MOTT MACDONALD

Bristol Airport - Forecast Validation

2018

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Executive summary

1. Mott MacDonald has been commissioned by Bristol Airport ("BRS") to undertake a traffic forecast and a review of the airport's management forecast. Mott MacDonald's approach to this study is to analyse the local catchment area and to generate independent econometric forecasts to validate the airport management's methodology.

2. For the purpose of this analysis, Mott MacDonald forecasted BRS traffic volumes until 2045 (the same time period as BRS Management's forecast). In addition to a base scenario (considered the most likely traffic development scenario), a low and high scenario was also developed by Mott MacDonald to provide a bandwidth of traffic volume that can be expected. The low and high scenarios differ from the base scenario with regards to expected economic growth and development of new air services.

3. BRS Management projections show growth from the 2017 figure of 8.2 million passengers to 12 million in 2026 and eventually to 19.5 million passengers in 2045. This represents an overall CAGR of 3.13%. **Mott MacDonald's analysis suggests that this projection is a realistic assessment of likely growth at Bristol Airport.**

4. Mott MacDonald's independent traffic forecast reflects positive underpinning traffic drivers which proved to be pertinent in the modelling process. The outcome of the econometric modelling reflects the potential of Bristol as an important economic region of the United Kingdom. **The econometric modelling suggests that UK GDP is an appropriate driver for traffic at BRS, hence a reliable indicator for future growth.**

5. Forecasts have been prepared for passenger movements and aircraft movements. Fuelled by a growing domestic economy and encouraging airline expansion plans, the trend of recent traffic growth at BRS is predicted to continue. Overall, Mott MacDonald and BRS Management have produced similar traffic forecasts until 2045. **Mott MacDonald's econometric analysis indicates that BRS traffic is likely to grow from 8.2 million passengers in 2017 to just over 12 mppa in 2026 and eventually to 19.8 mppa in 2045.**

6. Mott MacDonald's analysis of future night flying requirements consistent with a 12 mppa level of traffic indicate that the current limit of 4,000 annual night movements, if expressed as an annual limit with flexible use between summer and winter seasons is just sufficient to accommodate growth to 12 mppa. This assumes strict management of night movement use through an effective year-round process of slot coordination.

7. Assuming BRS adopts the latest London Airport QC rating system, these **4,000 annual night movements can be accommodated within current seasonal QC limits and seasonal flexibility**.

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2 Glossary

Table 1: Glossary

Acronym	Meaning
ATM	Aircraft Traffic Movement
BRS	Bristol Airport
BHX	Birmingham Airport
CAA	Civil Aviation Authority
CWL	Cardiff-Wales Airport
DfT	Department of Transport
EXT	Exeter Airport
GDP	Gross Domestic Product
GRDP	Gross Regional Domestic Product
GDHI	Gross Disposable Household Income
GVA	Gross Value Added
IPS	International Passenger survey
LCC	Low Cost Carrier
LHR	London Heathrow
MPPA	Million Passengers per Annum
QC	Quota Count
UK	United Kingdom

3 Introduction

8. Bristol Airport ("BRS") is a commercial airport serving the city of Bristol and the surrounding area in the Southwest of England and South Wales. BRS has one runway of 2,011m length and one passenger terminal. BRS has been experiencing rapid traffic growth in recent years – in 2017 a little over 8.2 million passengers (mppa) used the airport, up from 5.9 million five years previously, in 2012, and representing a compound annual growth rate of 6.2%[1] (for the period 2012-2017).

Figure 1: Bristol Airport Layout

Source: Google maps

9. BRS currently has planning permission for operations up to 10 mppa and has planning conditions which limit night flying during the core night period (23:30-06:00) to 4,000 movements per year (3,000 in summer, 1,000 in winter) and during the shoulder periods (23:00-23:30 and 06:00-07:00) to 10,500 movements per year.

10. A timely increase in the 10 mppa limit is necessary if growth is not to be constrained. Forecasts indicate that this limit may be exceeded by 2020 and night movements are already a constraint on growth, resulting in BRS introducing night slot controls in summer seasons from Summer 2018.

11. An interim planning application, due for submission in Autumn 2018, is being prepared to increase capacity to 12 mppa and BRS has developed in-house traffic forecasts to underpin this planning application. This report is an independent review of these BRS Management forecasts.

[1] Civil Aviation Authority passenger statistics

4 Background Information

4.1 Introduction

12. A sound traffic forecast starts with the development of a solid understanding of the catchment area that the airport serves. The potential market pool of the catchment area is determined by the socio-economic profile of the region, described by parameters such as the Gross Regional Domestic Product ("GRDP"), the number of habitants living in the airport's catchment area, and the household income per capita.

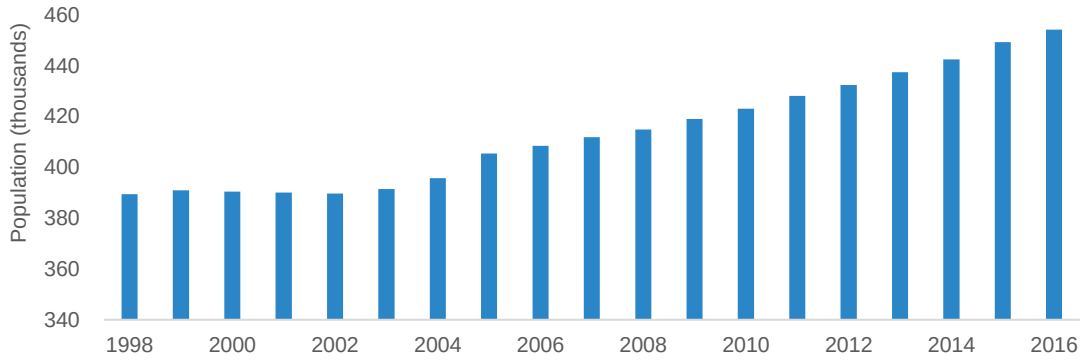
13. An examination of economic and demographic indicators of Southwest England provides evidence of a growing and comparatively wealthy market. The region's economy and income per capita have increased over the last several years and its population is also increasing.

14. In tandem with increasing economic activity, passengers, cargo, and aircraft operations in the UK and at BRS have increased, and economic indicators for both the UK and Southwest of England, are forecast to continue increasing. Therefore, it is likely that there will be increased demand for air service in the UK and the Southwest of England over the forecast horizon. This section will explore the socio-economic activities of the BRS catchment area that are likely to drive future air traffic demand.

4.2 Population

15. Bristol has a population of approximately 455,000, which makes it the largest city in the Southwest of England, and the 10th largest district by population in the UK[2]. After a decline in the post war years, Bristol's population stabilised during the 1990s and has grown strongly since the mid-2000s which is attributed to a significant increase in net migration[3]. According to the Office of National Statistics, population growth has been particularly concentrated in central areas of Bristol and this may be, in part, due to growing numbers of full-time students as reported by the University of Bristol and the University of the West of England[4].

Figure 2: The city of Bristol population 1998-2016



[2] Office of National Statistics

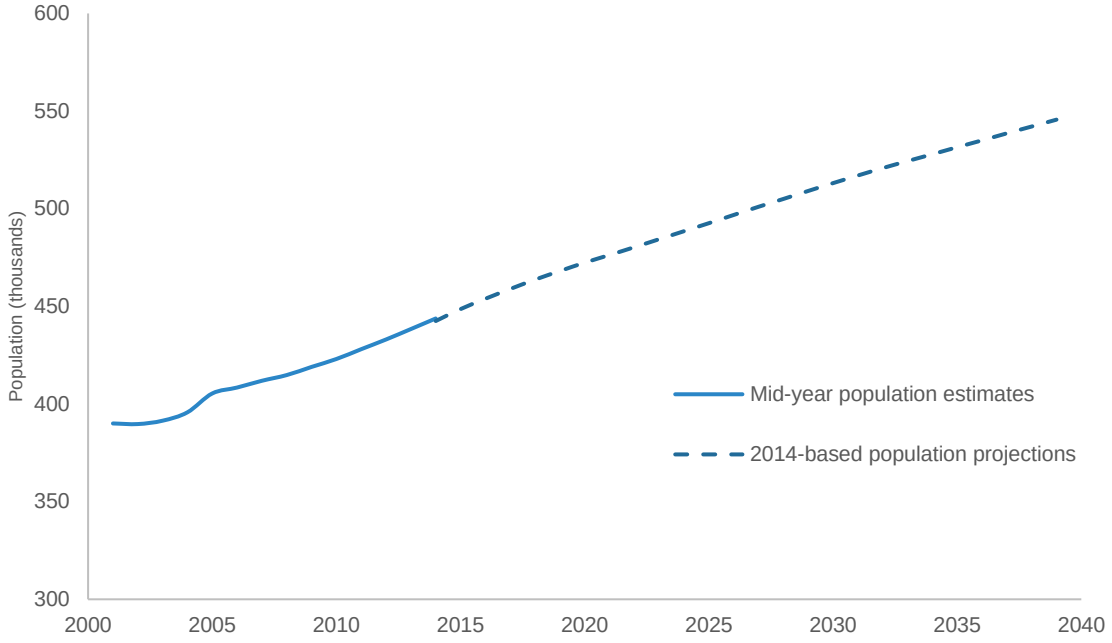
[3] Bristol.gov.uk, Population of Bristol, April 2018

[4] Bristol.gov.uk, Population of Bristol, April 2018

Source: Office of National Statistics

16. The size of the population, as well as the demographics and individual wealth, determine the potential pool of travellers. The larger the amount of people residing in the catchment area of the airport, the larger the potential demand that could be captured. In 2014, the Office of National Statistics produced population estimates for Bristol, which expect its population to reach 545,600 by 2039. This is a projected increase of 23.3%, which is higher than the projection for England as a whole of 16.5%:

Figure 3: Bristol mid-year population estimates and predictions



Source: Office of National Statistics, 2014

17. The population of Southwest England was estimated to be over 5.5 million in 2016, with the largest regions, along with Bristol, being Devon, Gloucestershire, Cornwall, Somerset and Wiltshire and this is detailed in Table 2[5].

Table 2: Population of all counties and unitary districts in Southwest England

Name	Population
Bath and North-East Somerset	187,751
Bournemouth	197,657
Bristol (City of)	454,213
Cornwall	553,687
Devon	779,834
Dorset	422,727
Gloucestershire	623,129
Isles of Scilly	2,308
North Somerset	211,681
Plymouth	264,199
Poole	151,500

[5] Office of National Statistics

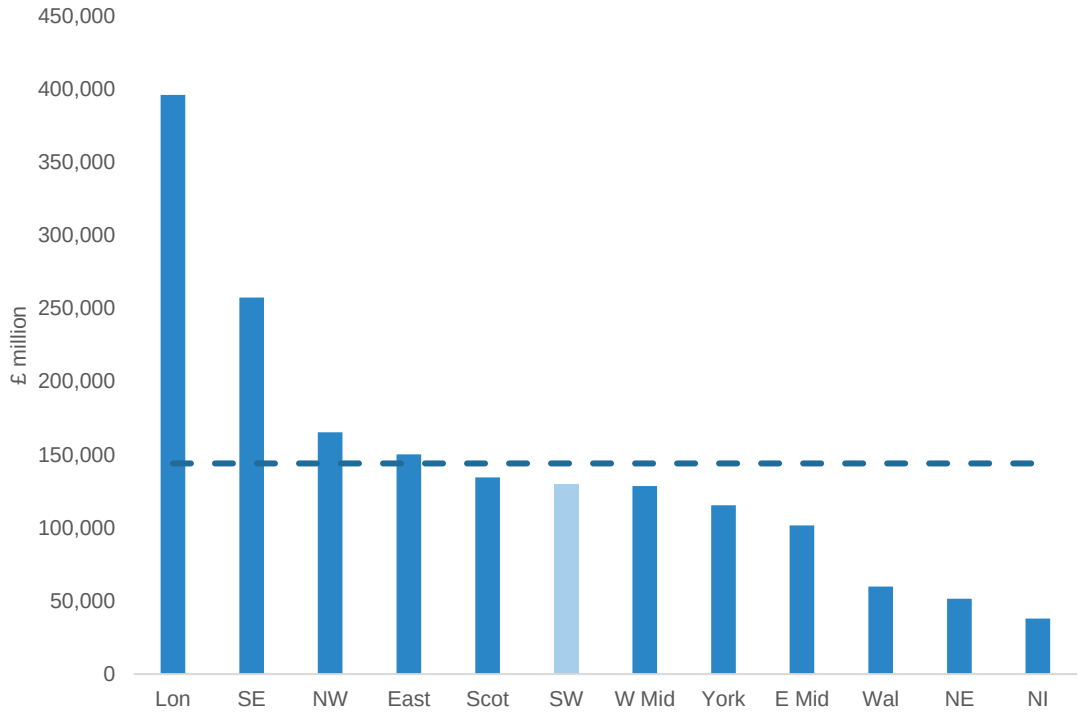
Name	Population
Somerset	549,447
South Gloucestershire	277,623
Swindon	217,905
Torbay	133,883
Wiltshire	488,409
Southwest England	**5,515,953**

Source: Office of National Statistics

4.3 Economy

18. Economic growth is generally a primary driver of air traffic demand. It is often closely related to historical growth of air traffic and so provides a good indicator as to future air traffic growth. Gross Value Added ("GVA") is a measure of the value of goods and services produced in a region and Figure 4 shows the GVA across UK regions for the year 2017. The Southwest of England has an average GVA which is a little below the UK average, although its growth rate has tracked closely to that of the UK as shown in Figure 5 below. In the Southwest region, Bristol is one of the most economically productive areas, contributing a quarter of local economy, along with south-east Dorset and the M4 corridor. These areas have the best links with London. The areas around Bristol, Somerset, Gloucestershire and Wilshire combined contribute another quarter.

Figure 4: United Kingdom Region's Gross Value Added (GVA) by region



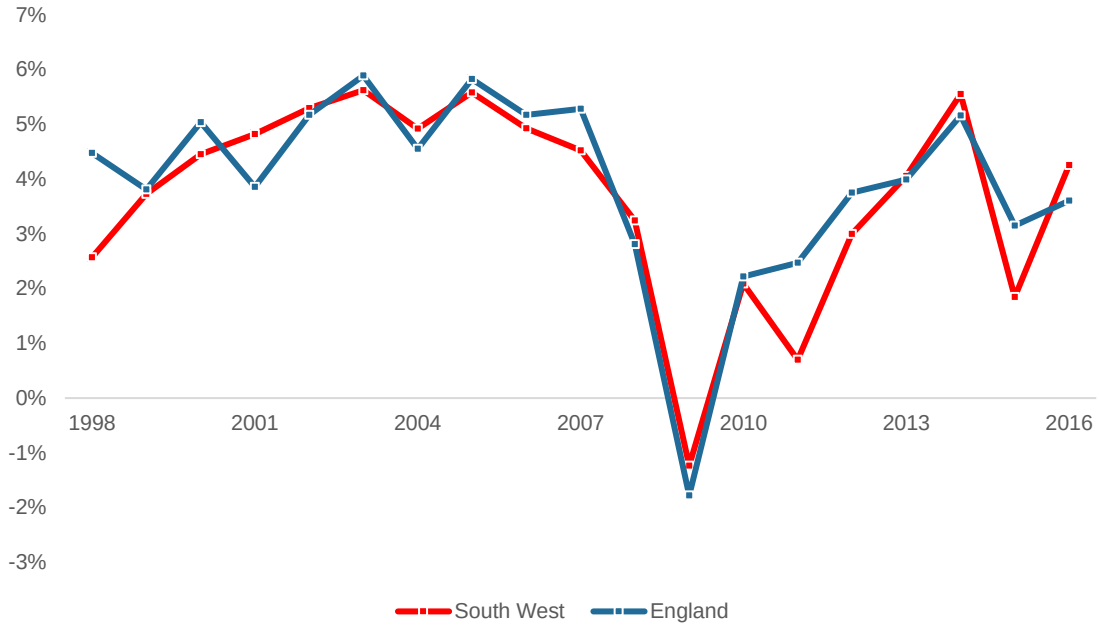
Source: House of Commons[6]

[6] These income approach tables are part of the regional gross value added (balanced) release published on 20 December 2017.

19. According to the Economic Development Division of Bristol City Council, that by 2015, Bristol's GVA was only 3.5% below the level that would have been expected had the 2008 recession not occurred and the economy had continued expanding at the trend rate for the period 2002 to 2007[7].

20. An important catchment area for BRS is the Southeast Wales area which encompasses the major areas of Cardiff and the Vale of Glamorgan as well as Monmouthshire and Newport. In 2016 the GVA per head for the whole Southeast Wales area was £23,718 which is higher than the average for Wales of £19,200. The overall GVA for the area increased by 5.3% in 2016 average of 4.1% for Wales. The per capita income of Southeast Wales is similar to Southwest England (£25,548 per capita), but lower than the Bristol area (£27,156 per capita)[8].

Figure 5: Comparison of Real GVA growth rates – Southwest England v England total



Source: House of Commons[9]

21. Bristol has a long history of trading commodities as it has long been a major seaport. Major imports currently include motor vehicles (of which Bristol is the largest importer to the UK), grain and petroleum products. Aside from its nautical connections, Bristol's economy centres on the aerospace industry, defence, the media, tourism, IT and financial service sectors. A major segment of the local economy is the aerospace industry, whose main companies are BAE Systems, Airbus and Rolls-Royce, all based at Filton[10]. The construction of Hinkley Point C is also expected to add substantially to the Bristol economy. EDF Energy expects that over its construction and operation period, Hinkley

[7] Bristol City Council

[8] Office of National Statistics 2016

[9] These income approach tables are part of the regional gross value added (balanced) release published on 20 December 2017.

[10] Bristol.org.uk, economy

Point C will create 25,000 employment opportunities[11] and these will further strengthen Bristol's growing economy.

22. According to the Oxford Economics local authority district forecasting model, Bristol is set to be one of the UK's fastest-growing cities over the next three years, outpacing London and Birmingham[12]. With GVA growth of 2.3% predicted (well above the national average of 1.8%) the city will be only slightly behind the growth rate of the top two cities of Reading and Manchester, both of which are forecast to grow by 2.4% over the period. The predicted success of Bristol's economy is due to its make-up, containing high growth sectors such as information and communications and professional services.

4.4 Education, workforce and investment climate

23. Companies which are established in Bristol include Airbus UK, Rolls Royce, Dyson, Aardman Animations, BBC, Royal Bank of Scotland, Halifax Bank of Scotland, AXA, Toshiba Research Europe, Lloyds Banking Group, Bank of Ireland, Orange, Hewlett Packard and Garrad Hassan. Bristol's economy and effective communication links offer the prospect of a high standard of living, attract skilled workers and major businesses and help to form a strong foundation for future growth and development.

24. Recent research carried out by Business West as part of the British Chambers of Commerce, indicate that the sectors forecast to show the greatest cumulative growth in Bristol are finance and insurance services and construction, both of which are set to outperform the national average. Significant growth is also expected in the professional and other private services, and information and communication services, over the next five years, at 15% and 14% respectively.

25. Public services are expected to have the lowest cumulative growth rate over the five-year period at 4%. So overall, there will be a rebalancing of the economy away from the public sector towards the professional services and information sectors.

26. Bristol City Council outlines investment opportunities in the city such as regeneration and infrastructure works to make the Western Harbour area a desirable residential development, regeneration of the Temple Quarter City District and the development of a Bristol Metro[13]. Reasons to invest in the area more generally include the population size, transport links with London and other UK regions, and upgrading the region's deep-sea port[14].

4.5 Individual wealth

27. The regional GVA per capita of Southwest England, according to the Office of National Statistics is £23,548[15], which is 11% below the UK average. However, it varies significantly around the region, from well below average in Cornwall (£18,231), Devon (£20,661) and Dorset/Somerset (£21,641), but above the UK average in the Bristol/Bath/Gloucestershire/Wiltshire region closest to Bristol Airport (£27,156). These intra-regional differences are often greater than inter-regional ones, with businesses in

[11] EDF Energy, Nuclear new build projects, Hinkley Point C

[12] EY 2017 Study published on Bristol Business News

[13] Bristol.gov.uk, Bristol Investment brochure

[14] Bristol.gov.uk, Bristol Investment brochure

[15] Office of National Statistics 2016

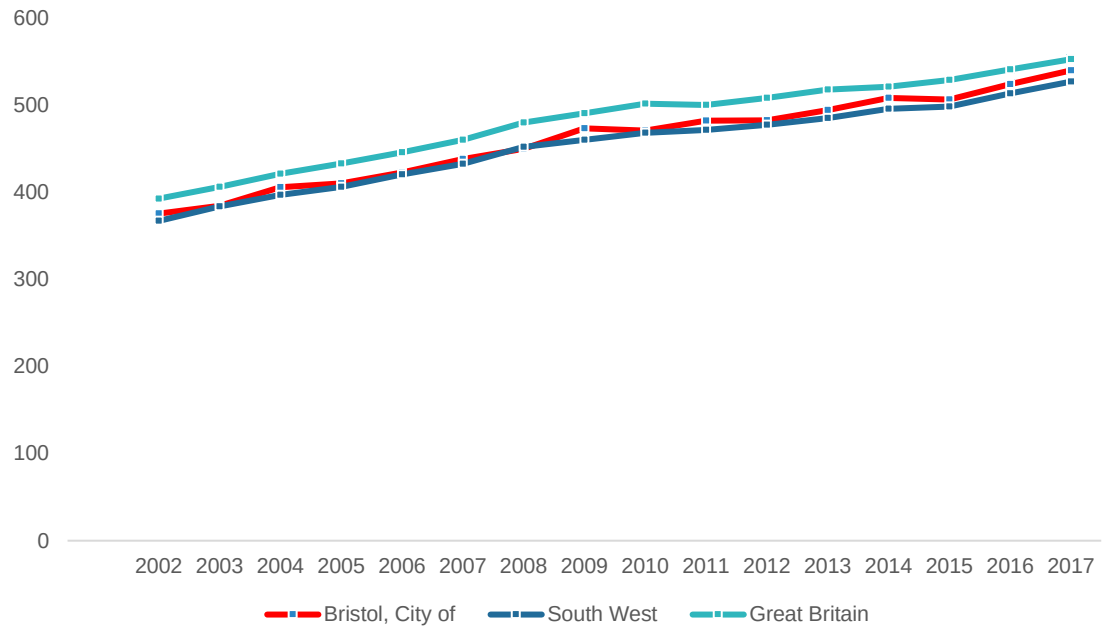
the north and east of the region more heavily influenced by the competitive pressures of the South East and West Midlands than the southern and western counties.

28. According to a report by the European Commission[16], the imbalance in Southwest England is reflected in the various economic sectors within the region, with the southern and western counties more focussed on rural activities and tourism while the northern and eastern counties have more mixed economies which include high-technology manufacturing (e.g. aerospace, defence, electronics) and knowledge-based industries (digital media, semi-conductor design, financial services).

29. Southwest England has a lower unemployment rate at 3.5% than the UK average at 4.2%[17]. As with many UK regions, the Southwest region has experienced a shift in the balance of economic activity with a decline in the manufacturing share of GVA and an increase in the contribution of services.

30. With Bristol being the largest city, as well as the trade and business centre for Southwest England, it is unsurprising that wealth and prosperity is concentrated here. Figure 6 shows average gross weekly pay for full-time workers in Great Britain, the Southwest of England and in the city of Bristol. Average pay in Bristol has become closer to the Great Britain average in recent years and has trended above Southwest England overall.

Figure 6: Average gross weekly pay for full time workers



Source: Office for National Statistics

4.6 Tourism

31. Tourism is an important component of the Bristol economy. The tourism industry is worth more than £1.3bn to Bristol and employment in the sector is estimated at almost 29,000

[16] Regional Innovation Monitor Plus – European Commission

[17] Office of National Statistics, unemployment rates by season January-March 2018

jobs[18]. Bristol receives 9 million visitors each year and it is one of the UK's most popular tourist destinations[19]. Attractions within Bristol and the surrounding region include the Museum of Bristol, Bristol Cathedral, the Clifton Suspension Bridge and Bath, as well as rural areas of Somerset and the Cotswolds[20]. According to the International Passenger Survey ("IPS"), Bristol received 570,000 international visitors in 2016 which made it the eighth most visited town or city by international visitors to the UK. Top visitor markets were from Europe (Germany, Spain, Poland and France particularly) but there were also visitors from further afield countries such as the USA and Australia[21].

32. The World Heritage City of Bath lies within the BRS catchment area and is linked to Bristol via several A-roads as well as by a 10-minute train ride and convenient bus routes. Although its population is under half that of Bristol, Bath is important to the local economy due to the tourism industry. Nearly 5 million visitors come to Bath every year with increasing numbers of international visitors[22].

4.7 Surface access

33. The BRS catchment area contains multiple roads which connect Bristol to three motorways in the region (the M4, the M5 and the M32). The M32 provides an important link to the M4, which in turn provides links to London (eastbound) and South Wales (westbound). The M5 is also within easy reach of Bristol, which provides links to Birmingham (northbound) and Exeter (southbound). Bristol has several train stations, the two biggest being Bristol Temple Meads and Bristol Parkway. Through these two train stations, Bristol's links with the surrounding area are strengthened; Cardiff is less than an hour away and London Paddington can be reached in 1h40min. Figure 7 shows the area which falls within a 90 minutes driving time of Bristol, as well as showing a 25-mile radius around the city:

[18] visitbristol.co.uk, About the visitor economy

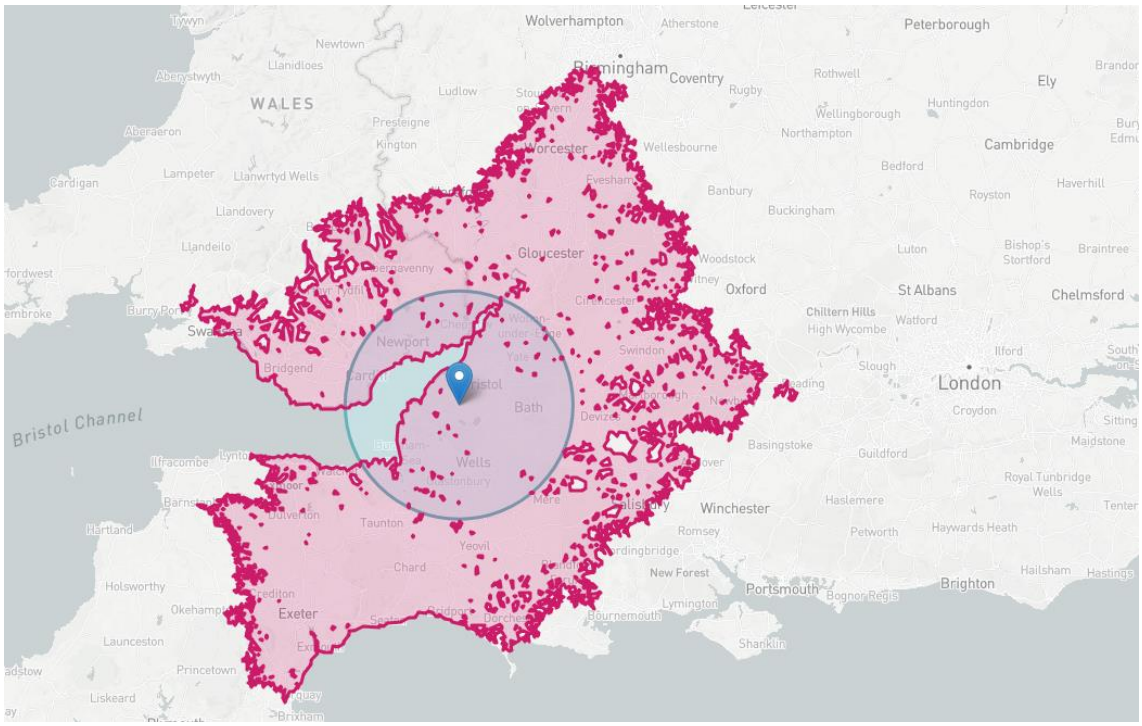
[19] bristol.org.uk/industry

[20] visitbristol.co.uk, About the visitor economy

[21] visitbristol.co.uk, About the visitor economy

[22] Bath and North-East Somerset Council, Tourism and the Visitor Economy

Figure 7: 25-mile radius of Bristol and the area reachable by driving 90 minutes



Source: Travel Time Platform

4.8 Competing airports

34. Figure 8 shows the location of competing airports relative to BRS. The two airports that are geographically closest to BRS are Cardiff-Wales ("CWL") and Exeter ("EXT") which are 60 and 68 miles by road from BRS respectively and can be reached inside an hour and a half[23]. However, two more distant airports can also be reached in approximately two hours via straightforward motorway links, Birmingham and the UK's busiest, London Heathrow ("LHR"). In this section we will discuss each of these airports and the extent to which they may affect traffic at BRS.

[23] RAC route planner, accessed May 2018

Figure 8: Location of Bristol and its competing airports

Source: Google Maps

35. Heathrow ("LHR") handled 78 million passengers in 2017[24] (around 58 million terminating and 20 million transfer passengers) and, according to CAA survey data, nearly 4 mppa of all terminating passengers at the airport had an origin or destination in the Southwest of England[25]. LHR offers a wide range of destinations as well as high frequencies on many short-haul and long-haul routes, which makes it an attractive airport to fly from and it can be reached via the M4 motorway from the BRS region in approximately two hours. However, LHR is operating close to its capacity of 480,000 ATMs per year which in turn means that it is more likely that traffic will 'spill over' to other UK airports. In June 2018, ministers signed off plans for a third runway to be constructed at the airport[26]. While the addition of a third runway at LHR may attract some services away from UK regional airports, such as BRS, the runway is unlikely to be operational before 2026. It is also likely that capacity will remain at a premium at LHR even with a third runway, which is likely to encourage airlines to continue developing services at other UK airports, especially on shorter-haul and leisure-focussed routes.

36. Furthermore, LGW offers those living in the Southwest of England an airport with a well-developed route network and easily accessible via surface transport. LGW has a strong LCC profile with many leisure routes, whereas LHR is caters more for long-haul destinations. The below table shows the share of passengers derived from the Southwest

[24] Heathrow.com

[25] CAA passenger survey 2017

[26] BBC news, Heathrow Airport: Cabinet approves new runway plan, 5 June 2018

using London airports, with the total passengers within the BRS catchment area using London airports totalling around 7 million passengers in 2017.

Table 3: Origin/destination of terminating scheduled passengers

	Gatwick	Heathrow	Luton	Stansted
% Share	5.1%	6.8%	2.1%	1.9%
Airport 2017 Traffic (mppa)	45.6	78.1*	15.8	24.3
South West Traffic (mppa)	2.3	4.0	0.3	0.5

Source: CAA 2017 Passenger survey

(*) Of LHR's total 78m passengers, around 58m were terminating passengers with the balance on connecting flights

37. Birmingham ("BHX") handled almost 13 million passengers in 2017 and it is one of the busiest UK airports outside the London area. It is a base for Flybe, Ryanair, Thomas Cook and TUI and easyJet operates a limited route network from the airport[27]. The CAA 2017 passenger survey indicated that nearly 4% of BHX's terminating passengers had an origin or destination in the Southwest of England, which indicates that it provides more limited competition for the region's traffic than LHR, despite it being able to be reached in less time than LHR (1 hour and 48 minutes compared to just over 2 hours)[28] and this is likely due to the more limited range of destinations served from BHX relative to LHR. In addition, the drive-time to BHX from the BRS area is comparatively long which might also limit the airport's attractiveness from the region, especially given the range of routes available at BRS.

38. Cardiff-Wales ("CWL") is the closest airport to BRS and therefore arguably one of the more likely to provide direct competition to BRS. It is owned by the Welsh Government and handled 1.5 million passengers in 2017, which makes it considerably smaller than BRS at 8.2 million[29] and its traffic is primarily leisure travellers, with sports related travel prominent in the leisure mix (Wales hosts large sporting events at venues such as the Millennium Stadium)[30]. CWL has a longer runway than BRS (2,392m v 2,011m)[31] which may enable it to handle larger aircraft on longer-haul services - Qatar Airways, for example, has begun serving the airport - and it is closer to many of Wales' population centres.

39. However recent financial results at CWL have been poor (a pre-tax loss of £5.97 million was recorded for the 2016-17 financial year and this followed a pre-tax loss of £4.9 million the year before)[32]. In addition, traffic growth at CWL has been weak in recent years; the airport handled a little over 2 million passengers at its peak in 2007, but this figure has yet to be matched since[33]. The Welsh Government has made loans of £10 million to improve the terminal and £13 million for route development and it is hoped that passenger numbers may climb once more[34], although the airport has a long way to go before it reaches numbers approaching those of BRS.

[27] Centre for Aviation (CAPA)

[28] RAC route planner

[29] CAA passenger statistics

[30] Centre for Aviation (CAPA)

[31] Centre for Aviation (CAPA)

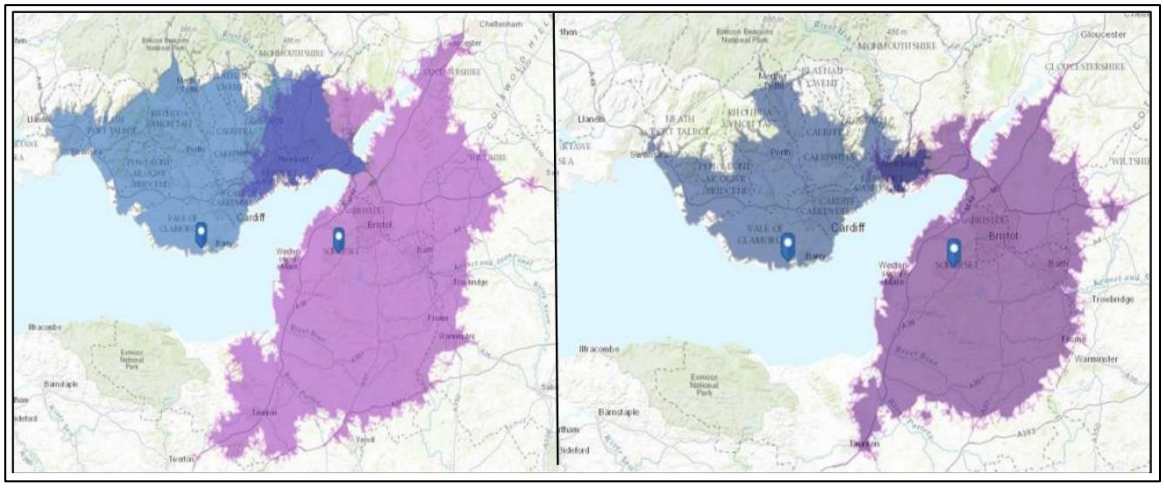
[32] BBC News Wales, "Cardiff Airport government cash 'could be recouped' by 2021", 26 April 2018

[33] CAA passenger statistics

[34] BBC News Wales, "Cardiff Airport government cash 'could be recouped' by 2021", 26 April 2018

40. Furthermore, a publication by Northpoint on behalf of the Welsh Government in June 2017, suggested that CWL has a largely distinct catchment area from BRS[35]. Two figures were included in the report (as shown in Figure 9) which show the 60-minute off-peak drive time (left) and 60-minute peak period drive time catchment areas of the two airports:

Figure 9: Catchment areas of BRS and CWL – 60 min Off-Peak and Peak Driving Times



Source: Northpoint Aviation, Travel and Tourism Consultants, "Devolution of Air Passenger Duty to Wales", June 2017, p18-19

41. It would appear from these charts that the extent to which CWL should be considered a rival for the same catchment area as BRS may be limited and that BRS is likely to continue benefiting from economic and tourism growth in its immediate region.

42. Exeter (EXT), 68 miles away and operated by Regional and City Airports Ltd, is a base for Flybe and TUI. It handled approximately 900,000 passengers in 2017[36], so smaller still relative to BRS, and its traffic is largely outbound leisure. Most traffic heads to holiday destinations across Europe and the Mediterranean (and much of this during the summer months), while Flybe provides year-round services to a relatively limited number of destinations in the UK and Europe. The last CAA passenger survey conducted at EXT (2012) reported that the majority of its passengers are from Devon which appears to suggest that EXT is used predominantly by local residents; less than 0.5% of its passengers were reported as travelling to or from the city of Bristol or north-east Somerset.[37]

43. Figure 10 compares passenger traffic growth at BRS relative to BHX, CWL and EXT for the period 1997-2017. As already discussed, BRS handles considerably more passengers than its closest neighbours, CWL and EXT, but it has also enjoyed stronger traffic growth in recent years; for the period 1997-2017, BRS traffic grew at a CAGR of 8.6% (compared to 1.4% for CWL and 7.6% for EXT), but between 2010-2017, BRS grew at a CAGR of 5.3% while CWL and EXT experienced growth of 0.7% and 3.0% respectively. BHX traffic growth has been comparable to that of BRS (6.1% per annum

[35] Northpoint Aviation, "Devolution of Air Passenger Duty to Wales", June 2017

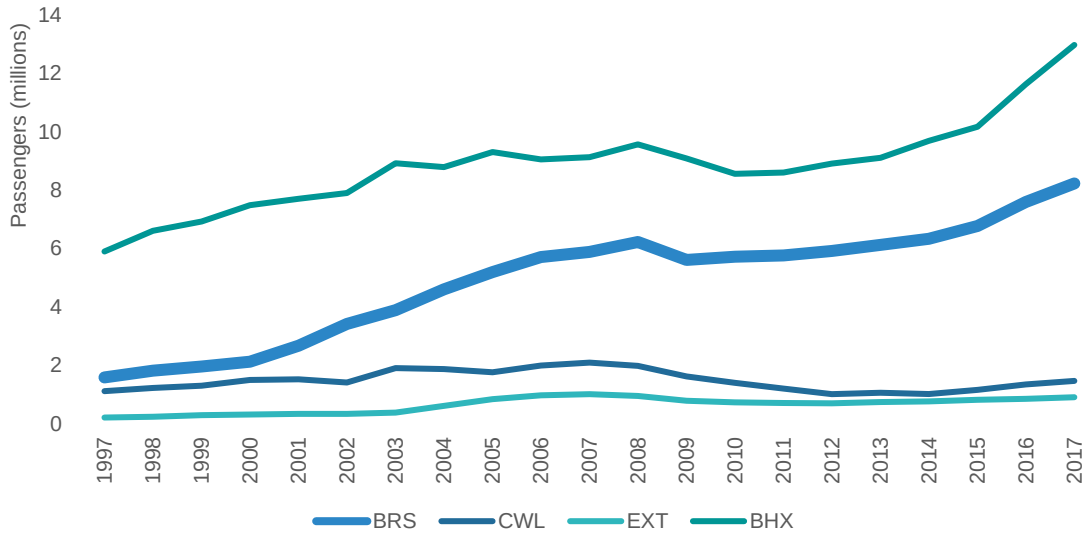
[36] CAA passenger statistics

[37] CAA passenger survey, 2012

between 2010-2017), although as shown by the CAA passenger survey data, this airport attracts relatively few passengers from the Southwest of England.

44. BRS also serves more destinations that either CWL or EXT (over 100 compared to approximately 50 and 30 respectively)[38] and, with capacity likely to remain an issue at LHR and BHX attracting relatively few passengers from the region, it appears BRS is in a strong position to remain Southwest England's main airport in the coming years.

Figure 10: Passenger traffic at BRS and competing airports 1997-2017



Source: CAA passenger statistics

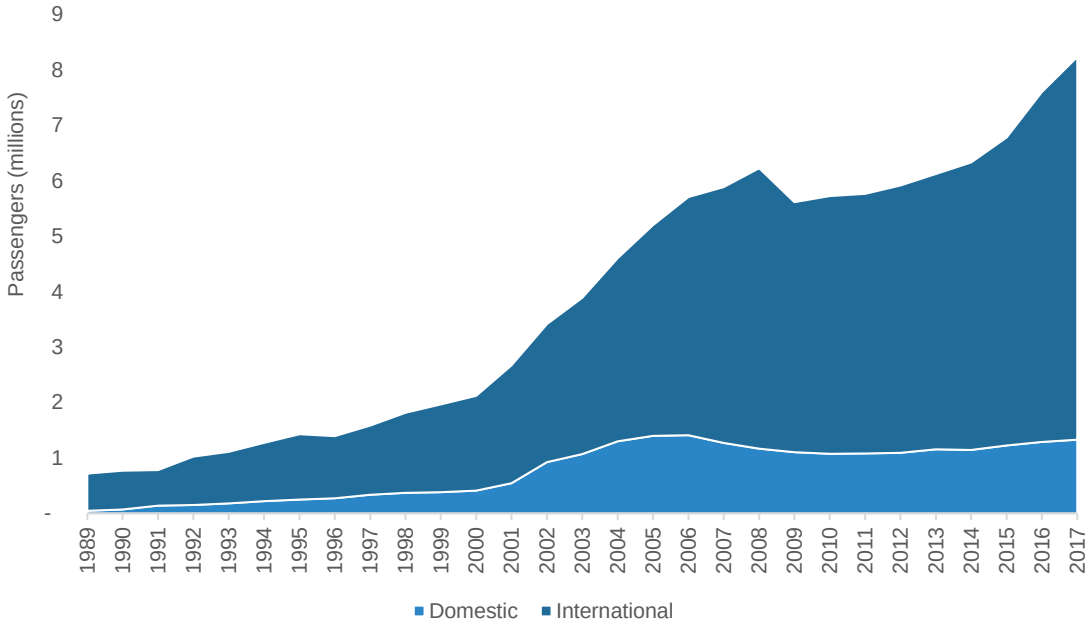
[38] SRS Schedules Analyser, accessed May 2018

5 Bristol Air Transport Market

5.1 Overview of BRS historic traffic

45. During 2017 BRS handled a little over 8.2 million passengers, which made it the ninth busiest UK airport and the fifth busiest outside the London area, after Manchester, Edinburgh, Birmingham and Glasgow[39]. In the years since the Global Financial Crisis, passenger traffic has grown by an average of 5% per annum (2009-2017) but has grown at over 10% per annum during the last two years (2015-2017). The below figure shows the development of passenger traffic at BRS between 1989 and 2017:

Figure 11: Bristol Airport Passenger Traffic 1989-2017



Source: Civil Aviation Authority statistics, tables 10-1 and 10-2

46. After experiencing steady growth during the 1990s, traffic at BRS accelerated markedly during the 2000s and this was largely due to the growth of low cost services. In May 2001, British Airways' low-cost carrier, Go, began operations at the airport with a service to Nice and by summer 2002 Go's BRS operations had grown to ten destinations and 18 daily departures[40]. During summer 2002 Go was acquired by easyJet but the BRS route network continued to expand rapidly; by summer 2007, easyJet was serving over 30 destinations from the airport[41].

47. Traffic has grown year on year since 2009 and in the last two years it has grown markedly as easyJet have launched new routes and based further aircraft at the airport. easyJet

[39] Civil Aviation Authority passenger statistics, calendar year 2017

[40] Anna Aero, 2007

[41] Anna Aero, 2007

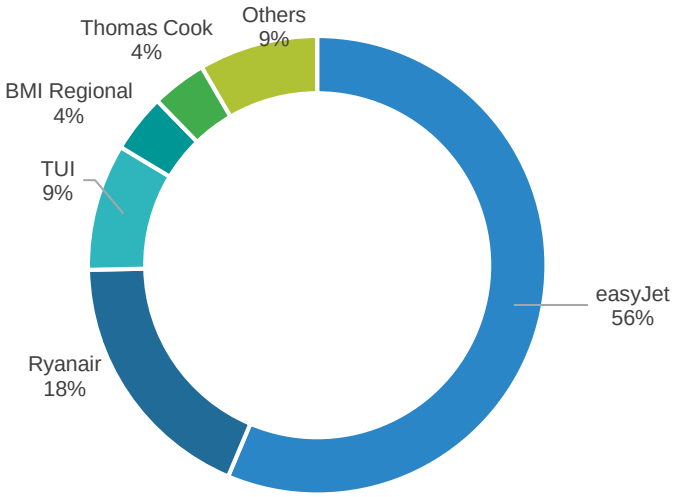
continues to add new routes at BRS (Genoa and Seville were added in 2018)[42] and Ali Gayward, easyJet's UK Country Manager, stated that easyJet is 'excited to continue to grow and expand in Bristol'[43]. With over 100 A320neo and 30 A321neo aircraft on order[44], it is likely that easyJet will be seeking further opportunities for growth in the coming years. This will be assisted by increasing capacity constraints at London airports at least until the opening of a new runway at LHR from around 2027.

48. The majority of BRS passengers are travelling internationally (over 80% during 2017) and this is a continuation of historical trends observed at the airport over the last 30 years. Apart from the period 2001-2007, which coincided with rapid easyJet growth, international traffic has accounted for over 80% of the total since 1999. In recent years, international traffic has grown at an average of 5.5% per annum (2009-2017) compared to 2.3% for domestic.

5.2 Airline activity

49. easyJet is the largest carrier at BRS in terms of departing scheduled seat capacity. As shown in Figure 12, this airline accounts for over half of the departing scheduled seat capacity:

Figure 12: BRS departing scheduled seat capacity by airline, calendar year 2018



Source: SRS Schedules Analyser, accessed May 2018

50. easyJet provides services to over 60 destinations across Europe and the UK from BRS, which is its largest UK base outside the London area (13 aircraft were based at the airport as at November 2017)[45]. The pattern of easyJet growth at BRS looks set to continue as the airline has added further routes during 2018.

[42] Bristol Airport news releases, 2018
[43] Bristol Airport news releases, 2018
[44] Centre for Aviation (CAPA)
[45] Bristol Airport news releases, 2017

51. Ryanair, the second largest carrier in terms of scheduled departing seat capacity, flies to over 30 European destinations from BRS. However, it competes directly with easyJet on only 10 of these (Alicante, Faro, Gran Canaria, Ibiza, Krakow, Lanzarote, Malaga, Palma de Mallorca, Tenerife and Venice)[46]. These routes are all popular holiday destinations so demand can therefore likely support services from both airlines. Aside from these routes, in general Ryanair focuses more on eastern European services (serving destinations such as Bucharest, Budapest, Gdansk and Kaunas) and services to its Dublin hub, whereas easyJet focuses more heavily on western Europe (the UK, Spain, France and Italy form the largest shares of easyJet outbound capacity)[47].

52. TUI Airways bases three aircraft at BRS[48]. While it flies primarily to holiday destinations in Europe (Spain and Greece forming its largest share of scheduled departing capacity), it also offers long-haul services to destinations such as Cape Verde, Mexico and Orlando-Sanford in the USA. For these routes, TUI flies Boeing 787-8 and 787-9, aircraft which is the largest type currently scheduled to fly from BRS[49].

53. Other operators serving the airport include BMI Regional, which has an operating base at BRS and flies to several European destinations (the majority of which are in Germany), as well as Aberdeen in the UK, Thomas Cook, which serves leisure destinations predominantly within Spain, Greece and Turkey, and KLM which serves its hub at Amsterdam Schiphol[50].

5.3 Route analysis

54. Figure 13 shows the departing scheduled capacity from BRS by region. Most of the route network is to Western European destinations (Spain, France, Italy and Ireland being the top four countries), while domestic services are predominantly to airports in Scotland, Northern Ireland and the Channel Islands. Other Europe comprises Eastern Europe (e.g. Poland, Hungary, Czech Republic) and Turkey, while Rest of World comprises the long-haul Cape Verde, Mexico, Caribbean and Orlando-Sanford services.

[46] Mott MacDonald analysis of SRS Schedules Analyser data, accessed May 2018

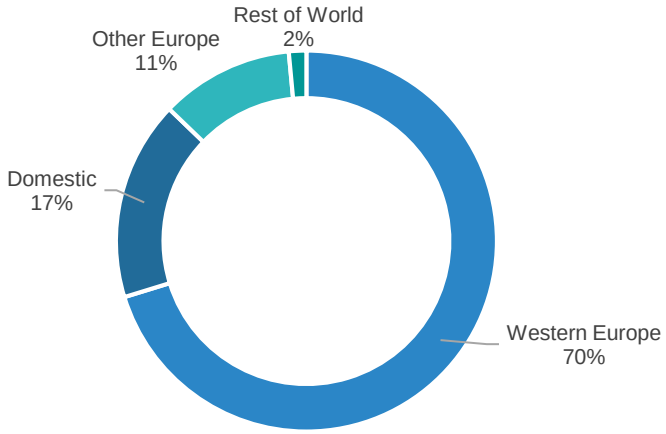
[47] Mott MacDonald analysis of SRS Schedules Analyser data, accessed May 2018

[48] Routes online.com

[49] Mott MacDonald analysis of SRS Schedules Analyser data, accessed May 2018

[50] Mott MacDonald analysis of SRS Schedules Analyser data, accessed May 2018

Figure 13: BRS departing scheduled seat capacity by region, calendar year 2018



Source: SRS Schedules Analyser, accessed May 2018

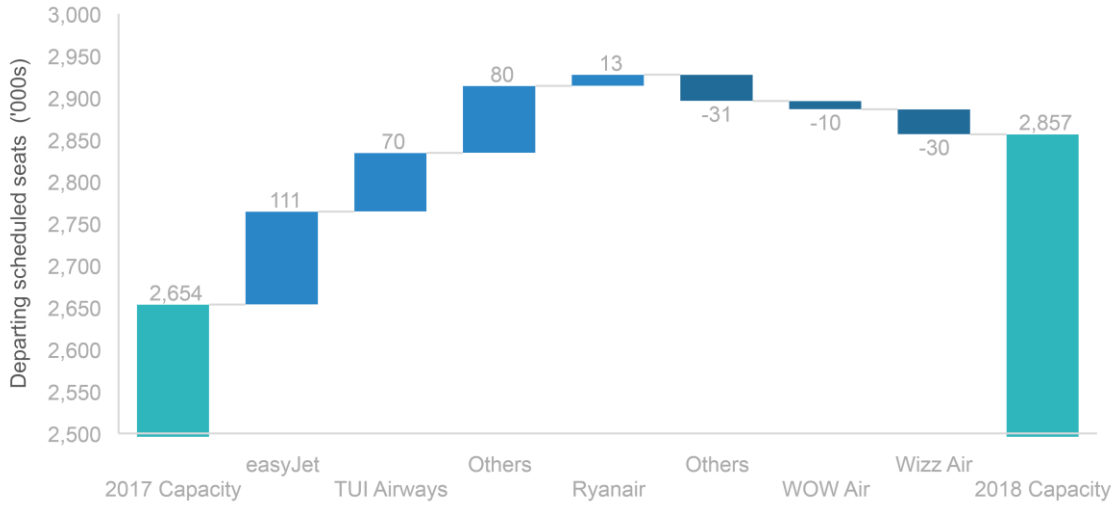
55. Most passengers using BRS are UK residents travelling for leisure purposes[51] and these passengers are well-served from the airport, with an array of popular holiday destinations on offer. Analysis of Sabre Airline Solution's Market Intelligence database indicated that just 3% of passengers using BRS were traveling onwards via a connecting airport[52], which is indicative of a largely outbound leisure market where passengers are mainly flying on holiday directly to their destination and then returning. An absentee in the BRS route network is New York, which welcomes more international visitors from the UK than any other country[53] and is one of the most visited long-haul destinations. Newark was previously served from BRS by Continental Airlines between 2005 and 2010[54] but currently no airline serves the New York area directly. With BRS experiencing growing passenger demand, there may be an opportunity for a carrier to explore the possibility of re-instating this route.

5.4 Capacity

56. Figure 14 shows the variations by airline in departing scheduled seat capacity from BRS between April-October 2017 and 2018. Overall, April-October 2018 seat capacity is showing 7.6% over 2017. The largest contributors to the increase are easyJet, which has introduced new routes, and TUI, which has added routes such as Antalya and Bodrum as well as increasing capacity on others, such as Palma de Mallorca and Tenerife. Airlines which have decreased capacity are WOW Air, which has ceased serving BRS and Wizz Air, which has dropped its routes to Kosice, Sofia and Warsaw[55]. It should be noted the Winter 2018/19 schedule is still subject to further adjustment following the IATA Slot Conference in June 2018, therefore, data between April and October was compared only[56].

[51] CAA 2015 passenger survey, Table 2.2
[52] Mott MacDonald analysis of MIDT Sabre
[53] Crainsnewyork.com
[54] Anna Aero 2007
[55] SRS Schedules Analyser, accessed May 2018
[56] IATA.org, 142nd Slot Conference

Figure 14: BRS Scheduled Departing Seat Capacity April – October 2018 v 2017

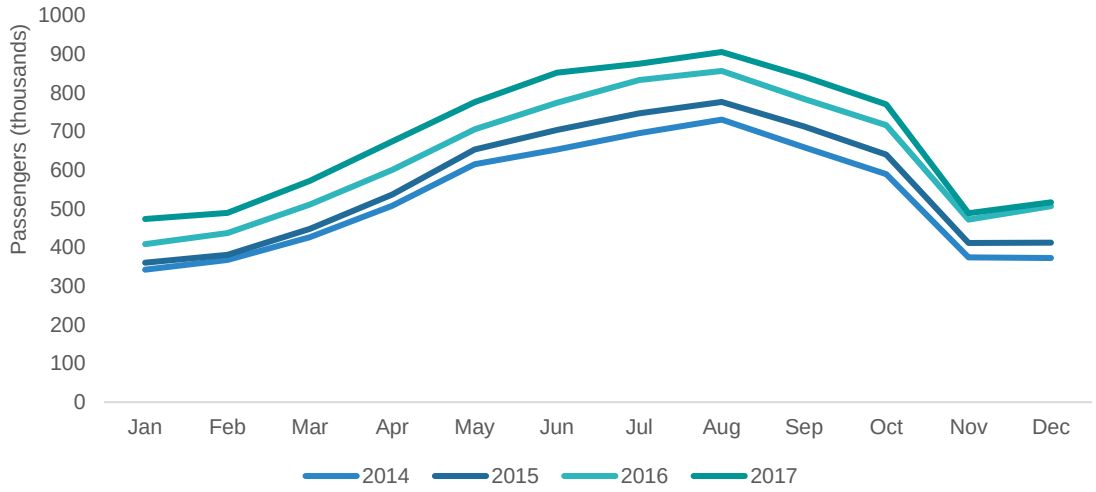


Source: SRS Schedules Analyser, accessed May 2018

5.5 Seasonality

57. BRS experiences its greatest passenger flows during the summer season (April-October), as illustrated by Figure 15:

Figure 15: BRS passenger throughput by month 2014-2017



Source: Civil Aviation Authority monthly statistics

58. Over the previous four years approximately 70% of the passenger throughput at BRS has occurred between April and October, although this share has dropped marginally over the last three years (from 70.3% in 2015 to 69.1% in 2017). In forthcoming years BRS is likely to continue exploring ways in which traffic can be grown in the shoulder seasons and therefore make best use of its facilities.

6 Independent Forecast Validation

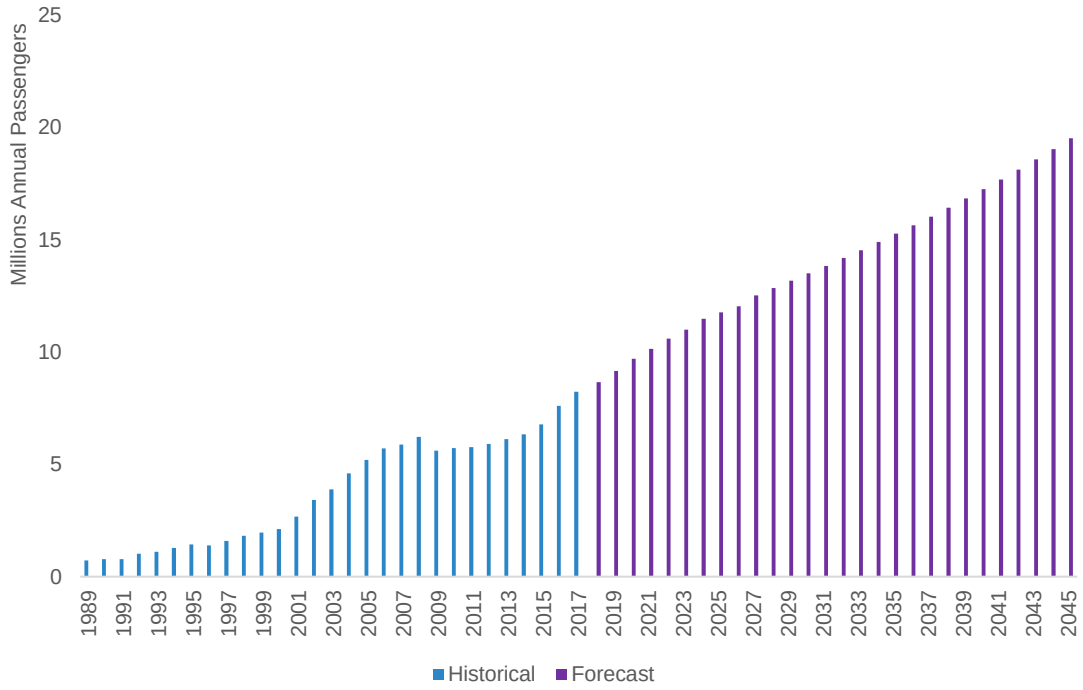
6.1 Bristol Airport Management forecast review

59. BRS Management have performed a forecast study of expected growth of passenger traffic. This forecast blended a top-down econometric model with a bottom-up, airline by airline, approach. For the period until 2027 BRS Management have forecast the supply of seat capacity, load factors and based aircraft. This bottom-up approach makes informed assumptions regarding the level of air service that can be expected over the planning period.

60. Mott MacDonald consulted the main BRS airline operators as part of this forecast validation project. The airline feedback broadly validated the BRS Management assumptions. In Mott MacDonald's view, the BRS Management short-term assumptions are reasonable.

61. Following the short-term developments, BRS Management have assumed a GDP elasticity of approximately 1.3 for the long-term. Therefore, this indicates that with each 1% increase in UK GDP results in a 1.3% increase in traffic from BRS. The BRS Management forecast results are presented in Figure 16:

Figure 16: Bristol Airport Management Passenger Forecast

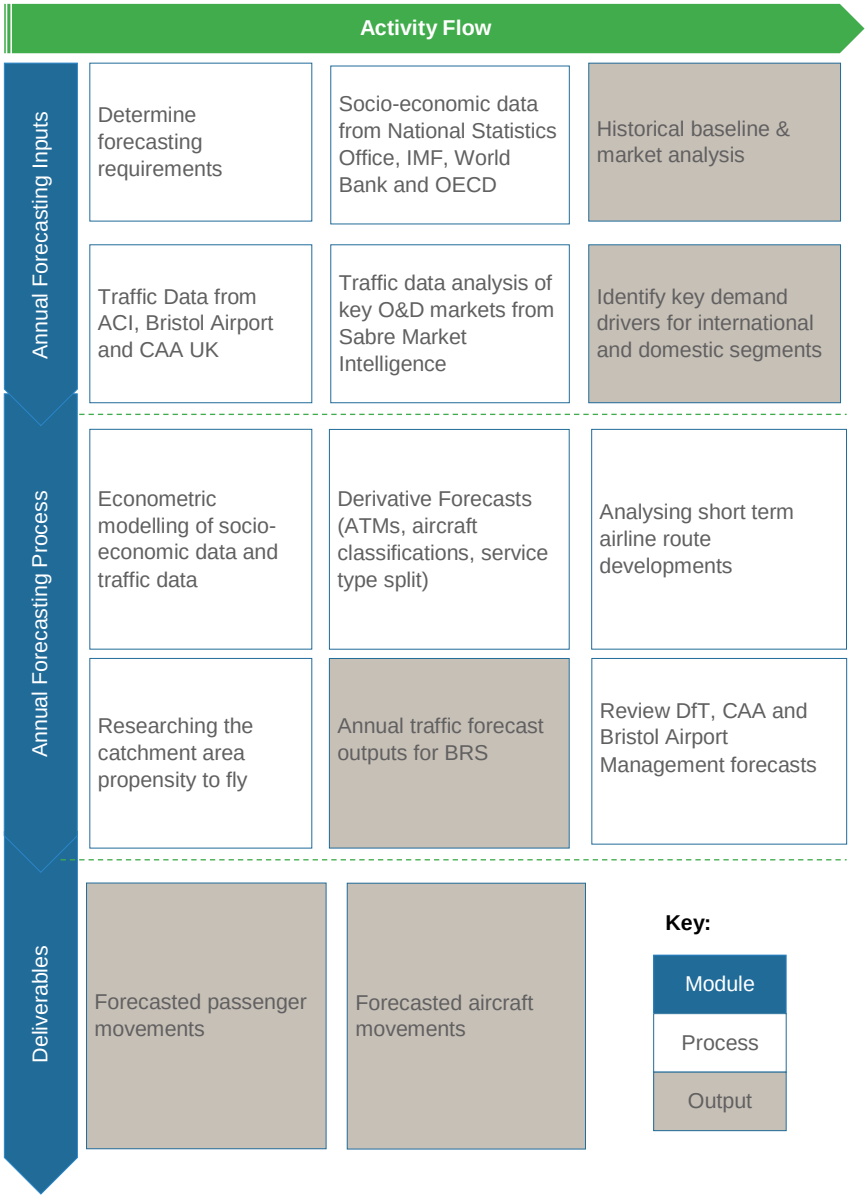


Source: BRS Management

6.2 Mott MacDonald traffic forecast methodology

62. Air travel is a derived demand. Demand for air transportation between origin and destination markets is derived from the socio-economic interactions between these markets, shaped by carriers' networks and available aircraft capacity. Generally, business/trade activity and tourism/visitor activity constitute the primary components of air travel at an airport. Dependable forecasting practice requires awareness of the uncertainties surrounding the forecasts. As discussed earlier, the Mott MacDonald team has investigated the key factors likely to affect traffic activity at BRS. However, as with any forecasts, there are uncertainties regarding these factors, such as the outlook for the local and world economies and the structure of the airline industry. A pragmatic and yet systematic approach has been used to produce a set of air travel demand forecasts for BRS. The following sections describe the methodology used by Mott MacDonald to forecast air traffic at BRS.

6.2.1 BRS Traffic Forecast Methodology Flowchart



6.2.2 Key Assumptions

The main assumptions underpinning the Mott MacDonald baseline scenario include:

No capacity constraint

63. The forecast assumes that no capacity issue in any component of the system will restrict the evolution of traffic. The term ‘component of the system’ refers to any element that is crucial for the capacity of an airport from its access, landside infrastructure, and terminal building to its runway and taxiway system.

No new airport in the Southwest England region

64. The forecast assumes that there will be no new airport or any material changes to any existing airport in the Southwest of England, or the UK, during the forecast period, excluding for the planned Heathrow expansion assumption described below.

Regained Southwest traffic

65. The total spill-over traffic of Southwest residents using London airports in 2017 was around 7 million passengers (as calculated in Table 3), mostly using Heathrow and Gatwick. Increasing capacity constraints at both of these London airports, up to the opening of a third Heathrow runway, are expected to help BRS capture a greater share of this Southwest resident traffic (up to 10% of spilt traffic), as well as attract airlines to base aircraft at BRS when London slots are scarce. Following the opening of a new runway in London, increased London competition is expected to result in Bristol Airport's share of the Southwest market returning to current levels.

Heathrow Expansion

66. For the base case, it is assumed that third runway will be operating in 2027, while in the high case, the expansion will be delayed to 2030.

Government Intervention

67. The present traffic forecasts do not consider or recommend any Government intervention to affect the airlines or destinations distribution among BRS. The general assumptions detailed above reflected the current situation and elements that have been made available to the team. Should those assumptions be modified with the time, the conclusion of this study may be affected.

Liberalisation

68. A key aspect in strong passenger travel growth over the past decades is increasingly liberalised markets. Liberalisation has encouraged significant traffic growth by removing restrictions on route entry, pricing, service capacity, and airline cooperative arrangements. As airline competition and operating efficiency have grown, pricing has decreased in real terms. Open Skies agreements have also promoted strong growth in the commercial airline industry, extending liberalisation and higher levels of competition to international and long-haul markets. The forecasts assume a continued liberalised aviation market.

Economic and Geopolitical Shocks

69. The forecast UK GDP does not include sharp downturns of the global or local economy. Generally sharp downturns of economic growth would usually result of a decline of air traffic. Likewise, any civil unrest, war, natural disaster, terrorist attack or any other hostile geopolitical event could affect air traffic and is not specifically incorporated into the forecast.

Brexit

70. The forecasts do not specifically build in a 'Brexit' effect as there is a great deal of uncertainty as to how this may affect patterns of air traffic, not just at BRS but across the UK and Europe. However, the GDP forecasts from the IMF, EIU and Oxford Economics reflect ongoing uncertainty with regards to Brexit and this can be seen in Figure 18, where

the predictions from these three outfits are considerably lower than those produced by the OECD pre-Brexit.

APD

71. Mott MacDonald have assumed that there would be no alteration to the existing Air Passenger Duty for UK airports during the forecast period. It is reasonable to assume that if the UK Government devolved powers over APD rates for flights from Welsh airports to the Welsh authority, and that if the authority set the APD rates on flights departing from Welsh airports to zero, this would have an adverse impact to BRS traffic due to the catchment areas overlapping with CWL.

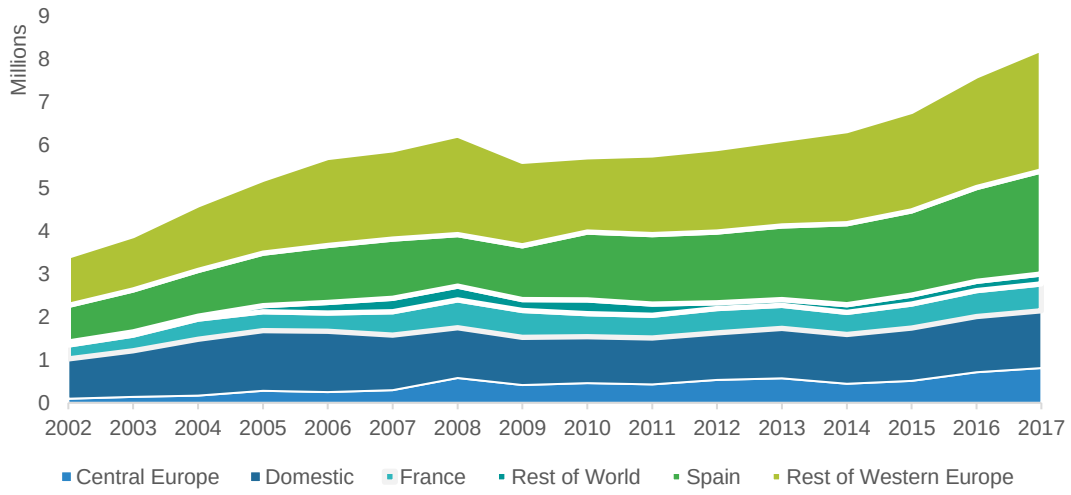
6.2.3 Econometric Analysis

72. To prepare the passenger forecast, Mott MacDonald used an econometric modelling approach. Historic passenger traffic within the major markets at BRS between 2002 and 2017 has been related to the historic development of various socio-economic variables, such as the economic growth in the UK, per capita incomes and low-cost carrier ("LCC") penetration.

73. Mott MacDonald evaluated the economic outlook for the UK and key international source markets and assessed air passenger traffic growth at BRS against these economic drivers. Mott MacDonald then used regression analyses to quantify the relationship between air traffic and key drivers and combined the economic drivers with regression analyses to derive passenger and ATM traffic forecasts.

74. The econometric model forecast passenger flows for key markets including Spain, France, Western Europe, Central Europe and the UK (domestic). The historic passenger development for these markets are shown in Figure 17:Figure 18

Figure 17: BRS Passenger Markets



Source: MIDT and CAA

75. Regression analysis showed that UK GDP is the variable with the strongest correlation with historic domestic traffic development. This regression analysis produced high adjusted R^2 value, indicating that this variable is likely to serve as a reliable predictor for future traffic development. For each market UK GDP was regressed against the market's

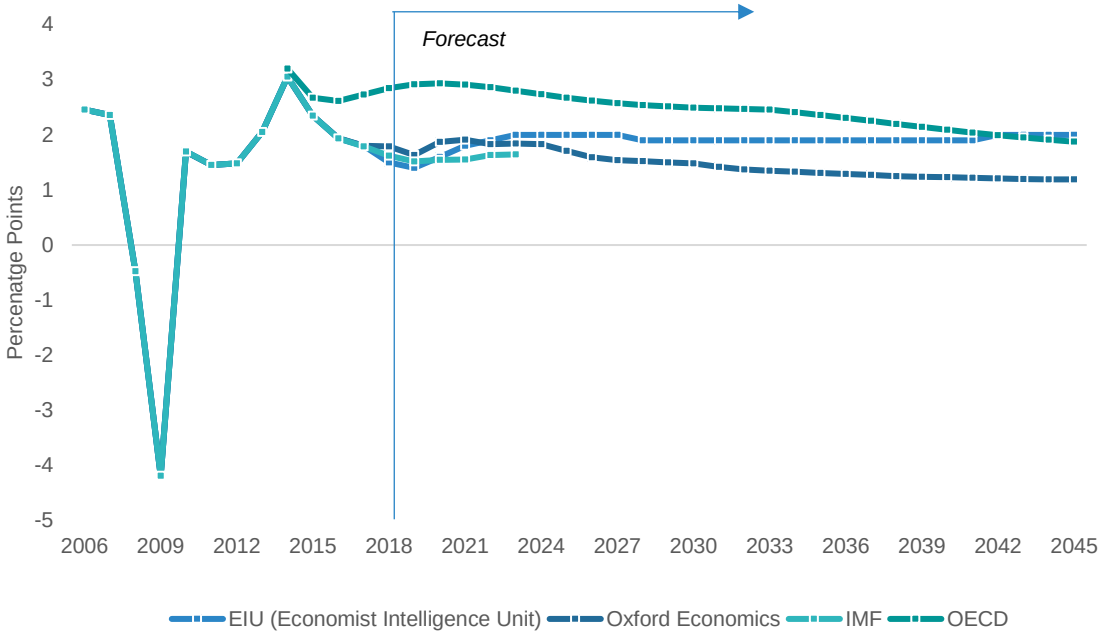
historic air passenger volumes at BRS. The final model was selected based on statistical fit, parameter robustness and the plausibility of the parameter estimates produced.

76. In many cases, demand for air travel grows at a rate higher than that of the economy, so that each 1% increase in GDP results in air traffic growth of 1.0% to 2.0%. However, as markets mature, the GDP elasticity tends to decline, meaning that over time GDP growth has a smaller impact on air travel growth. The USA, for example, tends to have relatively low elasticities between economic growth and air travel demand. Domestic USA travel demand is often recognised to have an elasticity ratio to economic growth of 1.0. In contrast, a developing economy may have elasticities exceeding 2.0. The regression results indicate GDP elasticities at BRS ranging from 1.2 for domestic traffic and 3.8 for Central Europe traffic. The domestic elasticity value is typical for a mature market such as the United Kingdom, while the relatively high Central Europe elasticity is common for emerging markets, especially one where demand for air travel has been stimulated by low-cost carriers offering lower fares which make air travel affordable for a growing number of people within a greater range of wage brackets.

77. This understanding of air travel demand relative to income elasticities was applied in preparing the forecasts. As the market matures and gradually reaches saturation, the GDP elasticity will decline to a value reflecting the maturity of the local air transport market. Based on the results of each model, the elasticity multipliers were applied to economic projections at the starting point of each long-term forecasts. As the forecast years progress, decreasing elasticities of demand were applied so that the long-term forecast reflects the growing maturity of the market as well as the source markets. Finally, the output was critically reviewed for reasonableness, validated the projections using independent industry regional forecasts, such as Airbus forecasts, and made adjustments to the year-over-year passenger growth rates as necessary. Historic and forecast GDP for the markets were sourced from official and reputable industry sources as listed below:

- International Monetary Fund (IMF): World Economic Outlook Database April 2018;
- Organisation for Economic Co-operation and Development (OECD): Long-term GDP baseline projections, No. 95 (Edition 2014);
- Oxford Economics;
- Economist Intelligence Unit.

Figure 18: UK Real GDP Percentage Change Growth Projections



Source: EIU, Oxford Economics, IMF, OECD

Table 4: Econometric Model Performance

Elasticity Name	Elasticity	Elasticity p-value	Adjusted R-Square
UK GDP – BRS Spain Traffic	2.9183	<0.001	0.9096
UK GDP – BRS France Traffic	1.9807	<0.001	0.8090
UK GDP – BRS Western Europe Traffic	2.4556	<0.001	0.8892
UK GDP – BRS Central Europe Traffic	3.8961	<0.001	0.8164
UK GDP – BRS Other International Traffic	3.3997	<0.001	0.9151
UK GDP – BRS Domestic Traffic	1.2276	<0.001	0.8445

Source: Mott MacDonald Analysis

6.2.4 Scenarios

78. All traffic forecasts are subject to a degree of risk and uncertainty. Forecasts are based on underlying assumptions such as economic growth traffic stimulus, fuel and airfare prices, new aircraft technology, tourism trends, etc. Although forecast assumptions are developed from the best-known intelligence, and careful analysis and experience, it is difficult to determine how these factors might vary.

79. Two alternative forecast scenarios, along with the base scenario, have been developed to gain a better understanding for the possible range of outcomes: (1) a low scenario, which in general takes on a more conservative stance towards factors such as economic performance, new air service traffic development, airline fleet deliveries, airline success, etc. and (2) a high scenario, which assumes a more positive view on the economic

development, as well as an accelerated pace for anticipated short-term air service traffic developments.

80. The following summarizes the variations that have been applied to the baseline forecast to generate the low and high scenarios:

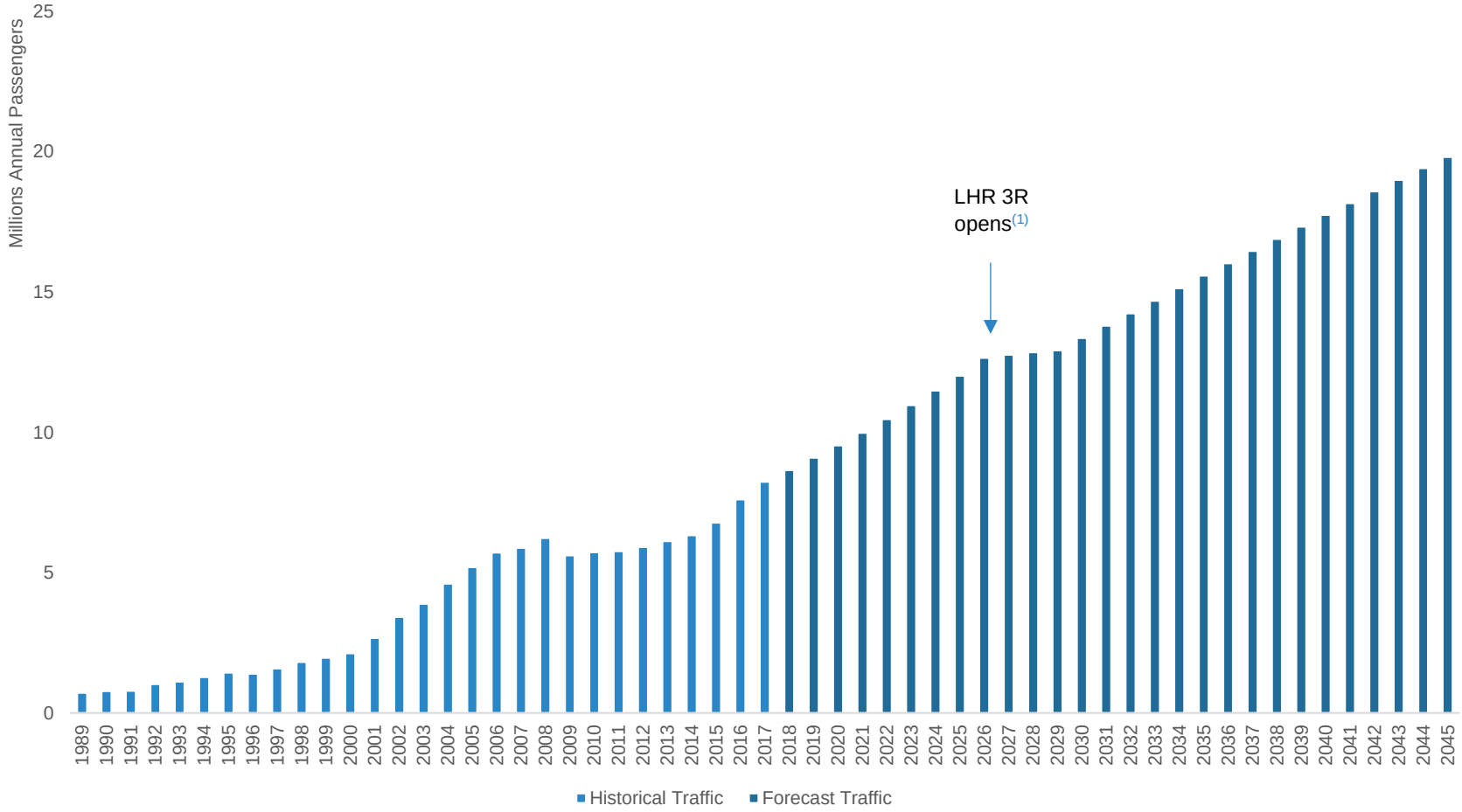
81. In the low, or pessimistic forecast, the economic growth in the main source markets is lower than in the baseline, or most likely, forecast. This could reflect a situation in which, for example, the economic situation in the UK changes to weak growth and consequently, puts a downward pressure on discretionary spending such as travel while economies in other European countries also develop more slowly than expected.

82. The optimistic forecast assumes that the UK economy thrives and that demand for air travel also increases - the accelerated economic development fuels increase in tourism and trade, translating into more passenger activity. In this scenario it is assumed that BRS will support the development of outbound tourism and other business activity within its region over the forecast period.

6.3 Mott MacDonald traffic forecast results

83. The results of the BRS base forecasts (mppa) are presented Figure 19. Fuelled by a growing domestic economy and positive airline expansion plans, the trend of recent traffic growth at BRS is continued in the years of the forecast. It predicts that BRS will grow from 8.2 mppa in 2017 to 12.7 mppa by 2026 and eventually to 19.8 mppa by 2045.

Figure 19: Mott MacDonald BRS Base Passenger Forecast

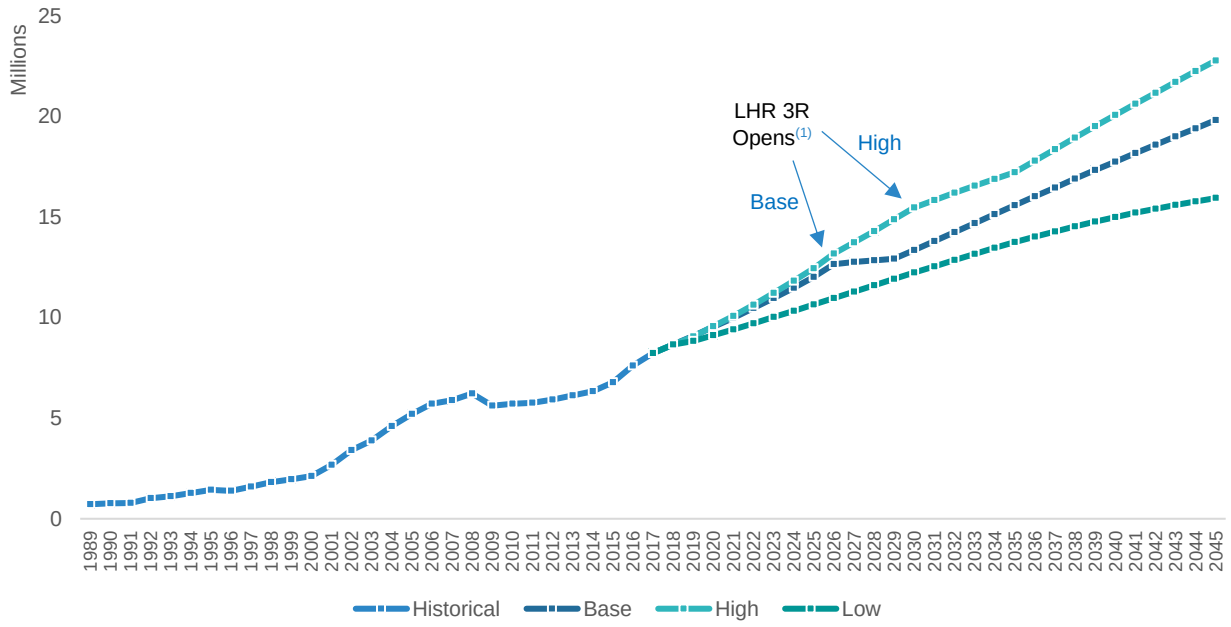


(1) Heathrow Airport's planned opening date for the third runway is by the end of 2026. This is the Base Case assumption for this BRS forecast; the high case assumes a 2030 opening.

Source: Mott MacDonald Analysis

84. The results for the three scenarios stated are presented in Figure 20. The low case predicts 15.9 mppa by 2045, whereas the high case predicts 22.8 million by 2045.

Figure 20: Mott MacDonald BRS Passenger Forecasts



(1) Heathrow Airport's planned opening date for the third runway is by the end of 2026. This is the Base Case assumption for this BRS forecast; the high case assumes a 2030 opening.

Source: Mott MacDonald Analysis

6.4 Comparison with BRS management and industry forecasts

85. Several relevant forecast studies have been considered by Mott MacDonald in the preparation of the traffic forecasts for BRS, including industry forecasts prepared by Airbus and Boeing, as well as forecasts that have been prepared previously for by the airport management. Table 5 shows the projections prepared by aircraft manufacturers Airbus for the traffic flows that are most applicable at BRS airport:

Table 5: Airbus Global Market Forecast 2017 - 2036

Traffic flow	2016-2026 CAGR	2026-2036 CAGR	2016-2036 CAGR
Intra Western Europe	2.8%	2.2%	2.5%
Domestic Western Europe	2.1%	1.8%	1.9%
Central Europe - Western Europe	5.5%	4.4%	4.9%

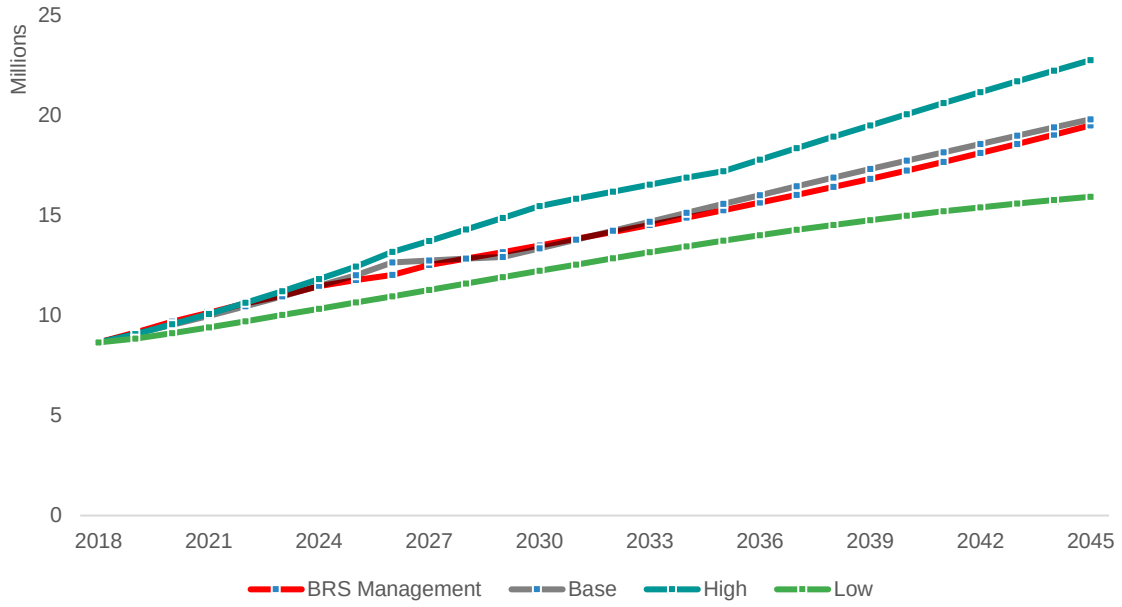
Source: Airbus

86. The Department for Transport ("DfT") published an update to its UK aviation demand forecasts in 2017, however, it should be noted that the DfT model forecasts overall demand at the national level, which is subsequently distributed geographically at the district level. The DfT forecasts take the current planning restrictions on Bristol Airport into account and therefore do not model growth beyond 10 mppa. The DfT states that the purpose of its forecasts is primarily in informing longer term strategic policy rather than in providing detailed forecasts at each individual airport. The DfT constrained

forecasts, therefore, do not reflect the underlying demand for additional air services at BRS should planning permission to grow beyond 10 mppa be granted. This underlying future demand is the subject of this forecast validation study.

87. Figure 21 compares Mott MacDonald's scenarios with the forecast by airport management and the latter falls within the high and low scenarios, and close to the Mott MacDonald base case. BRS Management expect a higher growth in passengers in the short term than indicated by the pure econometric model developed by Mott MacDonald, although in the medium to longer term the BRS Management and Mott MacDonald base case forecasts are very similar. This short-term growth in the BRS Management forecast is informed by detailed airline route, network and fleet plan intelligence. BRS Management forecast growth during the 2017-2022 period is 5.2% per annum, compared with actual growth 2012-2017 of 6.8%.

Figure 21: BRS Forecast Comparison – Mott MacDonald v BRS Management



Source: Mott MacDonald Analysis & Bristol Airport Management

Table 6: Comparison of Bristol Airport Management vs Mott MacDonald forecast (mppa)

Year	Mott MacDonald Low	Mott MacDonald Base	Mott MacDonald High	BRS Management
2017	8.23	8.23	8.23	8.23
2018	8.66	8.66	8.66	8.58
2020	9.12	9.53	9.56	9.70
2025	10.65	12.01	12.44	11.77
2030	12.24	13.36	15.47	13.50
2035	13.75	15.58	17.22	15.26
2040	15.00	17.75	20.07	17.25
2045	15.94	19.82	22.78	19.51
Compounded Annual Growth Rates				
2018-2025	3.00%	4.79%	5.32%	4.62%
2025-2035	1.39%	1.07%	2.20%	1.38%
2035-2045	1.49%	2.43%	2.84%	2.49%
2018-2045	2.29%	3.11%	3.65%	3.09%

Source: Mott MacDonald Analysis & Bristol Airport Management

6.5 Aircraft movements

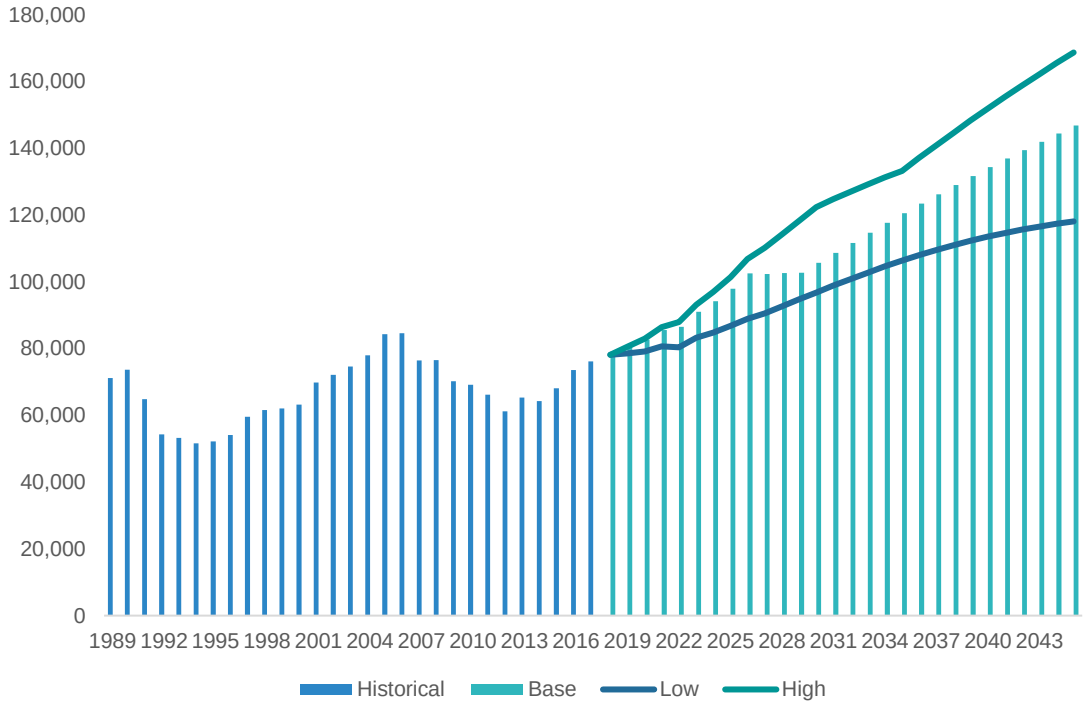
88. Movements can be translated into aircraft operations by making assumptions on average aircraft size and load factors described by the following equation:

$$Aircraft\ Movements = \frac{Passenger\ Forecasts}{Average\ Passengers\ per\ Aircraft\ Movement}$$

89. In this conversion process, estimates for average aircraft size and average load factor are prepared and applied separately to international and domestic traffic segments. Over the forecast period, changes in the future aircraft fleet mix and load factors reflect anticipated changes to the current fleet mix, market development and new air services as well as improved aircraft utilisation.

90. Mott MacDonald predicts commercial aircraft movements to reach a little over 146,000 in the base case, around 118,000 in the low case and 169,000 in the high case by 2045. BRS Management projected approximately 97,500 movements in 2026 compared to Mott MacDonald's base case forecast of 102,500 in 2026. This difference is due to a slightly higher Mott MacDonald passenger forecast in that year.

Figure 22: Forecast of aircraft movements through 2045



Source: Mott MacDonald Analysis

7 Night Flying Requirements

7.1 Current Night Flying

91. The current BRS planning conditions limit night flying during the core night period (23:30-06:00) to 4,000 movements per year (3,000 in summer, 1,000 in winter) and during the shoulder periods (23:00-23:30 and 06:00-07:00) to 10,500 movements per year. There are also limits on the number of Quota Count (QC) points operate each summer and winter season, as summarised in the table below:

Table 7: BRS Current Night Limits

Season	Night Movements	QC Points
Summer	3000	1260
Winter	1000	900

92. The night movement limits are fixed limits, with no flexibility between seasons. For QC points, up to 10% of unused quota may be carried over into the following season. The seasonal QC limit may also be over used by up to 10%, with the QC available in the following season reduced on a 1-for-1 basis. Any over use greater than 10% results in a reduction in the following season's QC limit by twice the amount of the overrun. The actual use of night movements at BRS is shown below:

Table 8: BRS Historic Night Movement Use

Year	Summer	Winter	Total
2007/08	2057	939	2996
2008/09	2322	831	3153
2009/10	2146	816	2962
2010/11	2984	559	3543
2011/12	2216	257	2473
2012/13	1861	253	2114
2013/14	1888	233	2121
2014/15	2210	232	2442
2015/16	2378	244	2622
2016/17	2704	298	3002
2017/18	2991	na	na

Source: Bristol Airport Operations Monitoring Report 2017

93. Night flying demand at BRS is driven mainly by short haul operations by aircraft based at the airport. These aircraft (operated by easyJet, Ryanair, Thomsonfly and Thomas Cook airlines) overnight at BRS with first departures between 06:00 and 07:30. A typical Low Cost Carrier ("LCC") aircraft will perform 3 return trips before last arrival at BRS in the late evening. A proportion of these late evening arrivals are after 23:30 in the night period. There are also a small number of long haul arrivals in the night period, typically in the early morning before 06:00. This pattern of night flying demand is typical of UK-based

European short haul operations and is similar to the patterns seen at comparable airports such as Gatwick, Manchester and Birmingham airports.

94. Winter season night flying demand is much lower than in a summer season as airlines operate aircraft with a lower level of utilisation in the off-peak season, often performing 2 return trips instead of 3 (which would often be the case for LCC's in the summer season) and requiring fewer post 23:30 arrivals in the evening. This overall pattern of demand is expected to continue in the future at BRS as the airport grows.

95. Up until 2010/11, BRS had a number of night mail flights, which have since ceased. This explains the drop-in night movement use in 2011/12, particularly in winter seasons. The resumption of night mail flights is not expected.

96. Use of available night movements in summer seasons has grown since 2013 as the airport's traffic recovered from the recession of 2008. Summer 2017 use was 99.7% of the available 3000-night movements, whereas winter season utilisation is less than 30% – on average in recent years, 90% of annual night flights occur in a summer season.

97. In response to growing night movement demand, and the risk of breaching the summer limits without adequate controls, BRS sought designation as a 'slot coordinated' airport under the EU Slot Regulations[57] by the Department for Transport for the period 23:00 to 07:00 in summer seasons, effective from the Summer 2018 season. This means that all night flights require the prior allocation of a slot before operating at the airport, providing an effective mechanism to control night flying within the planning condition limits.

7.2 Future Night Movement Requirements

98. As part of its interim planning application to grow to 12 mppa, BRS intends to seek to vary the current night restrictions planning condition. It plans to maintain the current 4,000 night movements per year, but set as an annual (rather than seasonal) limit to permit more flexible use of available night movements between summer and winter seasons.

99. Mott MacDonald has validated future night movement requirements consistent with 12 mppa airport operations (forecast to be reached around 2026) using two approaches:

- Forecasts of night movement demand related to overall growth in Air Transport Movements (ATMs) at the airport; and
- Analysis of the detailed assumptions contained in the BRS Management forecasts.

7.2.1 Mott MacDonald Night Movement Demand Forecast

100. Forecasting night movements is challenging as it depends on the detailed structure of airline schedules, as well as on-the-day flight delays affecting the proportion of day-flights that may be delayed into the night. Actual night movements may, therefore, vary year-on-year. None-the-less, there is a broad relationship between night movements and total movements at the airport over the long-run. Night movement forecasts have been developed based on the following assumptions:

Table 9: Night Time Assumptions

Scenario	Assumption
High Case	Night movements grow in relation to annual ATMs based on a linear regression of ATMs to Night Movements over the period 2012 to 2017
Mid Case	Night movements grow at the same rate as annual ATMs

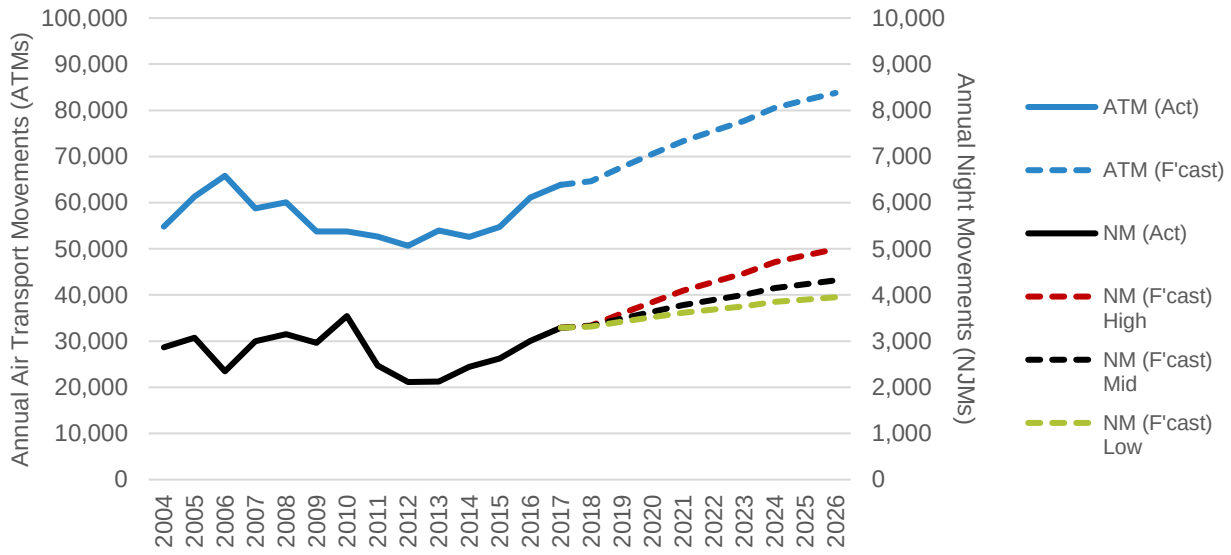
[57] *Council Regulation (EEC) 95/93*

Scenario	Assumption
Low Case	Night movements grow at 67% of the rate of annual ATM growth

101. The results of this forecast are shown in the figure below. In the High Case, night movements are forecast to grow more quickly, based on recent trends – by 51% to around 5,000 annual night movements. The Mid Case night movements grow in line with annual ATM growth (+31%) to around 4,300. The Low Case grows by 20% to 3,950 annual night movements.

102. The High Case represents an estimate of unconstrained demand for night movements with a continuation of airlines' current patterns of scheduling and proportions of aircraft based at BRS. The Low Case represents a constrained scenario where night movements are strictly controlled through the slot process, but at a level where overall growth of the airport to 12 mppa can still be achieved.

Figure 23: Forecast of annual night movements to 2026



ATM – Air Transport Movement – excluding GA, Freight and Mail flights
NM – Night Movement

Source: Mott MacDonald Analysis

7.2.2 Analysis of BRS Management Forecast Assumptions

103. In a Summer 2018 typical busy week, BRS currently has 95 scheduled night movements per week. The BRS Management forecasts assume 6 additional based-aircraft operating at the airport in summer seasons by 2026, increasing from 31 to 37 aircraft. Of these 6 additional aircraft, 4 are expected to operate with night arrivals in the late evening, ie, 4 additional night movements per day or 28 additional weekly night movements. This increases the weekly scheduled night movements to 123 per week by 2026. The table below calculates the number of annual night movements resulting from this forecast growth.

104. There are 30 weeks in a summer season, but there are slightly less night flights in the April/May shoulder months, so the historic ratio between the full season and peak week is 28.4. Applying this multiple to the 123 weekly night movements gives 3,493 summer

season scheduled night flights in 2026. Adding allowances for delayed scheduled flights, non-scheduled ad hoc night movements, and an allowance for winter season night movements gives a total predicted annual use of night movements in 2026 (at 12 mppa traffic levels) very close to the proposed 4000 annual night movement limit.

Table 10: BRS Night Movement Use Calculation for 2026 forecasts (12 mppa traffic level)

Summer 2018 Peak Week schedule night movements	**95**	[a]
additional Peak Week night movements by 2026	28	[b]
Total Summer 2026 Peak Week scheduled night movements	123	[c] [= a + b]
Peak Week to Full Summer season ratio	28.4	[d]
Summer 2026 full season scheduled night movements	**3493**	[e] [= c x d]
Allowance for delayed day-time flights	150	[f]
Allowance for ad hoc night flights	50	[g]
Total summer predicted use	**3693**	[h] [= e + f + g]
Winter season predicted use	300	[i]
Total annual predicted use	**3993**	[j] [= I + j]

7.3 Future Night QC Requirements

7.3.1 QC Rating System

105. Night noise is controlled by a noise quota count (QC) classification system, first introduced for the designated London airports (Heathrow, Gatwick and Stansted) in 1993, and adopted at other UK noise regulated airports such as Manchester, Birmingham and Bristol. An aircraft type's QC classification is based on its certified noise levels for arrivals and departures. The London system has been updated over time as aircraft have become quieter, introducing a QC 0.25 band in 2006 and a QC 0.125 band from October 2018. This has had the effect of reducing the number of QC 0 (or exempt) aircraft types.

106. The BRS night regime has not been updated to remain in line with the London system. The BRS interim planning application is expected to seek adoption of the latest London QC rating system. The current BRS and latest London QC classification systems are summarised in the table below.

Table 11: QC Classification System

Noise Classification	QC – London Airports(*)	QC – Bristol Airport
Below 81 EPNdB	0	0
81-83.9 EPNdB	0.125	0
84-86.9 EPNdB	0.25	0.5
87-89.9 EPNdB	0.5	0.5
90-92.9 EPNdB	1	1
93-95.9 EPNdB	2	2

Noise Classification	QC – London Airports(*)	QC – Bristol Airport
96-98.9 EPNdB	4	4 *banned at night
99-101.9 EPNdB	8 *banned at night	8 *banned at night
Above 101.9 EPNdB	16 *banned at night	16 *banned at night

(*) New London system taking effect from October 2018

107. The effect of adopting the London QC system at BRS, and of expected modernisation of the fleet by 2026, is summarised in the table below.

108. In Summer 2017, the average QC per movement actually operated at night (including delayed day-flights as ad hoc operations) was 0.51. This correlates closely with the average QC per movement for scheduled night flights, which is 0.52 for the busy week Summer 2018 schedule.

109. Adopting the London QC system with the current 2018 BRS fleet mix is calculated reduce the average QC per movement to 0.38, as a number of aircraft types currently classified as QC 0.5 at BRS actually produce 84-86.9 EPNdB noise levels and qualify for the QC 0.25 band. Conversely, the Embraer E190, currently classified as QC 0 at BRS, are QC 0.125 under the latest London QC system.

110. BRS Management have forecast the future airline fleet mix in 2026. Based on these fleet forecasts, average QC per movement is expected to decrease from 0.38 in 2018 to around 0.31 by 2026 (under the London QC system).

111. Mott MacDonald has reviewed these assumptions and consulted with the airport's main airlines on the fleet assumptions. Incorporating airline feedback, Mott MacDonald has calculated sensitivities on future (2026) QC requirements, which produce average QC per movement values in the range 0.27 to 0.30. Therefore, the BRS Management fleet assumptions are reasonable and slightly on the conservative side overall.

Table 12: Impact of QC Classification System and Fleet Modernisation

	BRS QC System			London Airports QC System	
QC Band	Summer 2017 Actual	Summer 2018 Schedule	Summer 2026 Forecast	Summer 2018 Schedule	Summer 2026 Forecast
0	2%	2%	37%	0%	0%
0.125	na	na	na	2%	37%
0.25	na	na	na	55%	28%
0.5	94%	93%	59%	38%	31%
1	4%	5%	3%	5%	3%
2	0%	0%	0%	0%	0%
QC per Movement	**0.51**	**0.52**	**0.33**	**0.38**	**0.31**

Source: Mott MacDonald analysis

7.3.2 Night QC Demand

112. Adopting the London QC system reduces average QC per movement, with the current 2018 fleet mix, to a calculated value of 0.38. This is expected to improve to 0.31 QC per night movement by 2026 with the phased introduction of quieter aircraft types.

113. The table below shows predicted QC use, based on an annual 4,000 night movement limit and adoption of the London QC classification system. It shows that the current seasonal QC limits (1260 points in summer and 900 points in winter) are sufficient to

accommodate the 4,000 annual night movements corresponding to operations at the 12 mppa level. With the current 2018 airline fleet mix, summer QC use will require use of the 10% seasonal flexibility permitted. With fleet improvements expected by 2026, QC use is likely to be within limits without use of seasonal flexibility.

Table 13: Seasonal QC Requirements

	Summer	Winter
QC Limits		
QC Limit	1260	900
• Winter-to-summer carry-over (10% of winter limit) • Summer over-use (10% of summer limit)	+90 +126	-90 -126
QC Limits using full 10% flexibilities	1476	684
Night Movements		
Assumed seasonal use of 4000 annual night movement limit	3700[1]	300
QC per Movement (based on London QC System)		
2018 fleet mix	0.38	0.38
2026 forecast fleet mix	0.31	0.31
Projected QC Use		
2018 fleet mix	1406	114
2026 forecast fleet mix	1147	93

Source: Mott MacDonald calculations

1 *High-end estimate, including allowances for delayed day-time flights and ad hoc use, as per Table 10*

7.4 Mott MacDonald Conclusion on Future Night Flying Requirements

114. The above analyses indicate that a 4,000 annual night movement limit, with flexible use between summer and winter seasons, is **just** sufficient to accommodate growth to 12 mppa traffic levels.

115. This assumes strict control of night movements through the slot process and management of the timings of airline schedules to limit growth in night movements, as well as proactive management of delayed flights and non-scheduled ad hoc night use. Unconstrained demand for night flights, consistent with 12 mppa traffic levels is likely to be closer to 5,000 annual night movements.

116. It should also be noted that slot controls are currently only applied in summer seasons, as the current 1,000 winter season night movement limit is ample to meet demand. If BRS moves to an annual night movement limit, both summer and winter seasons will be night movement constrained and slot controls will be required for winter seasons also.

117. Based on an annual 4,000 night movement limit, adopting the latest London QC system would reduce the QC requirements so that the 4,000 annual night movements can be accommodated within existing seasonal QC limits with continued use of the 10% seasonal flexibility permitted.