extent of surface access requirement significantly increase the cost.	Airport	Access	Other	Sub Total	Including Risk/OB
		34.8	14.0	1.3	50.1	112.7

Surface Transport	A new high speed branch line to HS1, airport express rail line to Waterloo via Essex and Canary Wharf, and extension of Crossrail to the airport is proposed. Expansion of London termini platform capacity would be needed, and there may be capacity issues with HS1 in accommodating the proposed level of service. Additional capacity on around 60% of the M25 is proposed, at considerable expense, but there are likely to be other highway capacity requirements that have not been identified. Strategy relies on achieving high public transport targets (65% rail mode share target).	1 hr isochrone	10
		2 hr isochrone	25
		London centre	55 miles

Economic					
Borough	Medway UA	Maidstone	Swale	Canterbury	Thanet
Unemployment (%)	9.5	6.7	7.5	8.5	12.1
Ave. Salary (£/yr)	27,378	28,236	28,085	28,371	21,585
Borough	Gravesham				
Unemployment (%)	9.1				
Ave. Salary (£/yr)	28,106				
County	Medway UA	Kent exc UAs			
GVA (£/capita)	13,631	15,883			

Environment	Relatively small population affected by noise due to off shore location. Site located within a marine SPA & SAC (European level designations). Additional impacts likely on bird populations in 4 surrounding SPAs. Significant compensatory habitat would be required and may be difficult to provide. Major coastal flood and erosion risk. Substantial materials import to construct the island and associated impacts not covered.		Airport	Net
		57 LA_{eq}	<50	(240,000)
			0	
		55 L_{DEN}	<50	
			0	

SAC[1]	SPA[1]	Ramsar	CA[1]	AONB[1]	SSSI[1]	Listed Buildings	SAM[1]	Houses Lost
1	1	-	-	-	-	-	-	-

---

[1] SAC: Special Areas of Conservation (or Site of Community Interest); SPA: Special Protection Areas; CA: Conservation Area; SSSI: Site of Special Scientific Interest; SAM: Scheduled Ancient Monument.

ECONOMY

Borough	**Medway UA**	**Maidstone**	**Swale**	**Canterbury**	**Thanet**
Unemployment (%)	9.5	6.7	7.5	8.5	12.1
Ave. Salary (£/yr)	27,378	28,236	28,085	28,371	21,585
Borough	**Gravesham**				
Unemployment (%)	9.1				
Ave. Salary (£/yr)	28,106				
County	**Medway UA**	**Kent exc UAs**			
GVA (£/capita)	13,631	15,883			

Impact on Industry

A new airport with 4 independent runways on an artificial island off Whitstable, with transport links both to the South and West, would provide a net increase of two runways assuming Heathrow is closed. This would provide sufficient capacity to meet expected hub airport demand to at least 2050. This creates benefits by allowing new services and reducing operational costs due to operation of a more efficient airport and by allowing significant improvements in connectivity over time. However this may be offset in part by increased landing charges to recover capital costs of construction, and being less well located for the airlines' prime passenger market. It would free up land at Heathrow helping address demand for other uses.

Airports	A four runway hub airport would provide sufficient capacity to meet anticipated hub airport demand and would attract network traffic away from Gatwick. It may inhibit development of Manston, but otherwise there is relatively little impact on other regional airports. By enhancing connectivity with the regions, it may see an increase in services to airports in the north of England, Scotland and Northern Ireland.
Airlines	As with any other major airport on an estuarial site, airlines using Heathrow and others seeking to use it would benefit from the increase in capacity allowing new direct routes, higher frequencies and/or reduced delays, because of sufficient capacity for resilience. Greater competition and significantly reduced airline 'slot' values could have an effect on some airlines. Interline traffic would have more potential to increase, enhancing the viability of more direct routes, particularly by airlines based at the new hub. LCC and charter airlines would be likely to face a greater choice of airports, as some network traffic may transfer out of Gatwick because of the greater interlining opportunities.
Passengers	As with any other large hub airport on an estuarial site, passengers would benefit from increased capacity at the new site via delay reductions, a greater choice of destinations and/or enhanced frequencies, more competition (reducing fares) and faster terminal throughput times. But travel times and costs would increase on average for typical customers, and be longer than for typical estuarial sites further west, though with reduced travel times in Kent and South East London. A lower Thames crossing is assumed which provides improved connections to southwest Essex.

Local & Regional Economic Impacts

The airport is located off Swale district, an area of above-average unemployment for the South East. It is possibly close enough to Canterbury and Thanet districts, all high unemployment areas, especially Thanet. A direct connection to Medway district is also proposed, which probably also brings the Borough of Gravesham within its ambit, both relatively high unemployment areas for the South East. The new site providing an expanded airport with sufficient capacity to meet expected medium term demand would facilitate growth of new and existing industries in aviation, airport and aviation support services and travel, tourism, logistics and other related sectors, to service the growth in passenger and freight demand met by the new airport. Most of these businesses would probably have to relocate from the vicinity of Heathrow. The immediate effect would be to increase commercial property development in the vicinity of the new site, but there would also be significant potential to redevelop the Heathrow site for commercial purposes and residential development. The agglomeration effects of the existing Heathrow/Thames Valley/M4 corridor may be diluted. Businesses may prefer to locate closer to the new airport around the A2 corridor. Reduced noise impacts are likely to have a positive effect on land prices to the east of the Heathrow site. There may be negative impacts closer to the new airport. There would be significant dislocation of employment, with many employees needing to relocate. Existing commuters in the Thames estuary may experience increased congestion and travel costs, despite the improved transport connections.

National Economic Impacts

The main impacts come from the provision of new capacity, enabling more flights and connectivity, and the increase in business and leisure trips, and trade in goods and services (and the indirect effects on inward investment). Increased choices of flights and airlines, reducing travel time and fares should generate significant consumer/welfare benefits. The benefits would be offset by higher access costs from London (although lower costs for Kent, Essex and East London).

SURFACE ACCESS

Time/Distance to Central London	1 hr isochrone population	Key required upgrade schemes
35 minutes 55 miles	10	▪ New high speed rail line to St Pancras ▪ New airport express rail line to Waterloo ▪ Extension to Crossrail ▪ London termini platform capacity enhancements ▪ New airport access road ▪ Lower Thames Crossing Option C ▪ Capacity enhancements to the A2 and A228 Widening the M25 from the M1 to the A243 junctions
Journey times to other population centre	**2 hr isochrone population**	
Birmingham 1hr 22 mins Manchester 1hr 42 mins (with HS2)	25	

Rail Infrastructure Capacity Analysis

The proposal suggests access to London via HS1 to St Pancras, via a new express rail line to Waterloo and via an eastern extension to Crossrail. It claims peak demand for the airport of **21,000 public transport passenger trips and 7,000 staff return trips between 7:00 and 8:00** (presumably daily). It would be useful to validate that existing lines and termini have sufficient capacity to cater for the airport-related demand, and to validate whether the proposed new airport express rail line to Waterloo is essential to cater for the demand, given the addition of this line would be particularly expensive.

Highways Capacity Analysis

The proposal suggests widening existing roads and the construction of new access roads in addition to capacity enhancements on existing roads such as the A2, A228 and M25. A new Lower Thames Crossing provides access to Essex and the M25 to the north (relying upon a variant of Lower Thames Crossing Option C), connecting the M2 and M25 Motorways slightly east of its proposed alignment. From here a major junction to the airport would need to be constructed. Widening of the M25 from the M1 in the north to the A243 in the South West is a significant project in its own right. Even with the stated 65% public transport mode split target, it is likely that significant capacity enhancements would be required to the local and sub-regional road networks.

Accessibility to Population & Business centres

A non-stop high speed service to St Pancras (**taking 35 minutes**) with onward connection to HS2 could potentially allow through trains from the HS2 line to serve the airport, connecting the West Midlands and Northern regions to the airport. An Airport Express service to central London would also service Canary Wharf, London Bridge and Waterloo (**38 minutes**). An extension to Crossrail and improved local links would help serve local populations and employees. Journey times for car journeys would be noticeably longer.

Accessibility to Transport Interchanges

Key transport interchanges directly served by the proposed rail services include: St Pancras; Ebbsfleet; Stratford; Canary Wharf; Farringdon; Tottenham Court Road; Old Oak Common London Bridge and Waterloo.

Accessibility to Workforce

The proposal has strong public transport links to local towns in North and South Kent and the Medway area via the proposed Thames Crossing and to east London. Further analysis is necessary to determine whether this can meet the modal assumptions made for employees especially given their dispersed nature and twenty four hour shift patterns.

Modal Split Assumptions

The surface access strategy is based on **a 65% public transport share for passengers**. A mode share for employees is not explicitly stated however they suggest **that 7,000 out of 9,000 passengers at peak times** would use public transport (78%). These mode shares seem high for both passengers and employees especially given their likely dispersed locations and shift hours. We have asked the sponsor for what measures they plan to implement to achieve this target. It is also much higher than at Heathrow where 41% of staff use public transport.

Potential Wider Use

The proposed road and rail connections are mostly airport-specific and are unlikely to have significant wider benefits. The main exception is the airport Express Service from London Riverside to Waterloo which could be shared between airport and non-airport passengers offering relief to the Jubilee Line and improving connections between south west London and Canary Wharf with 'Crossrail type' through services. The project would improve links from London Riverside (Dagenham) and central London. Improving rail links between Kent and Essex could help better integrate the Thames Estuary region however the submission does not provide any details for these services.

PROPOSAL TITLE:	**Outer Estuary**	Group:	**New**
SUBMITTED BY:	**Mayor of London**	Reference No.:	**52**

ENVIRONMENT

Overall noise impact	**<50 people impacted by air noise due to offshore location.**						Net	Airport	Net
							57 LA_{eq}	0	(240,000)
							55 L_{DEN}	0	
	SAC	SPA	Ramsar	AONB	SSSI	CA	Listed Buildings	SAM	Houses Lost
	1	1	-	-	-		-	-	-

Air Quality

Qualitative risk assessment provided for 2034 and 2050 for non-compliance for N02, PM10 and PM2.5 standards. This assessed proximity of airport and new/widened roads to AQMAs and proximity of these to residential areas. No risk of non-compliance for airport due to off-shore location.

For roads – high risk of compliance breach from 2034 for sections of the M25 and sections of the A2 (locations of AQMAs), but assume no high risks remain by 2050 with improved vehicle technology (similar to TfL Isle of Grain proposal).

Other Airports: As for all new hub options, potential for some local air quality benefits through removal or reduction of Heathrow airport's contribution to local NO_2.

Mitigation Plan

Maximise public transport use and restrict access to low emission vehicles only.

Noise

For Phase 2 (2050 @ 180mppa):

- **<50 new people exposed to Lden over 55dB**
- **<50 people affected by noise at 16hr LAeq over 57dB**
- **<50 people affected by 50dB at night assuming night-time operations confined to two centre runways**

Independent noise modelling for comparison provided the following results:

- 57LAeq: 0 people affected;
- 55Lden: 0 people affected.

The population affect by 57LAeq represents a nett reduction of 240,000 given the closure of Heathrow.

Mitigation Plan

Operational measures such as orientation of runways and flight paths, noise abating operational procedures and restricting location of new residential and employment buildings close to airport.

Designations

European designated sites (SPAs and a Ramsar) would be impacted along with nationally designated sites (SSSIs). Airport located within boundary of marine SPA (Outer Thames Estuary), with 5530ha of subtidal habitat impacted. Also located within Margate and Long Sands SAC. Would indirectly impact another 4 SPAs and closer to Essex Estuaries SAC than Isle of Grain proposals.

Significant effects on Natura 2000 sites unlikely to be avoidable and therefore compensation i.e. replacement habitat needed. Would need to follow process under Habitats Regulations (implementing EU Habitats and Birds directives) and undertake Appropriate Assessment, demonstrate no alternatives and overriding public interest and provide compensatory measures.

Further significant potential impacts from surface access and associated developments. Possible further impacts associated with coastal geomorphology changes. Bird strike risk measures would cause further additional impacts.

Mitigation Plan

Habitat enhancement and replacement including saline lagoons and coastal inlets. Examples provided from elsewhere.

Enhancement of herring stocks to support feeding birds in marine SPA.

Climate Change

High level assessment for 2050 based on DfT 2050 demand forecasting compared to Heathrow today and 2050 constrained. Due to technology improvements, larger planes, and more efficient hub operations, $C0_2$ per passenger would be lower at Hub both currently and in 2050 (130-140 kg/passenger compared to 280 and 200 for Heathrow today and in 2050 respectively) although based on overall greater passenger numbers at the Hub.

Also greater potential for technology improvements and modal shift for public transport having lower surface access emissions than Heathrow does today although many of these improvements may also be possible for Heathrow in the future.

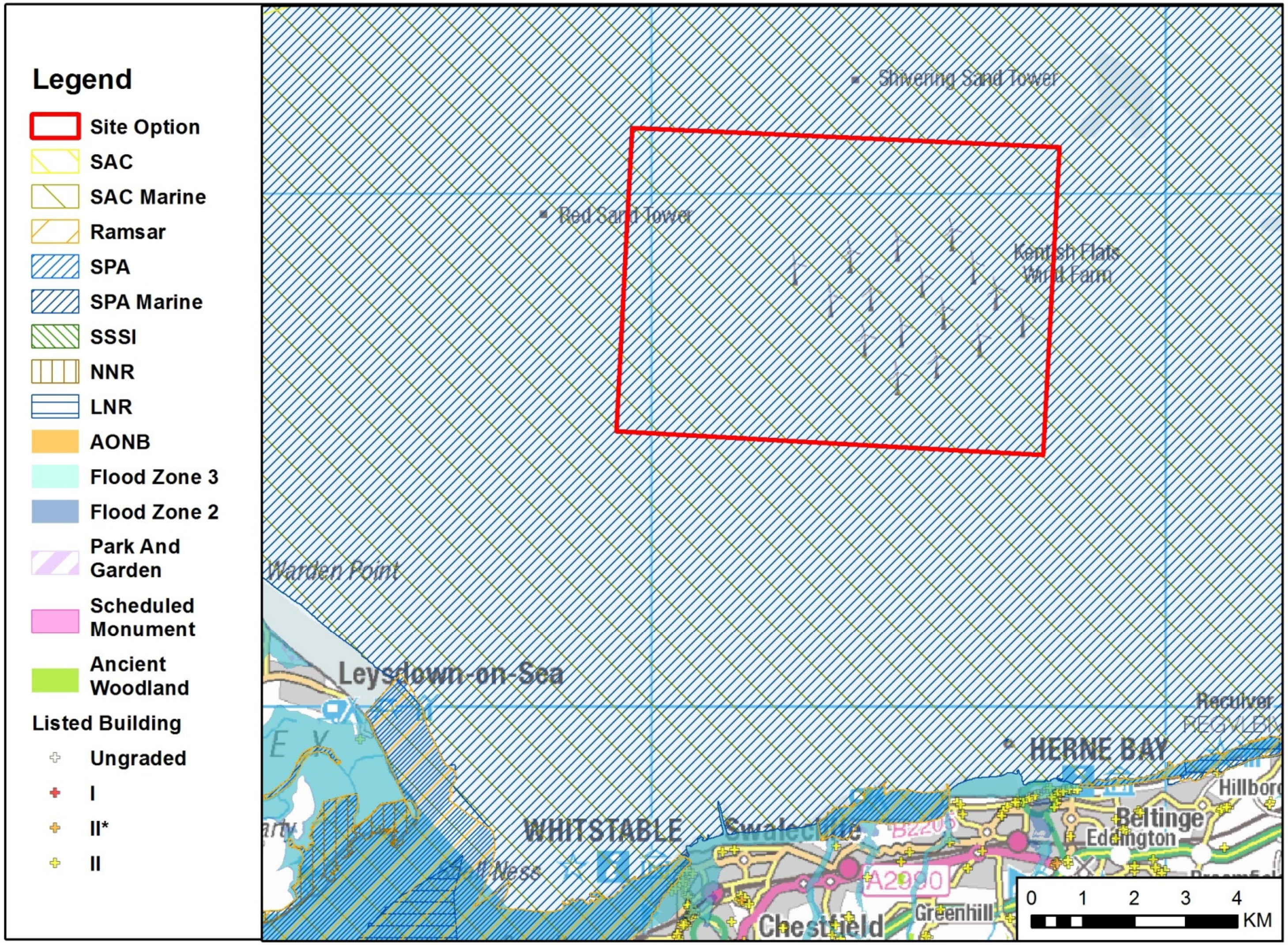
Mitigation Plan

None specified but implies efficiency potential in design and operation.

Other Issues	Mitigation Plan
Major coastal flood and erosion risk, with climate change to consider. Airport would impact on coastal process (sediment transport, wave climate, tidal currents). Substantial materials import required to construct Island. **Potential maritime archaeology impacts (wrecks etc.). SS Montgomery naval wreck presents explosives hazard.** Significant impacts from surface transport and additional development which may be considerable.	**Thames Estuary hydrodynamic model and coastal process model.**

PEOPLE

<table>
<tr><td>Housing
Offshore location so loss of housing only for surface access infrastructure.
Housing gain through redevelopment of Heathrow (~80,000 new houses) and additional housing (31,000) in Thames Gateway area.</td><td>Demolished
0</td></tr>
<tr><td colspan="2">Vulnerable Groups
Vulnerable groups not addressed specifically. Noted that higher levels of deprivation exist in Thanet, and to a lesser degree, Swale.
Personal disposable income forecast to grow by an additional 12.1% by 2050 (+£1,900).</td></tr>
<tr><td colspan="2">Quality of Life
Noise and air quality benefits: considerable net gains for large population around Heathrow. Some noise and air quality disbenefits due to new surface access, but improved employment and housing access significant contribution to health and quality of life.
A marked switch from net out-commuting of 15,000 in 2012 to a net inflow of 38,000 workers by 2050.
Temporary reductions in quality of life expected. Transition time likely to have the greatest adverse affect on vulnerable groups with less mobility and flexibility.</td></tr>
<tr><td colspan="2">Wider Social Impacts
Reference is made to wider economic benefits especially Eastern wedge and Thames Gateway and national economic benefits. Specific communities on the North Kent coast would need to be considered.
There are likely to be additional impacts from in-migration of working population in terms of increased pressure on services such as health, housing and education and changes to population mix and health issues. Additional pressure on housing and housing/rental could reduce affordability for the existing population. Social impacts at Heathrow would depend on redevelopment of the airport site and the extent they can provide for housing and employment needs</td></tr>
</table>


Legend
Site Option
SAC
SAC Marine
Ramsar
SPA
SPA Marine
SSSI
NNR
LNR
AONB
Flood Zone 3
Flood Zone 2
Park And Garden
Scheduled Monument
Ancient Woodland
Listed Building
Ungraded
I
II*
II
Shivering Sand Tower
Red Sand Tower
Kentish Flats Wind Farm
Warden Point
Leysdown-on-Sea
Reculver
HERNE BAY
Beltinge
Eddington
WHITSTABLE
Swalecliffe
B2205
A2990
Chestfield
Greenhill
0 1 2 3 4
KM

PROPOSAL TITLE:	**Outer Estuary**	**Group:**	**New**
SUBMITTED BY:	**Mayor of London**	**Reference No.:**	**52**

COST

Capital Cost

Phase 1 estimated at £63.2 bn including 37% risk, unadjusted for bias. Phase 2 estimated at £21.0 bn including 21% risk, unadjusted for bias. Submission does not explicitly identify exclusions from these cost estimates. Phase 1 cost estimate may need to be increased in order to improve flooding protection.

Independent Cost Analysis assesses the scheme to cost £113bn for both phases.

The off-shore location and extent of surface access requirement significantly increase the cost.

	£bn
Airport	34.8
Access	14.0
Other	1.3
Sub-Total	50.1
Risk	25.1
Optimism Bias	37.6
Total	112.7

Key Risks

- Nature of reclaimed land platform poses increased risk of differential settlement.
- Relocation or removal of Kentish Flats wind farm required, cost allowance had been made in an independent study.
- Surface Access Links
- Marine habitat compensation and coastal flood/erosion protection measures
- Sea Bed Licences

Risk and Contingency Allowances

Given the greater risk of off-shore construction a 50% contingency has been adopted for all costs. A 50% optimism bias has been applied to the risk-adjusted cost.

Surface Access Costs

£14bn estimate for road and rail links based on requirement for infrastructure identified by independent analysis.

Other Off-Airport Costs

An allowance of £0.3bn has been included within the independent cost analysis for marine habitat compensation and coastal flooding/erosion protection measures. An allowance of £0.5bn has been made for the relocation of the Kentish Flats wind farm. A further £0.5bn has been included to cover other typical mitigation environmental measures.

Summary Comments

The general approach in the submission appears reasonable, but underestimates optimism bias.
Costs associated with the closure of Heathrow have been excluded.

OPERATIONAL VIABILITY

Capacity

The proposed opening phase only replaces the capacity lost on the closure of Heathrow. Subsequent development increases system capacity.

	Airport	Net
Runways	**4**	2
ATM	**1,000,000**	520,000
pax	**180**	90

Resilience, Reliability and Efficiency

The proposal supports independent parallel approaches, but dependent within runway pairs. The proposal could be defined to meet resilience targets.

Safety

There does not appear to be any need to fly over significant population centres on final approach or immediately after departure. The removal of approaches to and departures from Heathrow over central London would increase system safety.

Bird strike would represent an unusually high threat compared to inland airport locations. Fog may also present a significant hazard, although its greatest negative impact maybe on capacity.

Scalability

Although the proposal is defined within an identified boundary, it appears that additional capacity could be developed if required, although this would require expansion of the artificial island. The construction, beside an operational airport, may be costly.

Airspace

The proposal would require significant considerable airspace design in terms of relocating the boundaries of the London Terminal Manoeuvring Area (LTMA), SIDs, STARS and interfaces with en route airspace. The LTMA would extend from the new airport in the East to Gatwick in the South, Luton and Stansted to the North. This would be a major reconfiguration and would also require international consultation and agreement. Given the long-term nature of the option and the likely airspace and air traffic management developments under SESAR, restructuring may be achieved as part of the on-going development process, however this is not certain. International boundaries may require amendment.

DELIVERY

Timescale

Government led initiative to acquire Heathrow, construct the new airport and supporting infrastructure, transfer operations and redevelop Heathrow site before sale of both assets. Assume a Hybrid Bill by 2019; government acquires Heathrow and land by 2021, with new hub and surface access built by 2029; Heathrow redeveloped by 2032.

Sources of funding

Scheme is government-funded and delivered via SPV except some new road links via PPPs with potential government underwriting of demand risk.

Commercial Deliverability

Even with government grant the scale of private financing challenge is very significant, but may be achievable subject to regulatory structure and comprehensiveness of government support package. The offshore location may increase the risk profile potentially reducing private sector interest, or increasing the risk premium. Raises major taxpayer value for money questions plus could impact government balance sheet treatment. Without grant funding landing charges would need to rise to levels that are likely to be unsustainable if the airport were to remain competitive.