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London Luton Airport Expansion

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8.121 Rail Impacts Summary

Infrastructure Planning (Examination Procedure) Rules 2010

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The Planning Act 2008

The Infrastructure Planning (Examination Procedure) Rules 2010

**London Luton Airport Expansion Development Consent
Order 202x**

8.121 Rail Impacts Summary

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1 INTRODUCTION

- 1.1.1 This report summarises the capacity assessment of rail services to London Luton Airport ('the airport'), in terms of on-train crowding, capacity of the Luton DART (Direct Air-Rail Transit) and the capacity of Luton Airport Parkway Station. Work on rail capacity for the Luton DART, Luton DART Stations and Luton Airport Parkway Station was undertaken in 2019 and 2020.
- 1.1.2 The period between 2020 and the start of the examination for the application for development consent has seen a period of uncertainty and change within the rail sector. Rail demand has seen significant changes in commuting due to the change in working patterns occurring as a result of the Covid-19 pandemic. In response the Government has made changes to the service patterns to reduce costs. However, the future rail capacity work was based on the expectations of both demand (present and future forecasts) and proposed services levels at the time of assessment in 2019 (pre-Covid). With rail demand still recovering and new trends emerging a steady state of rail demand has not yet fully emerged from which to establish a new baseline.
- 1.1.3 This report has been updated following its submission in November 2023 at Deadline 5 [TR021000/REP5-057] in response to engagement with Network Rail Limited ('Network Rail') that took place on 8 January 2024. Section 6 and Section 7 have been added to the end of the document to answer questions raised during the meeting.

2 FORECASTING RAIL DEMAND

2.1 Forecasting demand from the airport

2.1.1 Passenger rail demand was forecast based on the airport passenger demand and development phasing outlined in Table 6.5 of the **Need Case [TR021000/AS-125]** and the expected mode share following the introduction of the Luton DART. This is set out in Section 6.2 and Table 6.1 of the **Transport Assessment [TR021000/AS-123]** with mode share for rail forecast to increase from 21% prior to expansion to 23% in 2027 (21.5 mppa), 27% in 2039 (27 mppa) and 27% in 2043 (32 mppa). This increase is supported by the following interventions and expected wider transport changes, that have occurred subsequent to the baseline data collection exercise in 2019:

- a. Luton DART and Thameslink 20/20;
- b. EMR Connect Services;
- c. Elizabeth Line;
- d. Parking costs/differentials; and
- e. Road congestion.

2.2 Forecasting peak period demand

2.2.1 As set out in Chapter 7 of **Appendix H** of the **Transport Assessment [TR021000/APP-202]** ('Appendix H') the key crowding implication of Proposed Development occurs during the morning peak commuter period in the southbound direction (travelling from the airport) and northbound in the evening peak commuter period (travelling to the airport). By considering the forecast airport daily demand profile and the future mode share the morning and evening peak rail demand can be derived, as set out in Table 7.1 of Appendix H and reproduced below.

Table 2.1: Air passengers as % of rail passengers southbound (S/B) to / from London and Luton Airport Parkway (LAP)

Airport Annual Demand	Arriving Air Passengers*	PT Mode share	Rail Mode Share	Air Passengers travelling S/B	Arriving Air Passengers by Rail (S/B)**	LAP Services Overall Rail Demand (S/B)**	Proportion of S/B rail passengers that are also air passengers
18 mppa	3,480	38%	21%	80%	577	4,298	13%
21.5 mppa (2027)	3,712	40%	23%	80%	683	5,847	12%

Airport Annual Demand	Arriving Air Passengers*	PT Mode share	Rail Mode Share	Air Passengers travelling S/B	Arriving Air Passengers by Rail (S/B)**	LAP Services Overall Rail Demand (S/B)**	Proportion of S/B rail passengers that are also air passengers
27 mppa (2039)	5,396	45%	27%	80%	1,157	7,956	15%
32 mppa (2043)	7,261	45%	27%	80%	1,557	8,998	17%
Annual growth 2019-2043	3.1%	n/a	n/a	n/a	4.2%	3.1%	n/a

* (at Luton Airport Parkway Station or on the airport's road network between 06.00-09.30)
 ** arriving at London St Pancras between 07.00-10.00

Table 2.2: Air passengers as % of rail passengers northbound (S=N/B) to / from London and Luton Airport Parkway (LAP)

Airport Annual Demand	Departing Air Passengers +	PT Mode share	Rail Mode Share	Air Passengers travelling N/B	Departing Air Passengers by Rail (N/B) ++	London St Pancras (LAP Services) Overall Rail Demand (N/B departing between 16.00-19.00)	Proportion of N/B rail passengers that are also air passengers
18 mppa	4,314	38%	21%	80%	715	9,109	8%
21.5 mppa (2027)	5,096	40%	23%	80%	938	12,393	8%
27 mppa (2039)	5,917	45%	27%	80%	1,269	16,862	8%
32 mppa (2043)	7,068	45%	27%	80%	1,515	19,072	8%
Annual growth 2019-2043	2.1%	n/a	n/a	n/a	3.2%	3.1%	n/a

+ (at Luton Airport Parkway station or on the airport's road network between 16.30-19.30)
 ++ departing from St Pancras between 16.00-19.00

2.3 Forecasting background demand

2.3.1 Rail demand was forecast using a 3.1% annual growth rate from the 2019 base year. This was based on the long term recorded growth rate on the route

between London and Luton Airport Parkway from 2000 to 2017 (excluding the impact of the airport growth in rail demand on the corridor). This was a period of significant growth in the level of commuting into London and represents a comparatively high growth (and therefore robust) scenario for background demand.

2.4 Changes in post-Covid-19 demand and services

2.4.1 There has been a significant reduction in demand as a result of Covid-19 and subsequent changes to commuting patterns. This has impacted both the total demand for rail and the distribution of those passengers, with stronger recovery in weekend travel and the biggest reductions on Monday and Friday peak times.

2.4.1 As stated in paragraph 2.3.1, the forecast background demand growth was 3.1% from 2019 base year levels. This is likely to be an optimistic forecast for rail growth given the impact of Covid-19 on travel demand. Overall rail demand according to the Department for Transport (DfT) (Ref 1) has recovered to 80% excluding passengers from the Elizabeth Line. Therefore, to reach the forecast background demand in 2043, growth would need to be around 4.5% per year.

2.4.2 The Government has responded to the fall in demand by taking greater revenue risk from railway operators and moving to service based contracts. The DfT has also reduced services in response to changing demands to reduce costs. Whilst in the short-term capacity may have been reduced, if demand growth returns in the long term, then capacity would be increased to reflect this.

2.4.3 Growth in rail demand from the airport in Assessment Phase 1 (2027) in the morning peak SB direction is only 106 (18%) passengers compared to the base year with the higher levels of growth delivered through the later stages of the Proposed Development. As a result, the assessment years considered in **Appendix H** of the **Transport Assessment [TR0210000/APP-202]** are 2037 and 2043 where there is more significant growth in airport passenger demand from Assessment Phases 2a (580 passengers) and 2b (980 passengers). There is therefore significant time for services to return to previously forecast.

2.5 Assessment of impacts

2.5.1 Appendix H sets out the impact on airport passengers from the forecast growth in background demand related to the Proposed Development (both assessment Phases 2a and 2b) at the airport, as follows:

- a. In the AM peak there are available seats to accommodate passengers at Luton Airport Parkway Station.
- b. In the PM peak seats are forecast to be occupied but standing capacity would be available. Seats would become available as passengers alighted at intermediate stations between London St Pancras and Luton Airport Parkway.

2.6 Assessment of individual services

- 2.6.1 The assessment of rail impacts did not model individual services. This is due to:
- a. The medium and long-term nature of the forecast meaning that timetables are likely to have changes before the airport growth materialises, which will impact demand for individual services.
 - b. The exact demand on each service from the airport would have significant variance over the year and between days; by looking at the average peak period this variance is reduced.
 - c. Non-airport passengers can reassign between services if they prefer less crowded trains within the peak periods, therefore wider capacity can be utilised.

2.7 Impact on stations outside Luton Airport Parkway

- 2.7.1 **Appendix H of the Transport Assessment [APP-202]** does not evaluate the impact on other stations. Airport demand represents a small share of demand on the networks (in 2019, for example, it was around 8%) and passenger demand is widely distributed across days and times. It is therefore considered that the impact on station capacity is not significant due to the highly distributed nature of airport passenger travel.
- 2.7.2 Hertfordshire County Council (HCC) raised concerns in their **Written Representations [REP1-069]** regarding the impact of the Proposed Development on stations at St Albans and Harpenden. The impact at these stations is not expected to be significant for the following reasons:
- a. Civil Aviation Authority (CAA) data indicates that St Albans (the Local Authority area) provides less than 3% of total rail passenger demand for airport passengers.
 - b. For the AM peak (06:00-09:30) and PM peak (16:30-19:30) periods there is forecast rail demand of 1,960 and 1,908 respectively in 2043 (when 32 mppa airport passengers is expected to be reached) compared to 730 and 905 for the AM and PM peak periods in the base year. With 3% of passengers coming from St Albans this represents an increase of 36 and 30 passengers respectively in the peak direction over a 3-hour period compared to the base year.
 - c. These passengers would be distributed across both Harpenden and St Albans stations and over the 3-hour period. St Albans station has recently undergone a capacity upgrade including a second footbridge adding capacity for passengers.
- 2.7.3 It is the Applicant's position that when compared to existing demand at these stations during the peak, the low level of change (less than 40 passengers over the peak period) does not require further detailed assessment.
- 2.7.4 Repeating this analysis for other Network Rail stations outside of Luton Airport Parkway station would similarly result in insignificant marginal impacts from

airport growth. As shown in Table 2.2, no local authority area accounts for more than 10% of total rail passengers.

Table 2.3: Origin of rail passengers travelling to Luton in the 2019 CAA passenger survey (Ref 2)

Local Authority	Share of rail passengers in 2019
London Borough of Camden	10%
Bedford Borough	10%
City of Westminster London Borough	5%
London Borough of Southwark	5%
City and County of the City of London	5%
London Borough of Islington	4%
London Borough of Tower Hamlets	3%
St. Albans	3%
London Borough of Hackney	3%
London Borough of Kensington and Chelsea	3%
All other Local Authorities	2% or less

2.7.5 London St Pancras represents the station with the largest share of passengers outside Luton Airport Parkway, as it is the terminus of East Midlands Services and is a stop on the Thameslink network. However, the increase in passengers remains small compared to the overall capacity of the station, a key Central London interchange and terminus. For example, in 2019 London St Pancras station had 44,400 AM peak domestic passenger arrivals (Ref 3). Ticketing data from the 2021-2022 origin and Destination Matrix (Ref 4) suggests that around 44% of passengers travel from Luton Airport Parkway to London St Pancras. This would imply an increase of around 500 passengers over the morning peak with assessment Phase 2b by 2043, an increase of around 1% over a 23-year period.

2.7.6 Through consultation, Transport for London (TfL) has raised concerns around the potential impact of increasing airport demand on London Underground services. The 2019 CAA survey data shows that 28% of rail passengers travelling to the airport also travelled by London Underground. If this share is maintained, then in the future morning peak, demand for London Underground services would increase by around 550 passengers per weekday peak. This represents a very small change in overall London Underground demand and would be distributed across multiple London Underground lines and services.

2.7.7 Passengers interchanging from London Underground to the airport are also distributed across several interchanges including West Hampstead, St Pancras, Farringdon, City Thameslink, Blackfriars and London Bridge. The introduction of the Elizabeth line also provides an additional interchange at Farringdon. The change in demand is very small when compared to the overall scale of interchanges which take place at key London Underground stations. For

example, over 22,000 interchange trips were undertaken between services at Kings Cross Pancras Underground station in 2022 (Ref 5). Taking into account the scale of the stations in London, the Proposed Development will have an insignificant impact on London Underground station interchange capacity.

3 Basis of Demand for Luton DART and Luton Airport Parkway

3.1.1 Table 3.1 sets out the basis of design for the proposed Luton DART extension to Terminal 2 for the Proposed Development with 32 mppa and Table 3.2 the calculation for translating this into a peak flow.

Table 3.1: Demand projection used for developing Luton DART extension capacity requirements, 32 mppa.

	Typical Day	Peak Day
2-way busy Hour	8,864	9,744
Arrival Busy Hour	4,510	4,924
Departure Busy Hour	5,612	5,990

3.1.2 Table 3.2 sets out the future peak hour flow design requirements in a 32 mppa scenario.

Table 3.2: Peak hour flows projected on the Luton DART

Luton DART Demand – passengers per hour per direction (pphpd)								
mppa	Airport Peak Hour	Rail Mode Share	Landside Factor	Airport Passengers	Airport Employees	Car Parks	Total	Equivalent Intra-Peak Hours
32 mppa (Typical Day)	5,612	26.8%	95.9%	1442	62	150	1654	2130
32 mppa (Peak Day)	5,990	26.8%	98.4%	1580	62	150	1792	2314

3.1.3 These projections resulted in the following design requirements for the peak demand flow which is **2,314** in the base peak hour peak day.

3.1.4 The Luton DART is currently operating at 14 services per hour with train capacity of 170 passengers per vehicle giving capacity of 2,380.

3.1.5 The vehicles are provided with wide doors to allow rapid boarding and alighting and are designed to take a peak load of 170 passengers (including 34 seated).

The system can be expanded by the addition of two further carriages (45 passengers each).

- 3.1.6 Designs considered the likely changes to the airport’s requirement through the long life of the structural assets and accommodate a variety of systems to be installed in future, such as an extension of the system to Terminal 2 in the event the DCO is approved and the airport is expanded.
- 3.1.7 Stations are futureproofed by designing platforms which can accommodate these longer trains, to minimise the need for costly changes and disruptive construction in the future. The airport Luton DART station is futureproofed and flexibly designed for potential further development of the Luton DART route on to a second terminal, if consented, and provides an extra wide 12m central platform that is resilient to surges in demand.
- 3.1.8 Provision has been made in the design for extension or capacity expansion of the system. The alignment, stations and structures incorporate provision for the system to be upgraded to accommodate higher capacity services.
- 3.1.9 The Luton Airport Parkway Station capacity assessment was based on the following peak hour airport scenario at 32 mppa. The demand projections used for developing Luton Airport Parkway Station are set out in Table 3.3.

Table 3.3: Demand projection used for developing Luton Airport Parkway Station capacity assessment

mppa	Arrival peak landside	Departures Peak Hour Landside	Rail mode share	2-way Hourly	Employees to Station¹	Employees to Airport²	To MSCP³	From MSCP⁴	2 Way Total	2way hourly T1⁵	2way hourly T2⁶
32 mppa (Typical Busy Day)	3,278	3,487	26.8%	1813	214	36	522	306	2891	1626	1265
32 mppa (Peak day)	3278	3599	0.268	1987	214	36	522	306	3065	1724	1341

4 FUTURE RAIL SERVICES

4.1 Current and past airport services

- 4.1.1 The current service to the airport is 10 trains per hour (tph) in the AM peak hour (7:30-8:30) consisting of 8tph Thameslink and 2tph EMR Corby to St Pancras service marketed as the Luton Airport Express.
- 4.1.2 Previously, longer distance EMR services called at Luton Airport Parkway Station once per hour serving Leicester. This was replaced in 2020 with the 2tph EMR service which instead serves Corby with a more regular timetable.

4.2 Post-Covid operating model of the Railway and the Williams-Shapps Plan for Rail

- 4.2.1 The impact of Covid-19 on passenger demand caused the Government to end the previous franchise agreement and move to EMA (Emergency Measures Agreements) and EMRA (Emergency Recovery Measures Agreements) contracts, effectively with the Government taking revenue risk and operators paid to operate a given service level. Previously with franchising the proposed timetable as set out in franchise agreement.
- 4.2.2 The Government was already developing new proposals for how the railway could operate resulting in the Williams-Shapps Plan for Rail (Ref 6), published in May 2021.
- 4.2.3 The Plan for Rail sets out how the railway will be planned in the future with the proposed Great British Railway (GBR) (a proposed state-owned public body to oversee rail in Great Britain) taking a greater role in the planning of the railway with train operators operating performance-based Passenger Service Contracts (PSCs). GBR is yet to be granted these powers through legislation within the proposed Draft Rail Reform Bill (Ref 7).
- 4.2.4 Currently, train operators run services through a National Rail Contract (NRC). The current services at Luton are operated as follows:
- a. Current Thameslink, Southern and Great Northern 2022 rail contract operating until 1 April 2025,
 - b. Current Abellio East Midlands Limited 2022 rail contract operating until 13 October 2030.
- 4.2.5 Annual commitments are made and agreed between DfT and operators through annual business plan commitments, published on the DfT website.
- 4.2.6 The 2023/24 Thameslink, Southern and Great Northern business plan (Ref 8) commitments include the following:
- Luton and Gatwick Airports Collaboration: The Operator shall collaborate and engage with the operators of Luton Airport and Gatwick Airport in developing, and supporting the implementation of, strategies to increase rail modal share of journeys to and from those airports.*
- 4.2.7 The 2023/24 EMR business plan (Ref 9) commitments include the following:

The Operator shall implement the developed brand strategy and plan for “Luton Airport Express Brand” for Passenger Services to and from Luton Airport Parkway as part of supporting the launch of the Luton Airport Dart and the promotion of the Luton Airport Express service together with a programme specifying the timescales for the implementation of the relevant marketing activities as approved by the Secretary of State (the “Luton Airport Brand Strategy”).

- 4.2.8 There remains some uncertainty over the future operating model that will be adopted and the role for DfT, GBR and operators in planning future timetables. Under any model it would be expected that services levels would be planned logically in relation to demand and crowding levels.

4.3 Potential for future services at Luton Airport Parkway Station

- 4.3.1 The analysis of rail capacity is based upon reasonable assumptions at the time of production of the **Transport Assessment [APP-200-203, APP-205-206, AS-123]**, and relies upon commitments outlined in the franchise agreement proposal to introduce the proposed Thameslink 20/20 timetable (the level of service in GTR’s Timetable Consultation Phase 2 in 2018, proposed to be introduced over the franchise). Currently Luton Airport Parkway Station has 21 Thameslink services over the morning peak (7-10am) compared to 24 in the 20/20 timetable, in the evening peak (4-7pm) 20 services compared to 24 in the 20/20 timetable.
- 4.3.2 However, the rail assessment is based on the expected future services in 2027, 2039 and 2043 (and the early years rail growth is far less significant than later years). Should demand for services grow for Thameslink, then it is expected that the timetable would be altered to provide more services (most likely aligned to the previously proposed 20/20 timetable). The decision on future timetable increases would need to be agreed by government and train operators in the short term, or in the medium and long term these powers could be taken on Great British Railway (GBR).
- 4.3.3 There is also potential for further services at Luton Airport Parkway Station. Previously, there was a proposal for a 4 tph EMR service, to match the services available at other London-based airports. Whilst this was not taken forward by the operator (with the 2ph service to Corby – St Pancras Airport Express introduced instead) however it remains a feasible ambition.
- 4.3.4 Growth at the airport (serving more destinations and at higher frequencies) will increase demand for passengers to travel to the airport, and the growth in the destination and frequency of flights will increase the airport’s attractiveness and generate new demand which rail could seek to serve through increased services).
- 4.3.5 The benefit of stopping services at Luton Airport Parkway Station would need to be significant enough to offset the cost of an additional stop as this would result in a longer journey time for passengers not beginning or ending their journey at the airport. Improvements such as further electrification of the Midland Mainline could support improved services at the airport.

- 4.3.6 Therefore, as the airport grows and its demand increases, the likelihood of the railway operator stopping services at the airport also increases whether this planning takes place through GBR/DfT or operated through either a franchise or open access operator. The growth in forecast rail demand because of the Proposed Development and higher mode share for rail from the opening of Luton DART and other **Surface Access Strategy [APP-228]** measures will make Luton Airport Parkway Station an increasingly key station on the East Midlands route.

5 SUMMARY

- 5.1.1 The forecasting of available future capacity is reliant on three factors, the future rail service, the level of background demand and the level of airport demand generated through the Proposed Development.
- 5.1.2 Forecasting background demand growth was based on the data available in 2019 with future growth based on growth factors based on growth in prior years. Current expectations based on the fall in commuting demand due to changing working patterns as a result of the Covid-19 pandemic means future growth is likely to be lower than previously forecast. Previously forecast background growth was 3.1% per year resulting in a 109% growth by 2043.
- 5.1.3 Forecast airport demand is not impacted by the changes to commuting patterns and will increase with the Proposed Development due to forecast increased mode share for rail (from 21% to 27%) and higher total airport demand, as shown in Table 3.2 and Table 3.3. The airport growth is far less significant in both the morning and evening peaks compared to the forecast growth in background demand.
- 5.1.4 The impact on demand set out in paragraph 5.1.2 has resulted in operational model changes within the railway sector and changes to service levels serving Luton Airport Parkway. Whilst the current rail service is not currently operating the future service assumed at the time the Transport Assessment was undertaken, in the long term the case for increased future services is linked to future rail demand growth, both at the airport and from non-airport demand.
- 5.1.5 Station capacity impacts outside Luton Airport Parkway are not significant, due to the highly dispersed nature of the airport's rail demand. Where demand is more concentrated for example at London St Pancras, the growth from the Proposed Development will remain an insignificantly small share of total station demand (around 1%).

6 RESPONSE TO NETWORK RAIL ENGAGEMENT – CAPACITY OF EXISTING STATIONS AT LUTON AIRPORT PARKWAY

6.1 Introduction

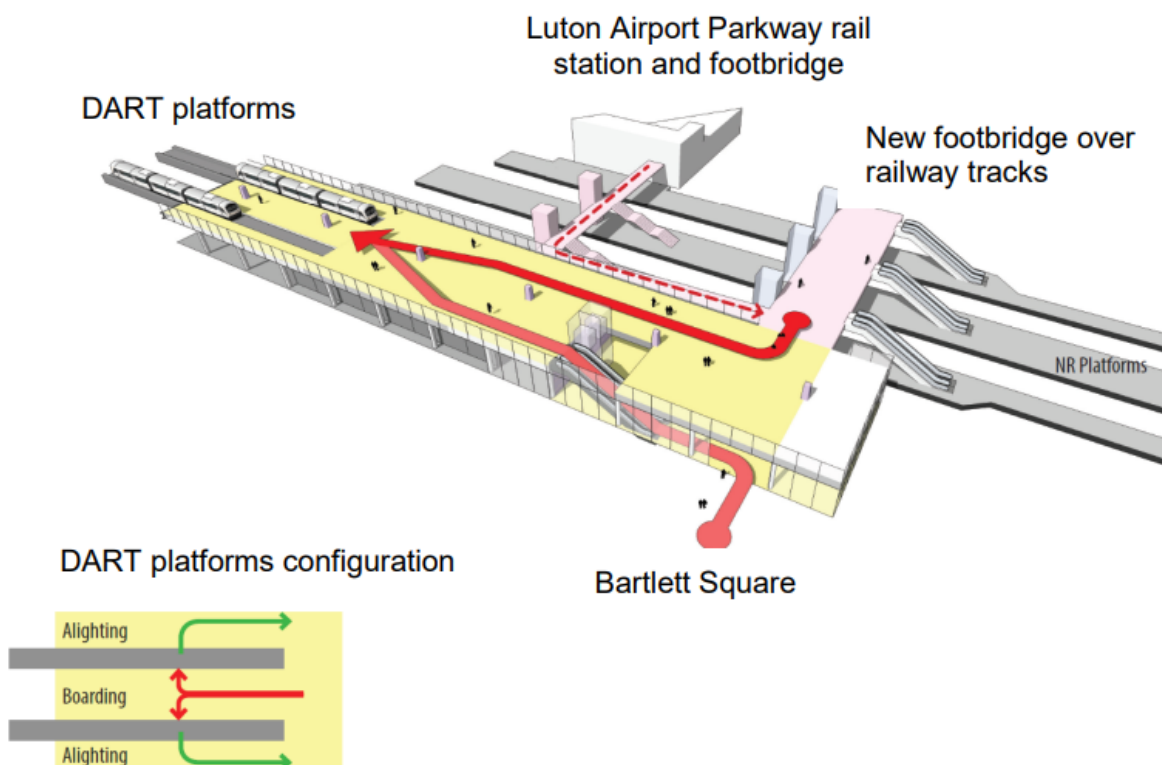
6.1.1 The following information summarises the capacity analysis undertaken to ensure Luton Airport Parkway and Luton DART Stations would be compatible with an increase in demand should the airport be expanded. This work was undertaken in March 2020 as part of the Luton DART project to evaluate the design requirements for an expanded 32 mppa airport. The information provided below is derived from the Network Rail Parkway Station and DART Stations Capacity Report which was the basis for the design of the Luton DART Station Scheme and its interface with the existing Network Rail Station, which is now operational. Network Rail was a key stakeholder during this project. The design requirements were developed in line with identified station and airport design guidance. Reference to ‘report’ or ‘guidance’ within Section 6 of this document is reference to the aforementioned (unless stated otherwise).

6.2 Luton DART Scheme and Interface with Network Rail Station

Luton Airport Parkway Station planning considerations

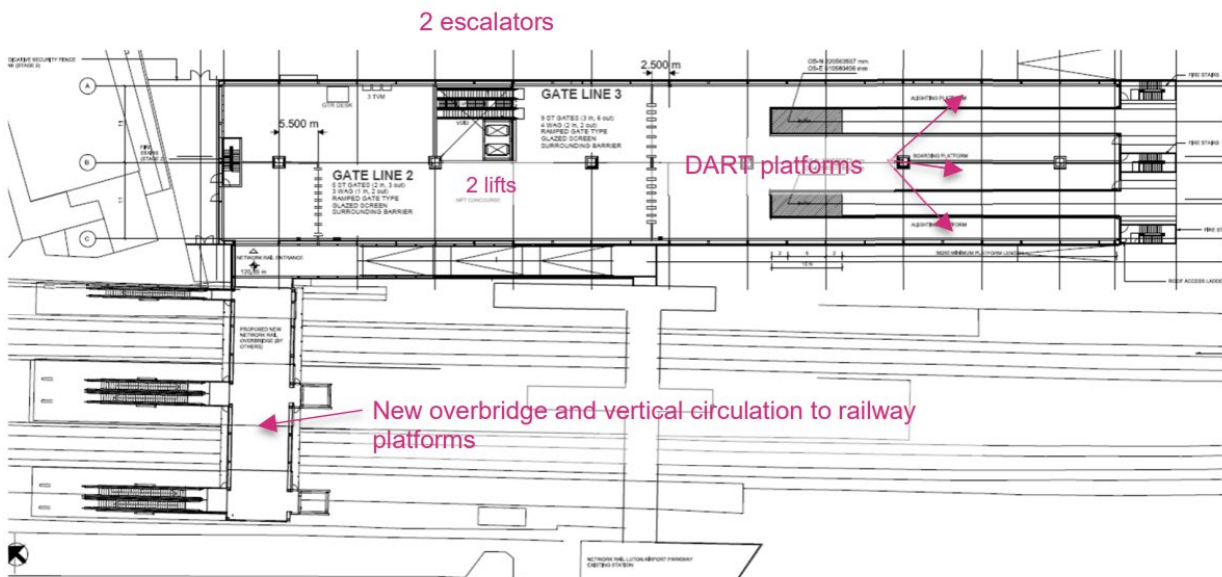
6.2.1 The Luton DART system opened in 2023 and provides a service between Luton Airport Parkway Station and the Airport’s Central Terminal. The Proposed Development includes the proposal for the construction of a new Terminal 2, which will require an extension of the existing Luton DART system.

Figure 6.1: Overview of Luton DART Parkway Station and Luton Airport Parkway Station



6.2.2 The Luton DART Parkway Station comprises a central boarding platform and alighting platforms on each side. This is similar to other people-mover systems in the UK and Europe, such as at Gatwick Airport.

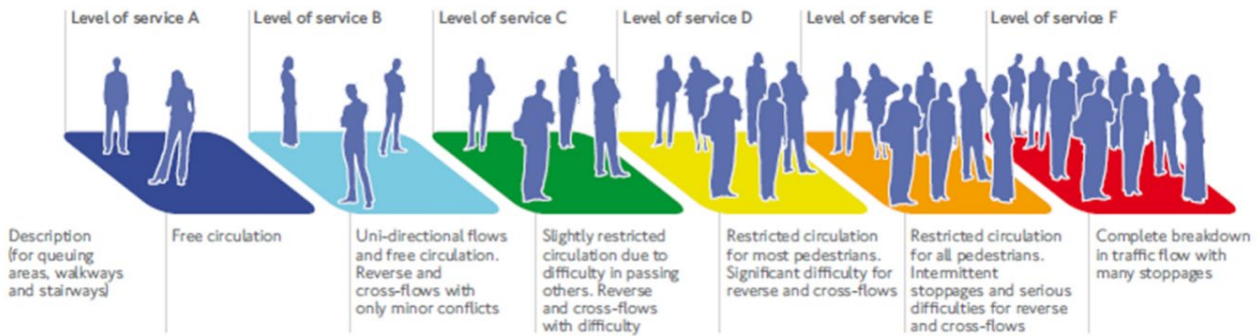
Figure 6.2: Luton DART Parkway Station layout: Level 1



6.3 Levels of service

- 6.3.1 For airports, the International Air Transport Association (IATA) has taken the Fruin standards and augmented these over several iterations in the last 20 years to create airport passenger-related standards (reflecting groups and baggage requirements). In general, the IATA standards are more onerous than Fruin. Accordingly, when analysing concourse requirements in particular, IATA Level of Service (LoS) metrics have been used. The Fruin LoS C requirement for concourse areas is between 0.65m^2 and 0.93m^2 , whereas IATA requires between 1.2m^2 to 2.3m^2 reflect both higher passenger expectations and passengers with luggage. A mid-point of 1.7m^2 was used in this analysis
- 6.3.2 Analysis of pedestrian flows for the Luton DART was undertaken against Fruin and IATA LoS requirements.
- 6.3.3 Fruin LoS describes pedestrian movement, relating density of pedestrians and flow rates for walkways and circulation areas, stairs and in queues, with LoS A representing free flow and LoS F a complete breakdown in circulation.
- 6.3.4 Fruin describes LoS C as being free flow, assuming a normal walking speed with opportunity to overtake. However, unlike LoS A there is potential for pedestrian conflicts where crossing movements and counter-flows exist. LoS C is typically used for designing transport interchanges as it provides a balance between congestion, design and operations.

Figure 6.3: Fruin Levels of Service (LoS)



6.4 Pedestrian flow modelling and analysis

6.4.1 The pedestrian flow assessment was undertaken by Arup for the Network Rail station as part of the Luton DART project comprised a combination of static analysis and dynamic modelling, using Legion and MassMotion software, against Fruin and IATA LoS and with reference to appropriate guidance as follows:

- Transport for London (TfL), Guidance Document – G371A: Station Planning Standards and Guidelines (SPSG), dated July 2012 and reviewed in July 20174,
- Network Rail, Managed Stations Design Guidance, dated 21.03.2007,
- Network Rail, Station Capacity Assessment Guidance, dated November 2016, and
- IATA, Airport Development Reference Manual, 10th Edition, 2014.

6.5 Vertical circulation

6.5.1 Vertical circulation requirements for the Luton DART project were estimated in line with Network Rail and TfL guidance but with localised adjustments reflecting surveyed usage at comparable UK airport stations at the time of the assessment in March 2020. This assessment is set out in Table 6.1.

Table 6.1: Vertical circulation assessment criteria

Factor	Assessment
Escalators	Escalator requirements were estimated in line with Network Rail standards using the peak minute one way flow. However, in line with observed throughputs at UK airports and airport stations, a flow rate of only 60 people per escalator per minute has been used, as opposed to a flow rate of 100. This lower flow rate has also been used in dynamic modelling.
Lifts	Benchmarking analysis has been done on comparable UK airport operations which shows that between 15% and 30% of passengers

Factor	Assessment
	<p>could be expected to be in possession of large hold baggage and therefore would use lifts – this proportion is at the higher end at airports with significant long-haul operations (such as Heathrow). A further finding has been that the number of passengers who have accessibility requirements at airports is likely to be in the order of 5%. This benchmarking therefore implies a range with 25% lift usage being a typical average, and up to 35% at the higher end of the range. Lift usage has been modelled statically assuming 40% of plated capacity in line with observed lift utilisation at Luton Airport Parkway Station and other UK airport stations.</p>
Level Changes	<p>In line with Network Rail guidance and in particular in relation to the new overbridge, the design provides a combination of escalators and lifts reflecting a level change of greater than 5.0m between the overbridge and platform level.</p>
Platform Width and Occupancy	<p>Platform occupancy and therefore platform width requirements have been estimated in line with the Network Rail standards, as described below. The latest guidance splits the platform into four zones:</p> <ol style="list-style-type: none"> a. Yellow Line Zone – 0.5m for Luton Airport Parkway Station where line speeds are lower than 100mph, b. Boarding/Alighting Zone – each platform block (the equivalent platform area in front of a train car) to accommodate the peak boarding and alighting load at 0.93m² per person, equivalent to Fruin LoS C. This is more onerous than previous guidance which only specified 0.65m² per person (LoS D) and also only for “all waiting passengers” i.e. boarders only, c. Circulation Zone – circulation for passengers walking through a platform to board or alight further along the platform at 40 people per metre per minute, equivalent to Fruin LoS.C, d. Activity Zone – a zone accounting for furniture, retail, station buildings and vertical circulation edges assumed at 0.3m from obstacle.
Concourse	<p>All passengers are assumed to wait on the Luton DART concourse for between 1 minute and 15 minutes for the correct DART service. Direct passenger access to Platform 1 at Luton Airport Parkway Station is not assumed and therefore all Network Rail demand is assumed to come via the Luton DART concourse.</p> <p>The assessment assumes 1.7m² of space for Luton DART and Network Rail passengers which make up the majority of users. This is equivalent to all passengers going to and from the airport having bags. In line with Network Rail standards, 1.0m² has been used for commuters, staff and other users which is equivalent to a waiting or queuing area on the concourse at Fruin Level of Service B.</p> <p>Using 1.7m² for airport users and 1.0m² for other users, the concourse is being designed at LoS B or better. Accordingly, even if the concourse</p>

Factor	Assessment
	is shown as 100% utilised, this does not mean it fails, but that it is likely to be busy and closer to operating at LoS C.
Gatelines	Gateline requirements were estimated in line with Network Rail standards, with an additional wide gate on each gateline to provide capacity for surges in demand of passengers with bags.

6.6 Luton Airport Parkway Railway Station

6.6.1 The capacity of Luton Airport Parkway Station was assessed using the demand forecast set out in the **Transport Assessment [TR021000/APP-202]** with the addition of street to station flows which were provided by Capita and are detailed as follows:

- a. To/from Bartlett Square – 500 local commuters, 25 car park users, 100 pick-up/drop-off passengers,
- b. To/from the South – 100 local commuters and 300 car park users.

6.6.2 The peak hour matrices for Luton DART are outlined in Table 6.2.

Table 6.2: Luton DART demand to 25 mppa, 32 mppa, Two-Way Peak

Year	Hourly demand	Arrivals peak hour: landside	Departures peak hour: landside	Rail mode share	2way hourly	Employees to station	Employees to airport	To MSCP	From MSCP	2way hourly total	2way hourly T1	2way hourly T2
2029	25 mppa (typical busy day)	2,871	3,142	26.8%	1612	181	25	522	306	2646	2275	370
2043	32 mppa (typical busy day)	3,278	3,487	26.8%	1813	214	36	522	306	2891	1626	1265

6.7 Vertical Circulation

- 6.7.1 For platform 1, a single escalator is provided in the down direction to the new overbridge. The escalator within Luton DART Parkway Station is available for alighters heading up to the Luton DART. A single lift is retained to the existing Network Rail overbridge but with the option for passengers to also use the two lifts within Luton DART Parkway Station.
- 6.7.2 Two escalators are provided in each direction to platforms 2/3 from the new overbridge as well as an additional lift. The platform 2/3 stair and lift access to the existing overbridge are both retained.
- 6.7.3 Two escalators are provided in each direction to platform 4 from the new overbridge. An additional lift is also provided to the new overbridge. Vertical circulation in the existing Network Rail station, comprising one up and one down escalator, stair, and lift access, is retained. This assumes the existing Network Rail station will be functioning as per currently in the future.
- 6.7.4 For the Luton DART Parkway Station, two escalators and two lifts will be provided between platform level and street level.

6.8 Stairs and Escalators

- 6.8.1 Predicted passenger demand for the 32 mppa AM (04:00-05:00) and PM (17:30-18:30) peak times for Luton DART are shown in Table 6.3 below based on forecast airport profiles. Peak boarding load is spread over 7.5 minutes before train departure which aligns with 8tph on platform 1 and platform 2. It assumes boarders are concentrated into the last 7.5 minutes before train departure for platform 3 and platform 4 which will be served by up to 4tph in the peaks, i.e. every 15 minutes.
- 6.8.2 Peak alighters are assumed to arrive at the vertical circulation over 2 minutes owing to train length and based on observed walk speeds at Luton Airport Parkway and Gatwick Airport stations.

Table 6.3: Peak boarding and alighting demand, platforms 1 to 4, 32 mppa

	Peak boarding load	Boarders per min	Peak alighting load	Alighters per min
AM Peak				
Platform 1	120	16	25	13
Platform 2	7	1	123	61
Platform 3	41	5	40	20
Platforms 2/3 combined (shared stair and escalator)	48	6	163	81
Platform 4	22	3	133	67

	Peak boarding load	Boarders per min	Peak alighting load	Alighters per min
PM Peak				
Platform 1	119	16	8	4
Platform 2	31	4	135	68
Platform 3	81	11	19	9
Platforms 2/3 combined	111	15	154	77
Platform 4	23	3	54	27

6.8.3 Assuming escalator capacity of 60 people per minute as per the guidance set out in Table 6.1, the down escalator to platform 1 can accommodate the peak boarding demand of 16 and 22 people per minute at 32 mppa. For passengers going up from platform1 to the Luton DART, sufficient escalator capacity is provided within Luton DART Parkway Station to accommodate the peak minute alighting flow of 13 and 16 people per minute at 32 mppa. In addition, the existing 2.7m wide stair to the existing station overbridge will also provide access to the upper level and into the Luton DART concourse.

6.8.4 On platform 2/3, the single down escalator has sufficient capacity to accommodate the peak boarding demand of 15 people per minute across both platforms at 32 mppa. Peak alighting demand will comprise 68 passengers per minute assuming a single train arrival on platform 2, and 81 passengers per minute assuming simultaneous train arrivals on platforms 2/3 at 32 mppa. The escalator will be able to accommodate 60 people per minute and the existing stair up to 75 people per minute at LoS C, for a total capacity of 135 people per minute, indicating enough combined capacity to clear the peak alighting load in 2 minutes. The two lifts will also be able to take passengers, meaning actual platform clearance should be faster than 2 minutes.

6.8.5 Platform 4 will be served by 2 up and 2 down escalators, via the new overbridge and the existing station building for a total capacity of 120 people per minute in each direction. The peak alighting loads on platform4for 32 mppa is 67 people per minute indicating that the escalators will have sufficient capacity to clear this demand in less than 2 minutes.

Lift Capacity

6.8.6 Lift analysis was undertaken assuming a 6.95m rise between the platform and the overbridges and an assumed speed of 0.63m per second for lifts. This assumption has been applied to both new and existing lifts. A dwell time of up to 30 seconds has been assumed at platform level and overbridge

6.8.7 The current platform 1 lift to the overbridge is an 1800kg 24-person lift. The peak alighting load on platform1 is 25 passengers per service at 32 mppa and the single lift can provide capacity for over 35% of these alighters in 5 minutes (i.e. before the next train arrival). In addition, 2 lifts are also provided in the Luton DART Parkway Station which can be used by passengers travelling

between platform1 and the DART. Accordingly, sufficient lift capacity is provided to and from platform1.

- 6.8.8 The current platform 2/3 lift to the overbridge is an 1800kg 24-person lift. A new 2000kg 26-person lift is also provided to the new overbridge. At 32 mppa, the peak arrival on platform 2 results in 1356 passengers and the two lifts provide capacity for up to 35% of this load in 5 minutes (i.e. before next train arrival). The peak alighting loads on platform 3 are 40 passengers and the two lifts can provide for more than 35% of these passengers in 5 minutes.
- 6.8.9 The combined peak alighting loads on platform 2/3 at 32 mppa is 163 passengers per service respectively, and the lifts can provide capacity for up to 30% of these alighters in 5 minutes. With 25% of people on average being lift users at Luton Airport Parkway Station (as per Section 2.3), the findings indicate that the two lifts provide appropriate capacity.
- 6.8.10 The current platform 4 lift to the overbridge is a 2000kg 26-person lift. A new 2000kg 26-person lift is also provided to the new overbridge. The peak alighting loads at 32 mppa on platform 4 are 133 passengers per service, and the lifts can provide capacity for 35% of these loads in 5 minutes before the next train arrival. The proportion of alighters that can be taken by the lifts increases if allowing a slightly longer clearance time which should be achievable given longer train headways on platform4, with a train approximately every 15 minutes.

Overbridge

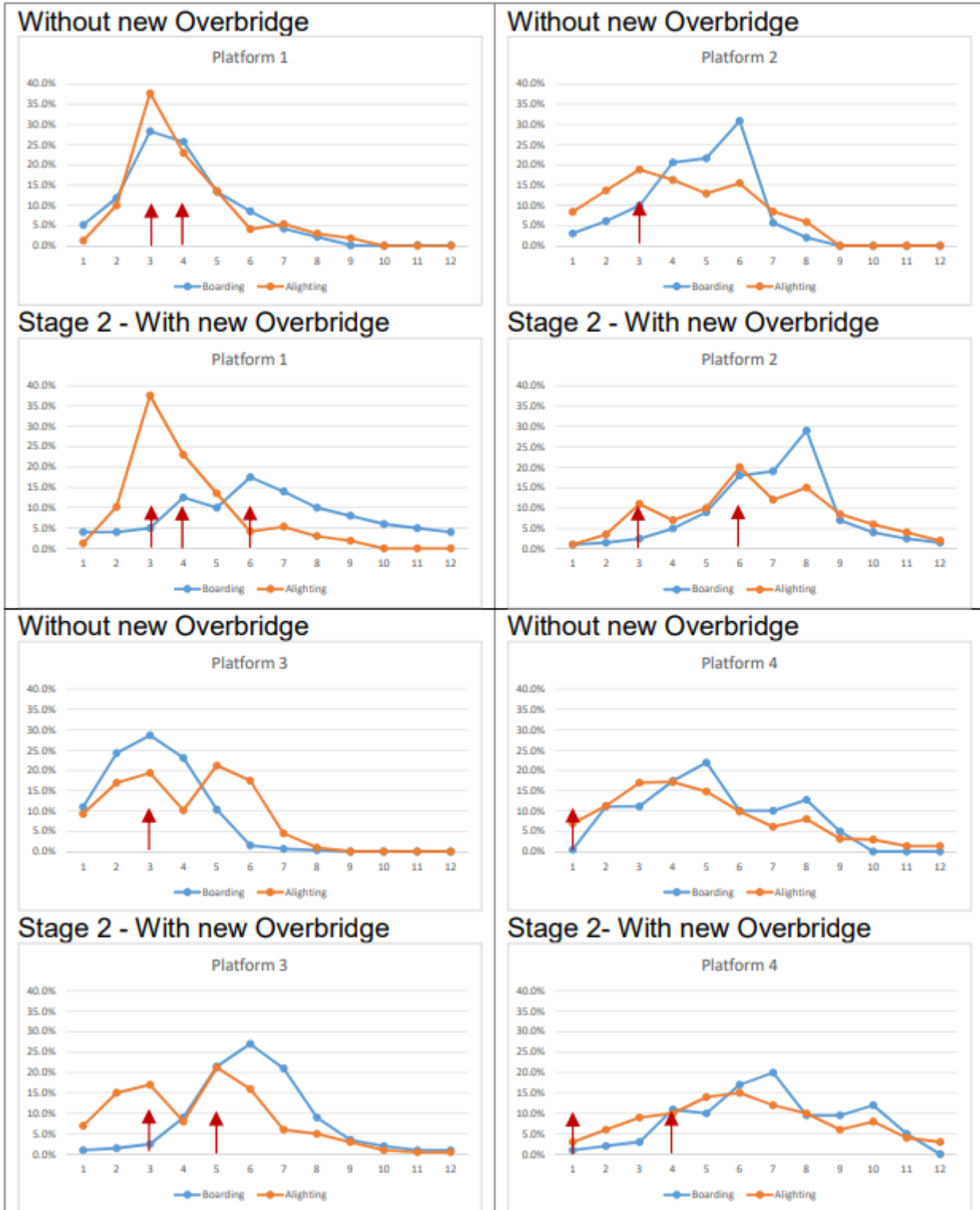
- 6.8.11 As stated in the Network Rail Parkway Station and DART Station's Capacity Report, the total demand at 32 mppa between Network Rail, Luton DART and the street is 3,916 passengers in the peak hour. Assuming all of these passengers use the new overbridge (which is an overestimate as some Luton DART to street flows and platform1 to street flows will not be via the overbridge), static analysis shows that an overbridge clear width of 3 metres excluding edge effects is required.
- 6.8.12 The new overbridge is 8m wide with additional run-off provided on the landings for escalators and queuing spaces provided for lifts. Where a fire shutter is installed across the overbridge adjacent to the platform 1 escalator, the bridge width narrows to 6m. However, this is still more than the circulation width required at LoS C (free flow) and indeed modelling shows the new overbridge performing at LoS B or better.
- 6.8.13 In addition, there is the existing overbridge at 3.0m wide which provides an alternative route between platforms and additional capacity.

Platform Occupancy

- 6.8.14 Platform utilisation, in terms of percentage boarding and alighting per train car, has been taken from the 2016 survey data (provided by Network Rail for the Network Rail Station Capacity Assessment: Luton Airport Parkway Station – Static Analysis March 2020) and is shown in Figure 6.5, adjusted to reflect the new overbridge and a new entry/exit point onto platforms and how these might

spread boarding and alighting. Entry/exit points for the various platforms are shown by the red arrows. Platforms are divided into 12 blocks, one per car.

Figure 6.4: Percentage boarding and alighting per train car, by platform – with the new overbridge



- 6.8.15 In generating these revised boarding and alighting profiles, care has been taken to maintain comparable profiles to those shown in existing survey demand, as follows:
- a. Platform 1 now has three entry / exit points, these being the stairs to the current overbridge, access to the new Luton DART station and, for boarders only, the new down escalator at platform 1. The boarding profile has been adjusted reflecting that the new escalator will be the most heavily used entry point to the platform. The previous boarding profile showed 54% of all boarders waiting on the platform were located opposite to train cars 3 and 4. The adjusted profile reflects a shift of passengers to train blocks further west. However, to maintain the same busyness, 54% of boarders are assumed to wait on the platform opposite train cars 4 to 7. Of these, 32% of boarders wait opposite train cars 6 and 7 at the base of the new escalator. For alighting flows, the access points are no different than currently as the new overbridge does not provide any additional vertical circulation for alighters. The alighting profile is therefore maintained as per current surveyed information,
 - b. Platforms 2/3 have two primary entry / exit points, these being the island platform stairs to the current overbridge and the new overbridge escalators. With the new escalators, it is assumed that the boarding profile for both platforms 2 and 3 will move westwards along the platform but with the shape of the profile maintained. This shift will be facilitated by provision of a new waiting room on platforms 2/3. The highest proportion of boarders is currently 31% to train car 6 and 29% to train car 3 on platform 3. This shifts to 29% and 27% to train cars 8 and 6 with the new overbridge and escalators. The slightly lower proportions reflect a nominally greater spread of passengers along the platform in order to maximise their ability to board trains arriving at Luton Airport Parkway Station. For platform 2, the highest proportion of alighters, 19%, currently come from train car 3 which is next to the stair to the existing overbridge. Over time, it is assumed that the train car next to the up escalator from platform 2/3 will be the most popular and the revised profile has 20% of passengers alighting here, from train car 6. The current platform 3 alighting profile is unusual and shows the two busiest sections of the platform, one by the overbridge stair and one at train car 5 (which is where the new escalator will connect though there is no vertical circulation here currently). Accordingly, this profile has been left untouched reflecting that these two locations will still be the busiest for alighters in the future.
 - c. Platform 4 has two entry / exit points being the door into the existing station building located broadly in front of train car 1 and the new escalators which land at train car 4. Currently passengers tend to spread along the whole of platform 4 and the new profiles reflect this existing pattern but shifted slightly west to reflect the new overbridge and new escalator capacity that has been provided.

6.9 Platform Width Requirements

6.9.1 Platform occupancy, and therefore platform width, requirements have been estimated for 32 mppa, in line with the latest Network Rail, Station Capacity Assessment Guidance, dated November 2016.

Table 6.4: Platform demands at 32 mppa

	AM peak (04:00- 05:00)		PM peak (17:30- 18:30)	
	Peak boarding load	Peak alighting load	Peak boarding load	Peak alighting load
Platform 1	144	34	161	10
Platform 2	7	123	31	135
Platform 3	41	40	81	19
Platform 4	22	133	23	54

6.9.2 The analysis shows all platform blocks operating at LoS C or better in the peak 15 minutes at 32 mppa. For all platforms, significant spare capacity exists either side of the busiest areas; in order to mitigate this information provision provided beyond the mid-point of the platform could be used to encourage passengers to move down the platforms. This may happen naturally over time as rail services become busier and passengers move to find more space on trains.

Table 6.5: Platform width requirements at LoS C at 32 mppa

Platform 1				Platform 2			
Per carriage section	AM required width (m)	PM required width (m)	Available width (m)	Section	AM required width (m)	PM required width (m)	Available width (m)
1	1.1	1.1	4.0	1	0.9	0.9	4.0
2	1.3	1.2	2.5 – 4.0	2	1.0	1.0	2.5 – 4.0
3	1.7	1.4	2.6 – 4.0	3	1.4	1.5	2.6 – 4.0
4	2.1	1.9	3.6	4	1.3	1.4	2.5 – 2.7
5	1.8	1.7	2.5 – 3.6	5	1.4	1.6	2.5 – 2.7
6	2.1	2.2	2.5 – 4.0	6	2.0	2.4	4.0
7	1.9	2.0	4.0	7	1.6	1.9	4.0
8	1.6	1.6	4.0	8	1.8	2.2	4.0
9	1.4	1.5	4.0	9	1.4	1.5	4.0
10	1.2	1.3	4.0	10	1.2	1.3	4.0
11	1.2	1.2	4.0	11	1.1	1.1	4.0
12	1.1	1.1	4.0	12	0.9	0.9	4.0
Platform 3				Platform 4			
Per carriage section	AM required width (m)	PM required width (m)	Available width (m)	Section	AM required width (m)	PM required width (m)	Available width (m)
1	0.9	0.9	4.5	1	1.2	1.0	3.9
2	1.1	1.0	3.0 – 4.5	2	1.4	1.1	3.9
3	1.3	1.2	3.0 – 4.5	3	1.6	1.2	3.8
4	1.2	1.3	2.7 – 2.9	4	1.7	1.3	3.3
5	1.6	1.9	2.7 – 2.9	5	1.9	1.3	3.3
6	1.6	2.0	4.5	6	2.0	1.4	3.3
7	1.3	1.7	4.5	7	1.8	1.4	3.7
8	1.1	1.2	4.5	8	1.6	1.2	3.7
9	0.9	1.0	4.5	9	1.3	1.1	3.7
10	0.9	0.9	4.5	10	1.4	1.1	3.7
11	0.8	0.8	4.5	11	1.1	1.0	3.7
12	0.8	0.8	4.5	12	1.0	0.9	3.7

6.10 Luton DART Parkway Station

6.10.1 The Luton DART Parkway Station abuts the Network Rail station and is connected to it by the existing and the new overbridges.

6.11 Vertical Circulation

6.11.1 1,703 passengers will enter or exit from / to the street in the 32 mppa scenario peak hour. Assuming all of these passengers use the escalators in Luton DART Parkway Station (which is a worst case scenario as passengers to or from platform 1 can enter or exit to street at the same grade), there will be between 18 and 19 people per minute in each direction in the peak hour. This is within the designed capacity of a single escalator in each direction which would accommodate 60 people per minute.

6.11.2 Two lifts are adequate to meet the capacity requirements. These allow for up to 35% of people going from or to the street to use lifts. A third lift is available for redundancy to platform 1 within the Network Rail station and therefore some coordination between the rail and Luton DART operations is required if both lifts were to break down.

6.12 Concourse

6.12.1 In accordance with best practice, peaking factors have been used to represent surges in the hour. In terms of waiting behaviour, the assessment includes the following:

- a. All passengers are assumed to wait on the Luton DART concourse for between 1 minute and 15 minutes.
- b. Direct access to platform 1 at Luton Airport Parkway station is ignored and all Network Rail demand is assumed to come via the Luton DART concourse.
- c. In line with IATA standards, the assessment assumes 1.7m² of concourse space for Luton DART and Network Rail passengers. This is equivalent to all passengers going to and from the airport having bags.
- d. In line with Network Rail and TfL standards, 1.0m² of concourse space has been used for commuters, staff and other users which is equivalent to a waiting or queuing area on the concourse at Fruin LoS B.
- e. By using 1.7m² of concourse space for airport users and 1.0m² of concourse space for other users, the concourse is being designed at LoS B or better. Accordingly, even if the concourse is shown as 100% utilised, this does not mean it fails but that it is likely to be busier and closer to operating at LoS C.

6.12.2 At 32 mppa the Luton DART concourse is estimated to be utilised at around 80% of its LoS B capacity in the busiest demand scenario. Concourse utilisation is higher than previously reported owing to the introduction of two gatelines, one at the Network Rail overbridge and one at the Luton DART platforms, which has reduced the available waiting and circulation space.

- 6.12.3 This utilisation also includes all Network Rail flows from the south waiting on the Luton DART concourse. In reality, these passengers will have the existing Network Rail station concourse facilities available and are more likely to wait there.
- 6.12.4 The concourse area in the existing Network Rail station to the south of the railway line has not been analysed, as by moving all of the airport traffic to the DART on the other side of the railway line, this will free up space in the existing station, which will mean it performs at a good level of service.

6.13 Gateline

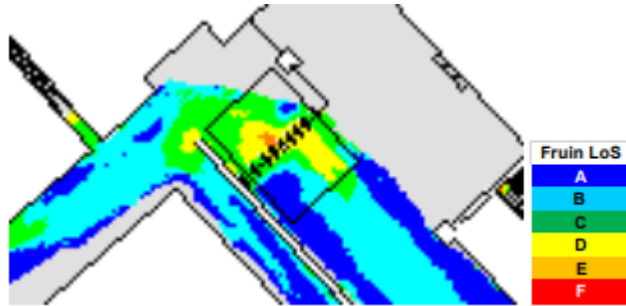
6.13.1 The gate line solution developed includes:

- a. Network Rail Platform 1 gateline: Network Rail P1 and DART/street (at ground level),
- b. Network Rail Platforms gateline: Network Rail P1-4 and DART (at Luton DART concourse and new overbridge level),
- c. Luton DART gateline: Luton DART and Network Rail/street (at Luton DART concourse level).
- d. Gateline requirements were tested in dynamic simulation using Legion software.

6.13.2 The following criteria have been considered:

- a. Gateline clearance - desirable for all passengers to pass through the gateline within 2 minutes of the first passenger. However, a longer clearance time is acceptable if the gateline is cleared prior to subsequent train or Luton DART arrival. This criterion aims to ensure safe dispatch of services,
- b. Headway - acceptable performance is defined as all passengers being through the gateline prior to the arrival of passengers from a subsequent service arrival. Luton DART headway for interim years is 225 seconds,
- c. Level of Service - acceptable performance for Fruin LoS. Walkways in a free movement environment (i.e. concourse, walkway, etc.) is LoS C. In a queuing environment, gateline clearance criteria apply; LoS Walkways criteria do not apply as pedestrians tolerate higher densities in queues and still consider their environment comfortable.
- d. The Network Rail gateline at the new overbridge delivered 3 standard and 2 wide gates for alighting passengers leaving the Network Rail premise. This configuration produces appropriate gateline operational performance with an acceptable level of queuing. The maximum queue in the peak is around 30 passengers, which across 5 gates is around 6 people per gate, so within the designated queuing area.
- e. Two standard gates and 1 wide gate are provided for entry flows, for a total of 8 gates. Queuing on entry is minimal even in the peak.

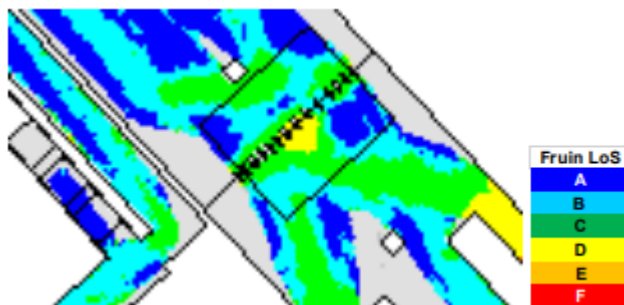
Figure 6.5: Level of Service at the Network Rail Platforms Gateline (Fruin Queuing)



6.13.3 The Luton DART gateline comprises 9 standard and 4 wide gates as a consolidated array (as opposed to separate gatelines to cover the boarding and two alighting platforms). The gateline clearance is greater than 2 minutes but clears prior to the next DART arrival. The density map shows the concourse performance is acceptable and can accommodate the crossover movements which occur with a consolidated configuration. There is a small amount of queuing at the gateline with a maximum of 35 people across the 11 out gates, so around 3 people per gate and within the designated queuing area. The sustained maximum queue is approximately 20 people.

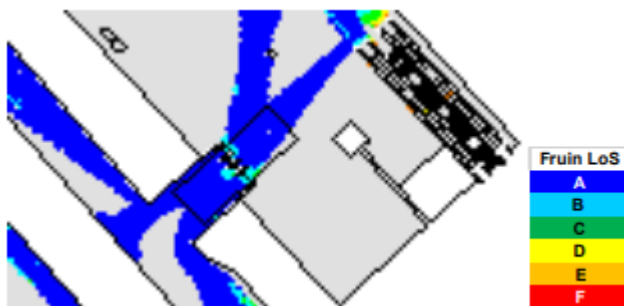
6.13.4 Sensitivity testing for 35% of Luton DART passengers using the wide gates indicates that the gateline will still clear prior to the arrival of the next service.

Figure 6.6: Level of Service at the Luton DART Gateline (Fruin Queuing)



6.13.5 The Network Rail platform 1 gateline comprises 1 entry gate, 2 out or exit gates and one wide gate which can operate bi-directionally. Modelling indicates that there is unlikely to be any queue at the Platform 1 gateline.

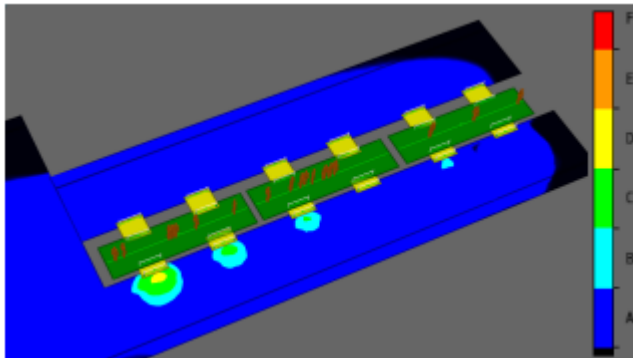
Figure 6.7: Level of Service at the Network Rail Platform 1 Gateline (Fruin Queuing)



6.14 Platforms

- 6.14.1 There are separate boarding and alighting platforms at the Luton DART Parkway Station. The Luton DART Parkway Station design includes a three-platform configuration with a central island platform for boarding and 2 alighting platforms. Analysis indicates that these widths will provide for appropriate LoS (LoS C or better).

Figure 6.8: Separate Boarding and Alighting Platform, Average Level of Service during Peak 15 Minutes (Fruin Queuing)



6.15 Conclusions

- 6.15.1 The Luton DART system needs to be sized to carry the busiest one-way flow, which is the departures peak 04:00-05:00 on the landside.
- 6.15.2 Whilst one-way peaks are lower later in the day, the combined arrival and departure peak hour is highest between 17:30-18:30 on the landside. This combined peak was used to validate the Luton DART and Network Rail station design as the stations will need to accommodate arriving and departing flows. In addition, this period also has higher flows of employees and background commuter traffic through the railway station.
- 6.15.3 Accordingly, this peak has been used for the assessment of Luton Airport Parkway Station and the adjacent Luton DART Parkway Station.
- 6.15.4 Luton Airport Parkway Station was shown to accommodate this higher peak demand at LoS C or better, with the exception of some areas on the platforms which were shown to operate at LoS D in the peak 15 minutes.
- 6.15.5 Accordingly, when considering lower forecast demand at 32 mppa based on agreed York Aviation forecasts, the station is shown to perform at LoS C or better, as outlined below:
- 6.15.6 **Vertical circulation** – vertical circulation capacity is appropriate, with stairs and escalators providing for the majority of passengers and lifts available for up to 35% of the peak alighting load on each platform.
- 6.15.7 **Overbridge(s)** – the new overbridge is 8m wide with additional run-off provided on the landings for escalators and queuing spaces provided for lifts. In addition, there is the existing overbridge at 3.0m width giving a total overbridge width of 11.0m which is more than the circulation width required at LoS C.

- 6.15.8 **Platform widths** – the analysis shows all platform blocks operating at LoS C or better in the peak 15 minutes at 32 mppa. For all platforms, significant spare capacity exists either side of the busiest areas and accordingly information provision provided beyond the mid-point of the platform could be used to encourage passengers to move down the platforms. This may happen naturally over time as rail services become busier and passengers move to find more space on trains.
- 6.15.9 **Luton DART Parkway Station** is also shown to perform at LoS C or better at 32 mppa (DCO design scenario), as per below:
- 6.15.10 **Vertical circulation** – demand is within the capacity of a single escalator in each direction operating at 60 people per minute. Two lifts are provided which would allow for up to 35% of people going from or to street using lifts.
- 6.15.11 **Gatelines** – the gateline provision achieves appropriate queuing and Level of Service performance.
- 6.15.12 **Concourse** – the Luton DART concourse is estimated to be utilised to between 80% and 90% of its LoS B capacity in the 32 mppa demand scenario. Concourse utilisation is higher than previously reported owing to the introduction of two gatelines, one at the Network Rail overbridge and one at the DART platforms, which has reduced the available waiting and circulation space.

7 RESPONSE TO NETWORK RAIL ENGAGEMENT – FUTURE EXPLANATION OF DEMAND FORECAST AND IMPACTS

7.1 Introduction

7.1.1 The following sections respond to Network Rail's requests for further evidence on the future demand forecast and impacts on the rail network building on the explanation set out in **Appendix H of the Transport Assessment [TR0210000/APP-202]** and the earlier version of the **Rail Impacts Summary [REP5-057]**.

7.2 Why does the increase in demand fall into interpeak periods?

7.2.1 The increase in airport rail passengers over the day at the 32 mppa, 2043 scenario is approximately 15,000 additional passengers travelling to and from London Luton Airport on an October weekday. Paragraph 6.6.26 of the **Need Case [AS-125]** sets out the reason why an October day was used for the purposes of surface access assessments.

7.2.2 This is based on the pattern of flight differences projected in a 32 mppa airport and the 18 mppa baseline, combined with the assumptions on the expected time passengers arrive before a flight (given the short/medium haul flights at London Luton Airport) and depart after a flight to allow passengers to pass through passport control, collect baggage and travel to or from Luton Airport Parkway Station and the airport.

7.2.3 The airport is busiest in terms of flight departures in the early morning peak. The peak departure at the airport is between 06:00-09:00, as a result passengers are primarily travelling on the rail network in the counter peak direction from London but will be arriving significantly earlier as passengers are required to arrive roughly 90 minutes before departure. The number of departures in the evening is relatively low compared to the morning and reduces the impact of airport demand on the peak commuter flow from London to Luton Airport Parkway Station.

7.2.4 London Luton Airport has arrivals after the first wave of early morning departures at 07:00, midday and the early evening. However, the growth in departures from 18 mppa to 32 mppa is highest in the midday and evening peak. Airport passengers arrive at the rail network later as they pass through the airport, through passport control and potentially reclaim luggage.

Table 7.1: Rail demand growth (18 mppa to 32 mppa) by rail period

Peak Period	Growth in Passengers (at 32 mppa)		Share of Growth	
	To the airport	From the airport	To the airport	From the airport
Early Morning (0-07:00)	2,410	901	33%	12%
Morning Peak (07:00-10:00)	1,011	1,396	14%	19%
Interpeak (10:00- 16:00)	2,467	2,204	34%	30%
Evening Peak (16:00 – 19:00)	1,103	1,160	15%	16%
Late Evening (19:00-00:00)	263	1,771	4%	24%
Total	7,254	7,432	100%	100%

7.3 How have figures been prepared relating to the overall growth impact on the rail network?

7.3.1 The airport has a passenger cap in terms of millions of passengers per annum. This has recently been uplifted from 18 mppa to 19 mppa but the baseline year comparison was 18 mppa.

7.3.2 The daily profile (as used in **Appendix H of the Transport Assessment [TR0210000/APP-202]**) is based on a forecast airline schedule produced by York Aviation for an October weekday. This is considered a normal month and is consistent across the highway and public transport modelling.

7.3.3 The weekday October profile in the 32 mppa scenario represents 99,000 daily passengers. This is 10% above the number of passengers of the average daily passengers across the year. Historically, summer months are busier (about 10-15% more than an October weekday). However overall total rail demand consists of airport and non-airport passengers; during summer months non-airport rail demand is lower and airport rail passengers make up only a small proportion of total rail demand on the Thameslink corridor.

7.3.4 The forecast rail mode share for 2043 is 27% - this is applied equally across the day. This results in approximately 26,500 daily passengers in 2043.

Mode Share

7.3.5 The baseline mode share was 20% of passengers travelling by rail increasing to 27% in the 2043, 32 mppa scenario. As set out in **Appendix H of the Transport Assessment [APP-202]** the components of the growth in mode share.

Table 7.2: Components rail mode share growth

Component	2027	2039	2043
Elizabeth line	1.0%	1.1%	1.1%
Road Congestion	0.0%	0.2%	1.1%
Luton DART & Thameslink 20/20	5.6%	6.3%	6.3%
EMR Corby-London service	2.5%	2.7%	2.7%
Sub-Total	25.1%	26.3%	27.2%

7.3.6 The estimation for each component is set out below.

Elizabeth Line

7.3.7 In order to estimate the impact of Crossrail on the public transport mode share, a calibrated high-level journey time / public transport mode share regression model for London's boroughs was undertaken. The use of the regression model provided a high-level estimate of the impact that journey time savings generated by the scheme would have on the overall public transport share. In this instance, the overall mode share growth is assumed to impact primarily car/taxi users. The model predicts the Borough's public transport mode shares based on the observed public transport and highway journey times to/from each Borough and London Luton Airport.

Road Congestion

7.3.8 The DfT publishes traffic forecasts for the UK road network (NTM model), including congestion forecasts which provide information about the expected changes in road speeds (by road type and area) in England and Wales. The changes in speeds have been used to determine the proportional changes in travel times at network level, including both cars, buses and coaches. The changes in travel time combined with the rail industry's Passenger Demand Forecasting Handbook versus bus-coach/car travel time cross elasticities provide an estimate for the likely shift from bus/coach and cars to rail.

Thameslink and Luton DART

7.3.9 The increase due to Thameslink and Luton DART was based on the analysis of comparative mode share for Stansted and London Luton Airports and the fall in journey times on Luton DART bringing it closer to the equivalent journey times achieved at Stansted. An adjustment was made for the different catchment of London Luton and Stansted Airports and to the additional crowding on Thameslink compared to Stansted Express.

7.3.10 This was based on the proposed Thameslink 20/20 timetable and the increase was in combination with Luton DART delivering 6.3% of the proposed 9% growth, with the majority delivered through improvements to journeys delivered through Luton DART compared to the shuttle bus service. The change in trains per hour at Luton Airport Parkway Station was only two additional services over the three hour morning peak therefore would only have a small impact on forecast mode share.

EMR Corby-London service Luton Airport Express

- 7.3.11 An assessment of the introduction of a dedicated airport express service was undertaken as part of the 'Maximising opportunities for the next East Midlands rail franchise: Benefits from increasing Express Services to London Luton Airport 2016' study. This project estimated a 4tph service would increase mode share by 7.6%. The estimated impact of the 2tph service due to timetable adjustments is less and 2.7%. The method used in the North Star Rail report is contained within the study.

Background Demand

- 7.3.12 As set out in **Appendix H** of the **Transport Assessment [APP-202]** , background demand was uplifted on the basis of historical growth rates, with airport demand added to background demand. This total demand was then divided over the timetabled service frequency to give an average level of crowding across Thameslink services on the corridor. The additional demand from the airport was then added to non-airport demand using the assumption that 80% of additional airport passengers are heading southbound at Luton Airport Parkway station. The capacity of future Thameslink timetable was the 20/20 timetable which provided the frequencies used to assess capacity.

7.4 Confirmation as to the cumulative effects of Gatwick Airport.

- 7.4.1 Gatwick Airport Expansion is not a consented scheme so would not have been included in any assessment of the Proposed Development – however it is important to note the background rail demand (as set out in **Appendix HB** of the **Transport Assessment [TR0210000/APP-202]**) was undertaken using an annual growth rate assumption rather than accounting for specific schemes due to uncertainty over how individual schemes would impact rail demand on the corridor over time.
- 7.4.2 Gatwick Airport demand is likely to have a small overlap with London Luton Airport demand due to them being at the opposite end of the Thameslink core and the preference that passengers have for local airports. For both airports, most rail passengers will be traveling from central London in opposite directions.

7.5 Train capacity analysis including effects on St Albans and Harpenden Stations

- 7.5.1 Only a small share of air passengers from Luton Airport Parkway Station are travelling directly to either St Albans or Harpenden by rail therefore an assessment of these stations' capacity was not undertaken. Network Rail have subsequently asked whether it is possible that additional airport passengers on Thameslink could create impacts at St Albans and Harpenden Stations during peak hours.
- 7.5.2 It is important to note that the increase in rail passengers occurs over the long-term development of the airport to 2043. Therefore, comparing conditions on specific services today with future long-term airport demands across the peak

hour is likely to not accurately reflect future background demand. There is no guarantee that timetables will be the same in 2039 or 2043 as today and this will impact on what services both background demand and airport passengers choose to travel on.

- 7.5.3 In addition to the mix of Thameslink services, the new Luton Airport Express service, which does not stop at St Albans or Harpenden, offers a more airport specific service. London Luton Airport does not have a breakdown of demand share of each of these services since Luton DART and the Luton Airport Express have been operating for a limited period.
- 7.5.4 The assessment of rail capacity undertaken, and detailed in **Appendix H** of the **Transport Assessment [TR021000/APP-202]**, was based on the CAA passenger survey and historical data on Thameslink loading data. Data reflecting the level of demand on individual services or the origin and destination of passengers along the Thameslink route during the peak is not in the public domain for assessment.
- 7.5.5 A review of publicly available data from Thameslink on crowding, provided as part of their timetable, at a service level shows that there are only a limited number of trains where passengers are not able to get a seat or significant standing capacity is not available at both Harpenden and St Albans Stations (departures from St Albans 0727, 0757, 0811, 0827, 0841 and 0857) which also stop at Luton Airport Parkway Station.

Table 7.3 Thameslink Morning Peak Timetable and Crowding information (available from the Thameslink Railway website)

Alerts	Operator	Facilities	Notes	TL	TL	TL	TL	EM	TL	TL	TL	TL	TL	TL	EM	TL	TL	TL	TL	TL	EM	TL	TL	TL	TL	TL	TL	EM	TL	TL	TL	EM	TL					
Bedford	7	BDM	d	-	-	0648	0703	0710	-	-	-	0715	-	-	0718	0733	0740	-	-	0730	-	-	0748	0810	-	-	0802	-	-	0818	0839	-	-	0832	-	0848	0911	-
Flitwick		FLT	d	-	-	0659	0713	-	-	-	0711	-	-	-	0729	0743	-	-	-	0741	-	-	0759	-	-	-	0813	-	-	0829	-	-	-	0843	-	0859	-	-
Harlington		HLN	d	-	-	0703	-	-	-	-	0715	-	-	-	0733	-	-	-	-	0745	-	-	0803	-	-	-	0817	-	-	0833	-	-	-	0847	-	0903	-	-
Leagrave		LEA	d	-	-	0708	-	-	-	-	0721	0731	-	-	0738	-	-	-	-	0751	-	-	0808	-	-	-	0823	-	-	0838	-	-	-	0852	-	0908	-	-
Luton	10	LUT	d	-	0701	0713	0722	0726	-	0717	0727c	0737	-	0731	0743	0752	0756	-	0747	0757c	-	0801	0813	0825	-	0817	0827	-	0831	0843	0855	-	0847	0859c	-	0913	0926	-
Luton Airport Parkway	7	LTN	d	-	0704	0716	-	0729	-	0720	0730	-	-	0734	0746	-	0759	-	0750	0800	-	0804	0816	0828	-	0820	0830	-	0834	0846	0858	-	0850	0902	-	0916	0929	-
Harpenden		HPD	d	-	0709	0722	0728	-	-	0725	0735	0743	-	0739	0752	0758	-	-	0755	0805	-	0809	0822	-	-	0825	0835	-	0839	0852	-	-	0855	0908	-	0922	-	-
St Albans City		SAC	d	0707	0715	0727	0733	-	0722	0731	0741	0748	0737	0745	0757	0803	-	0752	0801	0811	0807	0815	0827	-	0822	0831	0841	0837	0845	0857	-	0852	0901	0913	0907	0927	-	0922
Radlett		RDT	d	0712	0720	-	-	-	0727	0736	-	-	0742	0750	-	-	-	0757	0806	-	0812	0820	-	0827	0836	-	0842	0850	-	-	0857	0906	-	0912	-	-	0927	
Elstree & Borehamwood		ELS	d	0716	0724	-	-	-	0731	0739	-	-	0746	0754	-	-	-	0801	0809	-	0816	0824	-	0831	0839	-	0846	0854	-	-	0901	0909	-	0916	-	-	0931	
Mill Hill Broadway		MIL	d	0720	0728	-	-	-	0735	0743	-	-	0750	0758	-	-	-	0805	0813	-	0820	0828	-	0835	0843	-	0850	0858	-	-	0905	0913	-	0920	-	-	0935	
Hendon		HEN	d	0724	-	-	-	-	0739	-	-	-	0754	-	-	-	0809	-	-	0824	-	-	0839	-	-	0854	-	-	-	0909	-	-	0924	-	-	0939		
Brent Cross West		BCZ	d	0726	0732	-	-	-	0741	0747	-	-	0756	0802	-	-	-	0811	0817	-	0826	0832	-	0841	0847	-	0856	0902	-	-	0911	0917	-	0926	-	-	0941	
Cricklewood		CRI	d	0729	-	-	-	-	0744	-	-	-	0759	-	-	-	0814	-	-	0829	-	-	0844	-	-	0859	-	-	-	0914	-	-	0929	-	-	0944		
West Hampstead Thameslink		WHP	d	0732	0736	0739	-	-	0747	0751	-	-	0802	0806	0809	-	-	0817	0821	-	0832	0836	0839	-	0847	0851	-	0902	0906	0909	-	0917	0921	-	0932	0939	-	0947
Kentish Town		KTN	d	0737	-	-	-	-	0752	-	-	-	0807	-	-	-	0822	-	-	0837	-	-	0852	-	-	0907	-	-	-	0922	-	-	0937	-	-	0952		
St Pancras International	15	STP	a	0742	0747	0749	0754	0754	0757	0802	0804	0809	0812	0817	0819	0824	0824	0827	0832	0834	0842	0847	0849	0851	0857	0902	0904	0912	0917	0919	0921	0927	0932	0934	0942	0949	0953	0957
Farringdon	3	ZFD	a	0746	0751	0754	0759	-	0801	0806	0809	0814	0816	0821	0824	0829	-	0831	0836	0839	0846	0851	0854	-	0901	0906	0909	0916	0921	0924	-	0931	0936	0939	0946	0954	-	1001
City Thameslink	3	CTK	a	0748	0753	0756	0801	-	0803	0808	0811	0816	0818	0823	0826	0831	-	0833	0838	0841	0848	0853	0856	-	0903	0908	0911	0918	0923	0926	-	0933	0938	0941	0948	0956	-	1003
London Blackfriars	3	BFR	a	0751	0756	0758	0803	-	0806	0811	0813	0818	0821	0826	0828	0833	-	0836	0841	0843	0851	0856	0858	-	0906	0911	0913	0921	0926	0928	-	0936	0941	0943	0951	0958	-	1006
London Bridge	4	LBG	a	-	-	0804	0809	-	-	0817	0820	0824	-	-	0834	0840	-	-	0847	0850	-	-	0904	-	-	0917	0920	-	-	0934	-	-	0947	0950	-	1004	-	-
Elephant & Castle		EPH	a	0755	0800	-	-	-	0810	-	-	-	0825	0831	-	-	-	0840	-	-	0855	0900	-	-	0910	-	-	0925	0931	-	-	0940	-	-	0955	-	-	1010
Woolwich Arsenal	4	DLR	WVA	a	-	-	-	-	0840	-	-	-	-	-	-	-	-	0910	-	-	-	-	-	-	0940	-	-	-	-	-	-	-	-	-	-	-	-	
Dartford	4	DFD	a	-	-	-	-	-	0857	-	-	-	-	-	-	-	-	0927	-	-	-	-	-	-	0957	-	-	-	-	-	-	-	-	-	-	-	-	
Gravesend	4	GRV	a	-	-	-	-	-	0917	-	-	-	-	-	-	-	-	0947	-	-	-	-	-	-	1017	-	-	-	-	-	-	-	-	-	-	-	-	
Chatham	4	CTM	a	-	-	-	-	-	0936	-	-	-	-	-	-	-	-	1006	-	-	-	-	-	-	1036	-	-	-	-	-	-	-	-	-	-	-	-	
Gillingham (Kent)	4	GLM	a	-	-	-	-	-	0940	-	-	-	-	-	-	-	-	1010	-	-	-	-	-	-	1040	-	-	-	-	-	-	-	-	-	-	-	-	
Rainham (Kent)		RAI	a	-	-	-	-	-	0946	-	-	-	-	-	-	-	-	1016	-	-	-	-	-	-	1046	-	-	-	-	-	-	-	-	-	-	-	-	
Bromley South	4	BMS	a	-	0833	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0933	-	-	-	-	-	-	-	-	-	-	-	-	-	
Orpington	4	ORP	a	-	0844	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0945	-	-	-	-	-	-	-	-	-	-	-	-	-	
Wimbledon	6	WIM	a	0824	-	-	-	-	-	-	-	-	0854	-	-	-	-	-	-	-	-	-	0924	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Sutton (Surrey)	4	SUO	a	0844	-	-	-	0847	-	-	-	0914	-	-	-	-	-	-	-	-	-	-	0917	-	-	-	0947	-	-	1014	-	-	1017	-	-	-	-	
East Croydon		ECR	a	-	-	0818	0824	-	-	-	-	0836	0838	-	-	0848	0853	-	-	0906	-	-	0918	-	-	0936	-	-	0948	-	-	-	1006	-	-	1018	-	
Gatwick Airport	10	GTW	a	-	-	0834	-	-	-	0910	0854	-	-	0904	0921	-	-	-	0934	-	-	0934	-	-	1004	-	-	1004	-	-	1034	-	-	1034	-	-	-	
Three Bridges	4	TBD	a	-	-	0839	-	-	-	0916	0900	-	-	0909	0928	-	-	0940	-	-	0939	-	-	1010	-	-	1009	-	-	1040	-	-	1039	-	-	-		
Haywards Heath	3	HHE	a	-	-	0851	-	-	-	-	-	-	-	0921	-	-	-	-	-	-	-	-	0951	-	-	-	-	-	1021	-	-	-	-	-	-	1051	-	
Brighton	10	BTN	a	-	-	0913	-	-	-	-	-	-	-	0943	-	-	-	-	-	-	-	-	1013	-	-	-	-	-	1043	-	-	-	-	-	-	1113	-	

Usual seat availability

- Usually many seats available
- Usually plenty of seats available
- Usually some seats available
- Usually only a few seats available
- Usually standing room only
- Usually even standing space is limited
- Expected to be busier than usual

7.5.6 There are also alternative EMR services calling at Luton Airport Parkway at 0729, 0759 and 0825 – these services provide a faster (and less congested) service to St Pancras and may be attractive to airport passengers.

7.5.7 These peak hour southbound trains would be impacted by air passengers arriving at the airport prior to travelling at Luton Airport Parkway – air passengers must pass through the border and customs, travel on the Luton DART before they reach Luton Airport Parkway.

7.5.8 For 2043/32 mppa, this is an additional 464 southbound passengers (excluding passengers for Luton/Bedford and connections to the East Midlands) 0700-0800, and 378 south bound passengers between 0800 and 0900 but far fewer in 2027 (6 and 71).

Table 7.4 Number of additional rail passengers per hour southbound direction by assessment year

	2027	2039	2043
0700-0800	6	229	465
0800-0900	71	244	378

7.5.9 Assuming passengers arrive uniformly at Luton Airport Parkway and the time between each rail service, the additional demand on each service can be assumed and subsequently the number of passengers per car and amount of capacity utilised can be calculated.

Table 7.5 Additional passengers per carriage and capacity utilised due to additional passengers

Services	Minutes to previous service	Additional passengers per carriage 2027	Additional passengers per carriage 2039	Additional passengers per carriage 2043	Additional capacity utilised 2027	Additional capacity utilised 2039	Additional capacity utilised 2043
0716	12	0.1	3.8	7.7	0.1%	2.6%	5.3%
0746	12	0.1	3.8	7.7	0.1%	2.6%	5.3%
0800	10	0.1	3.2	6.5	0.1%	2.2%	4.4%
0816	12	1.2	4.1	6.3	0.8%	2.8%	4.3%
0830	10	1.0	3.4	5.2	0.7%	2.3%	3.6%
0846	12	1.2	4.1	6.3	0.8%	2.8%	4.3%

Impact Summary of Table 7.5

- 7.5.10 Trains arriving at these stations are likely to see a marginal increase in airport passengers in 2027 with an additional 1.2 passenger per carriage as set out in the Table 7.5 above.
- 7.5.11 By 2039, impacts on each train would be a ~3% increase in train capacity utilisation of around 3 additional passengers per carriage due to the growth in airport passengers.
- 7.5.12 By 2043, impacts on each train would be a ~5% increase in train capacity utilisation an increase of around 7 additional passengers per carriage due to the growth in airport passengers in crowding.

7.6 Impact of the removal of the aspiration for running 24 trains an hour

- 7.6.1 The future 24 train per hour timetable (referred to as Thameslink 20/20) was included as the future assumption for 2027, 2039 and 2043 based on the assumption that this would be introduced at the time of the assessment as part of the Thameslink franchise programme. Whilst the Applicant understands (although no stated public information was available to confirm this) that introduction is no longer a short-term aspiration, if significant levels of demand growth was as in the capacity assessment in **Appendix H of the Transport Assessment [TR021000/APP-202]** that 24tph is likely to return to being an aspiration for the Thameslink corridor.
- 7.6.2 There is a clear relationship between the current lower demand on the Thameslink corridor and the postponed introduction of the higher frequencies. In the long term, should demand grow, it is also assumed an operator would seek to increase capacity to reflect demand growth and future revenue potential opportunity.

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