Report
January 2020

Station Usage & Origin Destination Matrix 2018/19: Historical Methodological Changes

Office of Rail and Road
Our ref: 23285203
Client ref:

steer

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1 Methodological changes 2011/12 – 2018/19

1.1 This section summarises the methodological changes specified and implemented in the Station Usage dataset by Steer from the 2011/12 to 2018/19 dataset. The descriptions of the methodological changes in this section were originally included in the Station Usage Methodology and Validation reports for those years' datasets.

Methodological Changes in 2018/19

Key PTE Infill Changes for 2018/19

1.1 Each year, Passenger Transport Executive (PTE) infills are prepared by Steer (for West Midlands) and Mott MacDonald (for Greater Manchester, Merseyside, South Yorkshire, Tyne and Wear, West Yorkshire and Strathclyde).

1.2 These infills are subject to annual improvements, which normally represent a simple update, but some years contain a step change in the methodology.

1.3 For 2018/19, Concessionary ticketing data was available for Greater Manchester PTE for the first time. Table 1-1 below shows the split of PTE sales by PTE product.

Table 1-1: Summary of Transport for Greater Manchester (TfGM) Infill change in 2018/19

Ticket Type	2017/18 Journeys	2018/19 Journeys	Abs Change 2017/18-2018/19	% change 2017/18-2018/2019
Traincard	3,387,129	3,479,328	92,199	2.65%
Countycard	1,548,081	1,462,476	-85,605	-5.85%
Wayfarer	126,983	81,438	-45,546	-55.93%
GMPTE Accompanied Child	150,958	125,845	-25,113	-19.96%
DaySaver	53,615	44,454	-9,161	-20.61%
Rail Ranger	12,902	9,078	-3,824	-42.12%
Concessions	0	3,705,977	3,705,977	100.00%
Total	5,279,668	8,908,596	3,628,928	40.74%

1.4 This led to a total increase of 3.6m journeys, or 7.2m entries and exits, split across the Greater Manchester area.

Season ticket journey adjustments

1.5 In the production of previous years' statistics, adjustments were made to account for situations where passengers buy season tickets for travel to/from a station other than the one they generally travel from, in order to allow additional flexibility.

1.6 In some areas, multiple stations have identically priced season tickets to London. As a result, London season tickets are generally sold as being from the furthest station, regardless of the actual origin station. This means that the ticket sales data shows that there are more people travelling to/from this station than is actually the case.

1.7 LENNON sales data was used to estimate the number of tickets where the issuing office was at a branch line station but the ticket origin showed a station further along a line. In these cases, it was assumed that the journey was actually being made from a point on the branch line and not the recorded origin.

1.1 For the production of the 2018/19 statistics, the analysis underpinning this reallocation was updated with 2018/19 LENNON data. Table 1-2 shows the scale of the adjustments.

Table 1-2: Summary of adjustments in 2018/19

Station TLC	Station Name	Station Group	Adjusted Journeys	Total Journeys
SOV	Southend Victoria	Southend Victoria Branch	-293,456	2,129,590
HOC	Hockley	Southend Victoria Branch	-360,173	724,288
RLG	Rayleigh	Southend Victoria Branch	493,169	1,832,722
RFD	Rochford	Southend Victoria Branch	124,590	615,582
PRL	Prittlewell	Southend Victoria Branch	23,430	220,626
SIA	Southend Airport	Southend Victoria Branch	9,644	611,256
WIC	Wickford	Southend Victoria Branch	2,796	2,261,210
REI	Reigate	Reigate/Redhill	-155,388	1,436,558
RDH	Redhill	Reigate/Redhill	155,388	3,787,090
CHW	Chalkwell	Southend Central Branch	-66,071	1,913,550
BEF	Benfleet	Southend Central Branch	31,435	3,664,766
LES	Leigh-On-Sea	Southend Central Branch	31,361	2,355,650
SOC	Southend Central	Southend Central Branch	3,275	3,446,092
GRV	Gravesend	Gravesend	-55,733	3,087,304
EBD	Ebbsfleet International	Gravesend	55,733	2,106,802
EGR	East Grinstead	East Grinstead/Lingfield	-60,033	1,586,800
LFD	Lingfield	East Grinstead/Lingfield	60,033	503,444
ELD	Earlswood (Surrey)	Earlswood/Redhill	-63,349	404,288
RDH	Redhill	Earlswood/Redhill	63,349	3,787,090
CTM	Chatham	Chatham/Rochester	-58,095	2,730,416
RTR	Rochester	Chatham/Rochester	58,095	2,056,936
HIB	High Brooms	Tonbridge	-12,104	1,256,908
TON	Tonbridge	Tonbridge	-34,225	4,554,198
TBW	Tunbridge Wells	Tonbridge	46,330	3,838,532

GRY	Grays	Thameside	-55,038	4,165,432
CFH	Chafford Hundred Lakeside	Thameside	13,235	2,911,958
OCK	Ockendon	Thameside	20,496	1,160,354
PFL	Purfleet	Thameside	21,307	686,726
GLM	Gillingham (Kent)	Medway	-38,556	2,747,444
CTM	Chatham	Medway	-58,095	2,730,416
RTR	Rochester	Medway	58,095	2,056,936
SOO	Strood (Kent)	Medway	38,556	1,194,020

Demand allocation at Group Stations

1.2 In order to validate and improve the allocation of journeys between stations within groups (e.g. Dorking BR), passenger counts are routinely carried out at selected group stations on the network. The most recent counts were carried out in Autumn 2018/Spring 2019 at the following station groups:

- Brighton Main Line Stations
- Brighton BR
- Canterbury BR
- Colchester BR
- Dorking BR
- Folkestone BR
- Hertford BR
- Portsmouth BR
- Wakefield BR
- Bristol BR
- Exeter BR
- Guildford BR
- Edinburgh BR
- Reading BR

1.3 These counts were used both to validate existing data, and to create or update station group counts splits, with three new sets of station counts splits created. The proportion of journeys split between stations based on passenger counts are shown in Table 1-3 below.

Table 1-3: Count-based adjustments to 2018/19 statistics

Station Name	Station Group	Proportions	Year Undertaken
Colchester	COLCHESTER BR	85.0%	2013/14
Colchester Town		15.0%	
Bedford Midland	BEDFORD BR	96.0%	2014/15
Bedford St.Johns		4.0%	
Dorchester South	DORCHESTER BR	74.0%	2015/16
Dorchester West		26.0%	
Deepdene	DORKING BR	25.0%	2014/15
Dorking		72.0%	
Dorking West		3.0%	
Farnborough (Main)	FARNBOROUGH BR	82.0%	2013/14

Station Name	Station Group	Proportions	Year Undertaken
Farnborough North		18.0%	
Maidstone Barracks	MAIDSTONE BR	11.0%	2013/14
Maidstone East		55.0%	
Maidstone West		34.0%	
Newark Castle	NEWARK BR	46.0%	2015/16
Newark North Gate		54.0%	
Portsmouth & Southsea	PORTSMOUTH BR	49.0%	2014/15
Portsmouth Harbour		51.0%	
Wakefield Westgate	WAKEFIELD BR	82.0%	2014/15
Wakefield Kirkgate		18.0%	
Canterbury East	CANTERBURY BR	30.0%	2014/15
Canterbury West		70.0%	
Edenbridge	EDENBRIDGE BR	49.0%	2014/15
Edenbridge Town		51.0%	
Falkirk Grahamston	FALKIRK BR	44.0%	2014/15
Falkirk High		56.0%	
Helensburgh Central	HELENSBURGH BR	98.0%	2014/15
Helensburgh Upper		2.0%	
Worcester Foregate Street	WORCESTER BR	72.0%	2015/16
Worcester Shrub Hill		28.0%	
Southend Central	SOUTHEND BR	46.0%	2015/16
Southend Victoria		28.0%	
Southend East		26.0%	
Warrington Bank Quay	WARRINGTON BR	44.0%	2015/16
Warrington Central		56.0%	
Wigan North Western	WIGAN BR	52.0%	2015/16
Wigan Wallgate		48.0%	
Folkestone Central	FOLKESTONE BR	57.1%	2018/19
Folkestone West		42.9%	
Hertford East	HERTFORD BR	51.1%	2018/19
Hertford North		48.9%	
Guildford	GUILDFORD BR	88.0%	2018/19
London Road Guildford		12.0%	

Methodological Changes in 2017/18

Season ticket journey adjustments

1.6 In the production of previous years' statistics, adjustments were made to account for situations where passengers buy season tickets for travel to/from a station other than the one they generally travel from, in order to allow additional flexibility.

1.7 In some areas, multiple stations have identically priced season tickets to London. As a result, London season tickets are generally sold as being from the furthest station, regardless of the actual origin station. This means that the ticket sales data shows that there are more people travelling to/from this station than is actually the case.

1.8 LENNON sales data was used to estimate the number of tickets where the issuing office was at a branch line station but the ticket origin showed a station further along a line. In these cases, it was assumed that the journey was actually being made from a point on the branch line and not the recorded origin.

1.9 For the production of the 2017/18 statistics, the analysis underpinning this reallocation was updated with 2017/18 LENNON data. Table 1-4 shows the scale of the adjustments.

Table 1-4: Summary of adjustments in 2017/18

Station TLC	Station Name	Station Group	Adjusted Journeys	Total Journeys
EGR	East Grinstead	Southern Branches	-107,520	1,514,562
ECR	East Croydon		1,707	23,634,208
DMS	Dormans		6,831	111,060
PUR	Purley		1,724	3,076,294
OXT	Oxted		1,707	1,571,614
LFD	Lingfield		93,845	546,656
HUR	Hurst Green		1,707	662,178
CBG	Cambridge	Cambridge Area	-93,381	11,530,238
WLF	Whittlesford		14,371	538,972
NWE	Newport (Essex)		8,374	184,798
GRC	Great Chesterford		1,196	109,116
AUD	Audley End		64,655	1,011,626
SED	Shelford		4,784	204,618
SOE	Southend East	Southend (C2C)	-114,783	1,926,846
WCF	Westcliff		145,971	1,299,104
SOC	Southend Central		-44,483	3,396,030
LES	Leigh-On-Sea		1,827	2,232,070
CHW	Chalkwell		4,237	1,968,412
BEF	Benfleet		4,820	3,680,038
PSE	Pitsea		2,412	1,270,792
BTN	Brighton	Brighton Area	-118,565	16,928,828
HHE	Haywards Heath		2,818	4,392,522
PRP	Preston Park		90,356	503,650
WVF	Wivelsfield		5,645	444,326
BUG	Burgess Hill		19,746	1,819,774
REI	Reigate	Reigate/Redhill	-64,921	1,223,378
RDH	Redhill		206,831	3,553,742

Station TLC	Station Name	Station Group	Adjusted Journeys	Total Journeys
MHM	Merstham		4,218	662,836
GTW	Gatwick Airport		-120,870	20,328,212
HOR	Horley		88,655	971,834
SAF	Salfords		12,123	136,576
XDK	Dorking BR		-126,037	1,791,772

Demand allocation at Group Stations

1.10 In order to validate and improve the allocation of journeys between stations within groups (e.g. Worcester BR), passenger counts are routinely carried out at selected group stations on the network. The most recent counts were carried out in Autumn 2017 at the following station groups:

- Bicester BR;
- Farnborough BR;
- Southend BR;
- Birmingham BR;
- Worcester BR;
- Warrington BR;
- Wigan BR.

1.11 These counts effectively validated existing data, and the counts splits for all group stations were maintaining as they were in previous years. The proportion of journeys split between stations based on routine counts are shown in Table 1-5 below.

Table 1-5: Count-based adjustments to 2017/18 statistics

Station Name	Station Group	Proportions	Year Undertaken
Colchester	COLCHESTER BR	85.0%	2013/14
Colchester Town		15.0%	
Bedford Midland	BEDFORD BR	96.0%	2014/15
Bedford St.Johns		4.0%	
Dorchester South	DORCHESTER BR	74.0%	2015/16
Dorchester West		26.0%	
Deepdene	DORKING BR	25.0%	2014/15
Dorking		72.0%	
Dorking West		3.0%	
Farnborough (Main)	FARNBOROUGH BR	82.0%	2013/14
Farnborough North		18.0%	
Hertford East	HERTFORD BR	37.0%	2013/14
Hertford North		63.0%	
Maidstone Barracks	MAIDSTONE BR	11.0%	2013/14
Maidstone East		55.0%	
Maidstone West		34.0%	
Newark Castle	NEWARK BR	46.0%	2015/16

Station Name	Station Group	Proportions	Year Undertaken
Newark North Gate		54.0%	
Portsmouth & Southsea	PORTSMOUTH BR	49.0%	2014/15
Portsmouth Harbour		51.0%	
Wakefield Westgate	WAKEFIELD BR	82.0%	2014/15
Wakefield Kirkgate		18.0%	
Canterbury East	CANTERBURY BR	30.0%	2014/15
Canterbury West		70.0%	
Edenbridge	EDENBRIDGE BR	49.0%	2014/15
Edenbridge Town		51.0%	
Falkirk Grahamston	FALKIRK BR	44.0%	2014/15
Falkirk High		56.0%	
Helensburgh Central	HELENSBURGH BR	98.0%	2014/15
Helensburgh Upper		2.0%	
Worcester Foregate Street	WORCESTER BR	72.0%	2015/16
Worcester Shrub Hill		28.0%	
Southend Central	SOUTHEND BR	46.0%	2015/16
Southend Victoria		28.0%	
Southend East		26.0%	
Warrington Bank Quay	WARRINGTON BR	44.0%	2015/16
Warrington Central		56.0%	
Wigan North Western	WIGAN BR	52.0%	2015/16
Wigan Wallgate		48.0%	
Bicester North	BICESTER BR	48.3%	2016/17
Bicester Village		51.7%	
Birmingham New Street	BIRMINGHAM BR	78.5%	2016/17
Birmingham Moor Street		11.2%	
Birmingham Snow Hill		10.3%	

1.16 Note that the Bicester and Birmingham counts splits applied in 2017/18 are not included in the equivalent table (Table 1-3) for 2018/19. This is because the 2018/19 MOIRA 2.2 matrix has a different split of demand for the two Bicester stations, and the continued operation of Chiltern Railway services to Oxford means the demand split at Bicester calculated via counts may not be more robust than that in the underlying data - passenger counts are being carried out again in time for the 2019/20 statistics. Similarly, the 2018/19 MOIRA 2.2 matrix shows a demand split at Birmingham BR which is very close to the counts values in the table above, so this has been used instead of the counts values.

1.17 Note that these counts based splits are only applied to the Station Usage dataset, not the ODM.

Methodological Changes in 2016/17

London BR allocation update

1.18 In the production of the 2015/16 statistics, there were a number of journeys included in the underlying MOIRA 2.2 matrix with both an origin and a destination of "London BR". The methodology used to assign BR>BR flows uses LENNON sales data to allocate journeys according to where journeys outbound from the BR stations are travelling. Investigation showed that due to the limited ticket data for London BR > Individual London Terminal flows, a large proportion of the journeys were being allocated to Kensington Olympia leading to an overstatement of journeys at that station.

Table 1.6: London BR > Individual London BR stations LENNON data (2016/17)

Origin Code	Origin Name	Destination Code	Destination Name	Issues (*)[1]	Proportion of issues
1072	LONDON BR	5143	CHARING CROSS LONDON	4	0%
1072	LONDON BR	577	FARRINGDON	5	0%
1072	LONDON BR	1555	ST PANCRAS LONDON	10	1%
1072	**LONDON BR**	**3092**	**KENSINGTON OLYMPIA**	**982**	**97%**
1072	LONDON BR	5597	VAUXHALL LONDON	1	0%
1072	LONDON BR	5142	CANNON STREET LONDON	20	2%

1.19 The majority of London BR > Individual London Terminal issues recorded in LENNON in 2016/17 were between London BR and Kensington Olympia, noting that this is a very small number of issues in total and therefore not necessarily representative of the actual pattern of demand. Nonetheless, this result was being used to allocate c.2.2m London BR > London BR journeys in the underlying MOIRA2.2 matrix, with the majority of these c.2.2m journeys being attributed to flows involving Kensington Olympia flows.

1.20 In order to resolve the above issue, London BR > London BR demand has been allocated to individual London Terminal > London Terminal flows in line with the underlying MOIRA2.2 journeys between individual London Terminals. The 'Any Permitted' route code was used as the basis of the allocation. For example, if 1.5% of London Terminal > London Terminal journeys on the 'Any Permitted' route code are from Charing Cross to London Bridge, then 1.5% of the London BR > London BR journeys are allocated to this flow.

1.21 The journeys are also adjusted to remove all of the London BR > London BR journeys, therefore none are allocated using the LENNON process described above.

Table 1.7: Allocation of London BR > London BR journeys between London Terminals

Journeys	Input	Output
London BR	2,163,279	-
Blackfriars	-	108,230

[1] Only showing stations with 1 or more issue

Journeys	Input	Output
Charing Cross	-	131,309
Cannon Street	-	49,257
City Thameslink	-	78,866
Elephant & Castle	-	46,831
Euston	-	39,392
Fenchurch Street	-	13,452
King's Cross	-	28,325
Kensington Olympia	-	21,262
London Bridge	-	179,001
Liverpool Street	-	102,498
Moorgate	-	145,513
Marylebone	-	23,939
Paddington	-	44,934
St.Pancras	-	157,414
Victoria	-	157,552
Vauxhall	-	242,989
Waterloo (East)	-	93,466
Waterloo	-	405,273
Farringdon	-	93,775
Total	**2,163,279**	**2,163,279**

1.22 The most obvious impact of this change is that there is a decrease in recorded usage at Kensington Olympia, noting that this is a methodological change and does not imply an actual drop in the number of passengers using the station. The effect is less noticeable at the other London Terminals as the impact is spread between them, and the overall levels of usage are very high.

Season ticket journey adjustments

1.23 In the production of the 2014/15 and 2015/16 statistics, adjustments were made to account for situations where passengers buy season tickets for travel to/from a station other than the one they generally travel from, in order to allow additional flexibility. We consider the case of Southend Victoria here as an example.

1.24 On the southern fork of the Shenfield to Southend branch line which links Southend Victoria to Wickford and the Great Eastern Mainline there are a number of stations (Rayleigh, Hockley, Rochford, Southend Airport, Prittlewell and Southend Victoria) where the season ticket price to London is the same. As a result London season tickets are generally sold as being from Southend Victoria, regardless of the actual origin station. This means that the ticket sales data shows that there are more people travelling to/from Southend Victoria than is actually the case as there are passengers travelling from Prittlewell with Southend Victoria tickets, for example.

1.25 In order to account for this, LENNON sales data was used to estimate the number of tickets with Southend Victoria as the origin, but with the issuing office at one of the branch line stations. In these cases, it was assumed that the journey was actually being made from a point on the branch line and not from Southend Victoria.

1.26 For the production of the 2016/17 statistics, the analysis underpinning this reallocation was updated with 2016/17 LENNON data. Table 1.8 shows the scale of the adjustments, alongside the adjustment used in the 2015/16 statistics for comparison. In the case of Southend Victoria circa 837k journeys are redistributed to other stations on the branch line. This is a lower level of adjustment than what was used in the 2015/16 statistics due to the lower number of journeys assumed to be actually from other stations on the branch.

Table 1.8: Summary of adjustments in 2015/16 and 2016/17

TLC	Station	Adjustment to Entries & Exits (2015/16)	Adjustment to Entries & Exits (2016/17)	2016/17 Statistics with adjustment
SOV	Southend Victoria	-1,100,624	-837,043	1,877,587
RLG	Rayleigh	622,997	457,897	1,819,832
HOC	Hockley	338,473	264,199	960,116
RFD	Rochford	106,813	81,660	566,656
PRL	Prittlewell	20,672	19,163	209,708
SIA	Southend Airport	11,669	14,124	395,646
CHW	Chalkwell	-362,927	-369,670	1,562,918
BEF	Benfleet	254,019	266,759	3,844,366
LES	Leigh-On-Sea	108,908	102,912	2,341,028
REI	Reigate	-249,763	-218,053	1,193,556
RDH	Redhill	341,963	369,247	3,705,282
SOU	Southampton Central	-180,076	-151,582	6,361,392
SOA	Southampton Airport (Parkway)	180,076	151,582	1,842,710
SOE	Southend East	-130,909	-122,592	1,723,876
WCF	Westcliff	138,748	144,391	1,259,800
SOC	Southend Central	-7,839	-21,799	3,038,301
OXF	Oxford	-323,461	-356,311	6,631,498
DID	Didcot Parkway	323,461	356,311	3,554,204
EGR	East Grinstead	-135,262	-139,974	1,437,882

TLC	Station	Adjustment to Entries & Exits (2015/16)	Adjustment to Entries & Exits (2016/17)	2016/17 Statistics with adjustment
LFD	Lingfield	114,776	126,838	573,218
DMS	Dormans	20,486	13,136	111,430
GTW	Gatwick Airport	-101,175	-125,058	19,361,658
HOR	Horley	90,686	91,727	923,774
SAF	Salfords	3,499	12,543	125,372
XDK	Dorking BR	-85,210	-130,404	1,616,384
BTN	Brighton	-110,157	-88,372	15,993,072
PRP	Preston Park	110,157	88,372	527,116

Updated demand allocation at Group Stations

1.27 In order to validate and improve the allocation of journeys between stations within groups (e.g. Worcester BR), passenger counts have been carried out at selected group stations on the network. These counts were carried out in Autumn/Winter 2016 and have informed the allocation of demand at the following station groups:

- Dorchester BR;
- Newark BR;
- Southend BR;
- Warrington BR;
- Wigan BR; and
- Worcester BR.

1.28 The impact of updating these allocations is shown in the table below.

Table 1.9: Count-based adjustments to 2016/17 statistics

NLC	TLC	Station Name	Station Group	Entries + Exits (2016/17, with 2015/16 proportions)	Entries + Exits (2016/17) (with updated proportions)	Entries + Exits (2016/17) (change)
5961	DCH	Dorchester South	DORCHESTER BR	488,170	459,273	-28,897
5962	DCW	Dorchester West	DORCHESTER BR	136,100	164,997	28,897
6498	NCT	Newark Castle	NEWARK BR	583,847	752,394	168,547
6499	NNG	Newark North Gate	NEWARK BR	1,069,371	900,824	-168,547
7420	SOV	Southend Victoria	SOUTHEND BR	1,518,874	1,877,587	358,713
7456	SOC	Southend Central	SOUTHEND BR	3,262,861	3,038,301	-224,560
7457	SOE	Southend East	SOUTHEND BR	1,858,030	1,723,876	-134,153
2384	WBQ	Warrington Bank Quay	WARRINGTON BR	1,176,772	1,363,569	186,797
2390	WAC	Warrington Central	WARRINGTON BR	1,916,674	1,729,877	-186,797
2363	WGN	Wigan North Western	WIGAN BR	1,466,006	1,620,278	154,272

2406	WGW	Wigan Wallgate	WIGAN BR	1,647,580	1,493,308	-154,272
4891	WOS	Worcester Shrub Hill	WORCESTER BR	620,041	818,070	198,029
4893	WOF	Worcester Foregate Street	WORCESTER BR	2,298,855	2,100,826	-198,029

1.29 Note that these counts based splits are only applied to the Station Usage dataset, not the ODM.

Methodological Changes in 2015/16

London (In-boundary) Travelcard Methodology

1.30 In previous years, London Travelcard journeys were allocated using LATS (London Area Travelcard Survey) data from 2001. For the 2015/16 production of the MOIRA2.2 dataset, Resonate were able to use data from TfL's Oyster Clicks Model (OCM) to allocate in-boundary[2] Travelcard journeys to individual London stations. In previous productions of the statistics, Travelcard journeys were all assigned to the "London BR" code and then allocated according to the LATS data as with other journeys.

1.31 Travelcard journeys partly outside the London Travelcard Area (out-boundary) were allocated as in previous years using the LATS data.

1.32 As a result of these methodological changes, there were a large number of significant changes to estimated usage at stations within the London Travelcard Area. This in general has re-allocated some journeys that would have previously been to central London terminals to stations outside Zone 1, for example those stations on the London Overground network. When using the 2015/16 statistics it should be noted that this significant methodological change has taken place and therefore a direct calculation of growth between 2014/15 and 2015/16 using the published figures at London stations will not necessarily reflect underlying growth. For this reason, an additional field, "*Estimated absolute change in Usage due to 2015/16 London Travelcard Methodology*", was included so that users can identify where the methodological change is impacting results.

1.33 It should be noted that due to the complex processing and estimation techniques used to calculate this additional field, there are a number of non-London stations which have a small number of entries and exits associated with the London Travelcard Methodology change. These small differences are largely due to estimation approach used, rather than having actually been affected by the London Travelcard Methodology change.

1.34 Table 1.10 shows the top 10 increases (ranked by absolute number of entries & exits) due to the London Travelcard Methodology change. Table 1.11 shows the equivalent for decreases due to the change. The large increases are centred around stations outside of Zone 1, which have experienced large increases in traffic since the collection of the survey data that was previously used to allocated Travelcard journeys. The large decreases are therefore centred mostly on the large Zone 1 terminals, which are likely to have had a higher proportion of usage when the survey took place.

[2] Journeys wholly within the London Travelcard Area

Table 1.10: Top 10 increases in usage due to London in-boundary Travelcard methodology

Increase Rank	Station name	2015/16 Entries & Exits under previous methodology	2015/16 Entries & Exits under updated methodology	Percentage change due to methodology
1	Canada Water	13,802,077	23,643,842	71.3%
2	Stratford	33,903,520	41,113,260	21.3%
3	Highbury & Islington	22,646,684	28,166,440	24.4%
4	Whitechapel	8,608,391	13,996,988	62.6%
5	Clapham Junction	28,641,908	32,282,220	12.7%
6	Shepherds Bush	5,106,387	8,653,428	69.5%
7	West Ham	6,344,402	8,778,194	38.4%
8	Balham	7,731,554	10,114,526	30.8%
9	Barking	11,113,389	13,428,608	20.8%
10	Shoreditch High Street	5,379,586	7,661,254	42.4%

Table 1.11: Top 10 decreases in usage due to London in-boundary Travelcard methodology

Decrease Rank	Station name	2015/16 Entries & Exits under previous methodology	2015/16 Entries & Exits under updated methodology	Percentage change due to methodology
1	Charing Cross	34,678,162	28,998,152	-16.4%
2	Waterloo	104,121,285	99,148,388	-4.8%
3	Blackfriars	14,489,288	10,467,646	-27.8%
4	Euston	45,196,881	41,677,870	-7.8%
5	Liverpool Street	69,835,807	66,556,690	-4.7%
6	Putney	11,644,951	9,028,596	-22.5%
7	London Bridge	56,120,914	53,850,938	-4.0%
8	Queen's Park (Gt London)	4,964,576	3,001,396	-39.5%
9	Kensington Olympia	12,842,773	10,904,840	-15.1%
10	Cannon Street	23,155,435	21,242,364	-8.3%

London Terminals Demand Allocation

1.35 For the 2015/16 statistics, the MOIRA2.2 input data was disaggregated by individual London Terminal where possible (for example when a ticket is bought to a specific London Terminal rather than the generic 'London BR' destination). This gives an improved reflection of journey origins and destinations.

1.36 Table 1.12 shows the changes to the base journeys in 2015/16 compared to 2014/15. Where information is available to link journeys to specific terminals, this has been done, with the remainder associated with 'London BR' and allocated as in previous years.

1.37 As discussed, journeys associated with London Travelcards have been allocated to individual stations or 'London BR', therefore there are no journeys associated with London Travelcards. As the new London Travelcard Methodology allocates more journeys to smaller stations and less to the London Terminals than the previous methodology, the net number of journeys associated with London Terminals is lower than in 2014/15. It is important to note that this change is due to methodology and does not necessarily imply that journeys at London Terminals are lower than in 2014/15.

Table 1.12: Changes to London Terminal base journeys

Origin or Destination	2014/15 Base journeys (millions)	2015/16 Base journeys (millions)
London BR	377.6	302.6
London Travelcards	283.3	-
Blackfriars	-	5.9
Charing Cross	-	15.6
Cannon Street	-	11.4
City Thameslink	-	4.3
Euston	-	9.2
Farringdon	-	8.5
Fenchurch Street	-	6.5
King's Cross	-	4.6
London Bridge	-	36.8
Liverpool Street	-	35.4
Moorgate	-	6.4
Marylebone	-	4.4
Paddington	-	9.3
St.Pancras	-	7.8
Victoria	-	56.4
Waterloo (East)	-	7.6
Waterloo	-	55.5
Total	**660.9**	**551.2**

Season ticket journey adjustments

1.38 In the production of the 2014/15 statistics, an adjustment was implemented on the allocation of passenger demand at stations around Southend, as analysis of LENNON data revealed that

season tickets issued for travel to/from Southend Victoria <> London were actually being used to travel from alternative stations on the branch. This adjustment was updated and expanded to include additional stations where this issue was present.

1.39 The stations adjusted in the 2015/16 statistics were chosen through a combination of consultation with Train Operating Companies (TOCs) and analysis of LENNON sales data and therefore do not represent a definitive list of issues such as this on the GB rail network. Table 1.13 shows the stations that have been adjusted for the 2015/16 published statistics.

Table 1.13: Stations where Season ticket adjustments made (2015/16)

Station Group	Source	Diagnosis
Southend Victoria / Southend East / Rayleigh / Hockley	Previously adjusted (2014/15 statistics)	
Gatwick Airport / Horley / Redhill / Salfords	Reigate, Redhill and District Users' Association and Govia Thameslink Railway (GTR)	Large number of tickets for travel to/from Reigate bought at other stations
Reigate/ Redhill		
Dorking / Redhill / Reigate		
Brighton / Preston Park	Southern	Large number of tickets for travel to/from Brighton bought at Preston Park.
Oxford / Didcot Parkway	Great Western Railway (GWR) Analysis of LENNON data	Large number of tickets for travel to/from Oxford bought at Didcot Parkway.
Southampton Central / Southampton Parkway	Analysis of LENNON data	Large number of tickets for travel to/from Southampton Central bought at Southampton Parkway.
Chalkwell / Benfleet / Leigh-on-Sea	Analysis of LENNON data	Large number of tickets for travel to/from Chalkwell bought at other stations
East Grinstead / Lingfield / Dormans	Analysis of LENNON data	Large number of tickets for travel to/from East Grinstead bought at other stations

Southend Victoria and Southend Central

1.40 The original adjustment made to the 2014/15 statistics was updated to reflect the improved methodology made in 2015/16. It is important to note that a number of improvements have been made to the 2014/15 figures which explain the large differences observed.

1.41 The new methodology assumes that journeys are only reallocated for journeys via a specific route. For example, journeys were only reallocated on the 'via Romford' route among stations on the Southend Victoria branch. This results in fewer journeys being reallocated than under the methodology used in the 2014/15 statistics, but is more consistent with that used for other stations. This is an important improvement as it ensures that journeys are not allocated to other routes.

1.42 A calculation error relating to the allocation of Travelcard journeys under the previous (2014/15) methodology was identified, leading to an overstatement of Rochford and Prittlewell journeys and an understatement of Hockley journeys. This is estimated to have resulted in an overstatement of circa +120k journeys at Rochford (c.17% of 2014/15 usage),

+225k journeys at Prittlewell (c.53% of 2014/15 usage), and an understatement of -100k journeys at Hockley (c.10% of 2014/15 usage). The effect on other stations is less than 50k journeys. The 2014/15 Station Usage figures were therefore updated for these stations in the 2015/16 Station Usage dataset.

Southend East

1.43 This was the second original adjustment made to the 2014/15 statistics, which was updated with this improved methodology. This update involved reallocating journeys from Southend East to Southend Central. Previously the only reallocation was Southend East > Westcliff and Southend Central > Westcliff. Under the new methodology, the reallocation is Southend East > Westcliff; Southend Central > Westcliff; and Southend East > Southend Central. This reduces the net number of journeys being reallocated away from Southend Central.

1.44 A summary of the 2014/15 and adjusted 2015/16 statistics is shown in Table 1.14.

Table 1.14: Comparison of 2014/15 and 2015/16 statistics

Station	2014/15 published statistics	2015/16 Statistics (adjusted)
Southend Victoria	1,358,773	1,439,480
Rayleigh	1,864,064	1,949,600
Hockley	968,690	1,034,488
Rochford	700,214	596,634
Prittlewell	424,804	195,870
Southend Airport	520,734	425,160
Southend East	1,662,180	1,760,908
Southend Central	2,918,931	3,092,306
Westcliff	1,109,380	1,175,528

Dorking/Gatwick Airport/Reigate

1.45 Following the publication of the 2014/15 statistics, the Reigate, Redhill and District Users' Association raised a potential issue around passengers purchasing season tickets from Dorking / Gatwick Airport to London, rather than from Redhill to London. This anomaly is due to ticket prices being similar or cheaper from Dorking / Gatwick Airport than from Redhill, despite the fact that travel from Redhill is valid on such tickets. The Users' Association stated that based on their surveys, 26% of passengers at Redhill were travelling on Gatwick or Dorking season tickets. The procedure described above was carried out to reallocate journeys on season tickets away from Gatwick Airport and Dorking in proportion to where standard-class annual Season tickets were purchased.

1.46 In the evaluation of instances where a large number of tickets were bought at non-origin stations, a large number of Redhill tickets were identified as being bought at Reigate. Given the annual ticket prices are identical for the 'Any Permitted' route, there is reason to believe that passengers are purchasing Seasons from Reigate rather than Redhill in order to get added flexibility. An additional adjustment was therefore made to Reigate season journeys.

Brighton/Preston Park

1.47 The consultation with train operators highlighted numerous examples of stations with identical season ticket prices along the south coast. For this initial exercise one such example (Preston Park), was examined where season tickets to London are the same price as they are from Brighton. Given that having the flexibility to travel into Brighton as well as London is attractive to passengers, journeys were reallocated between these stations.

Oxford/Didcot Parkway

1.48 The consultation with Passenger Demand Forecasting Council (PDFC) members (supported by analysis) highlighted that Season tickets from Oxford to London cost the same as Season tickets from Didcot Parkway to London. Given that having the flexibility to travel into Oxford as well as London is attractive to passengers, a reallocation of journeys between these stations was considered appropriate.

Southampton Central/Southampton Parkway

1.49 Season tickets to London are marginally cheaper from Southampton Central (£5,324)[3] than Southampton Airport (Parkway) (£5,404), despite Southampton Airport being closer to London. It is therefore plausible that passengers buy Southampton Central tickets even though they regularly travel from Southampton Airport (Parkway) so that they have the flexibility to travel into Southampton. A reallocation of journeys was therefore considered appropriate.

Chalkwell/Benfleet/Leigh-on-Sea

1.50 Chalkwell station is in the suburban area surrounding Southend, directly adjacent to the beach. Season tickets from Benfleet and Leigh-on-Sea to London cost the same as tickets from Chalkwell to London. Given that there are car parks at Benfleet and Leigh-on-Sea, it is conceivable that season ticket holders use this station to access the beach/town at weekends.

East Grinstead/Lingfield/Dormans

1.51 Season tickets to London from East Grinstead cost the same as tickets to London from Lingfield and Dormans. Given that East Grinstead is the largest town close to Lingfield and Dormans, it is reasonable that passengers would find the flexibility of travel to East Grinstead attractive.

Summary

1.52 Table 1.15 shows a summary of the approximate difference to the final entries and exits made by this series of adjustments by station.

Table 1.15: Summary of adjustments

TLC	Station	Adjustment to Entries & Exits	2015/16 Statistics without adjustment	2015/16 Statistics with adjustment
SOV	Southend Victoria	-1,100,624	2,540,104	1,439,480
RLG	Rayleigh	622,997	1,326,603	1,949,600

[3] Prices for 12-month season – Any Permitted route. Source: National Rail Enquiries **http://ojp.nationalrail.co.uk/service/seasonticket/search** [Accessed: 10/10/2016]

TLC	Station	Adjustment to Entries & Exits	2015/16 Statistics without adjustment	2015/16 Statistics with adjustment
HOC	Hockley	338,473	696,015	1,034,488
RFD	Rochford	106,813	489,821	596,634
PRL	Prittlewell	20,672	175,198	195,870
SIA	Southend Airport	11,669	413,491	425,160
CHW	Chalkwell	-362,927	1,897,547	1,534,620
BEF	Benfleet	254,019	3,469,059	3,723,078
LES	Leigh-On-Sea	108,908	2,097,546	2,206,454
REI	Reigate	-249,763	1,568,763	1,319,000
RDH	Redhill	341,963	3,547,717	3,889,680
SOU	Southampton Central	-180,076	6,539,768	6,359,692
SOA	Southampton Airport (Parkway)	180,076	1,639,356	1,819,432
SOE	Southend East	-130,909	1,891,817	1,760,908
WCF	Westcliff	138,748	1,036,780	1,175,528
SOC	Southend Central	-7,839	3,100,145	3,092,306
OXF	Oxford	-323,461	6,888,139	6,564,678
DID	Didcot Parkway	323,461	3,133,219	3,456,680
EGR	East Grinstead	-135,262	1,662,082	1,526,820
LFD	Lingfield	114,776	501,132	615,908
DMS	Dormans	20,486	104,690	125,176
GTW	Gatwick Airport	-101,175	18,130,021	18,028,846
HOR	Horley	90,686	985,324	1,076,010
SAF	Salfords	3,499	128,909	132,408
XDK	Dorking BR	-85,210	1,784,780	1,699,570
BTN	Brighton	-110,157	17,443,483	17,333,326
PRP	Preston Park	110,157	457,843	568,000

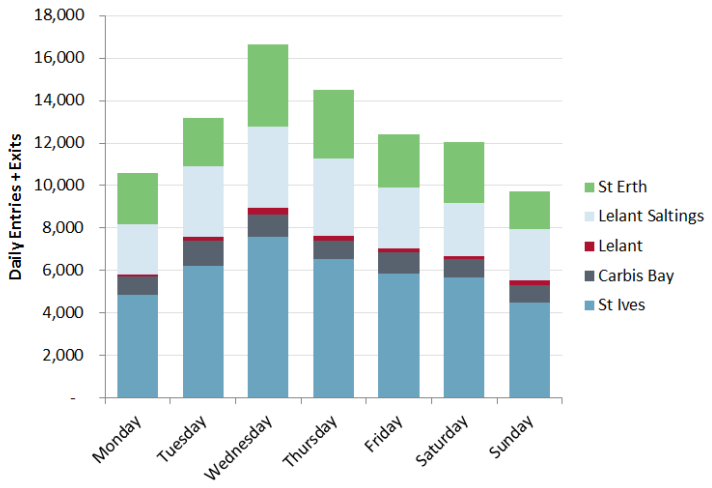
Count-based allocation of Ranger products on the St Ives Bay line

1.53 A large number of journeys on the St. Ives Bay line are made using Ranger/Rover tickets, which allow for flexible travel between any stations on the line. In previous years, journeys have been allocated to specific origins and destinations using point-of-purchase sales data. This does not allow for a robust link to be made between journeys and origins as most stations on the branch do not have ticket offices, and a large number of tickets are sold by on-platform staff which are not always recorded as a geographic location. Consequently, the ORR commissioned passenger counts to be carried out on the line in order to better allocate

journeys to geographic locations. These counts were carried out between Monday 1st and Sunday 7th August 2016, in order to capture peak summer demand on the line.

1.54 The observed distribution of entries and exits at each station for each day of the survey is shown in Figure 1.1.

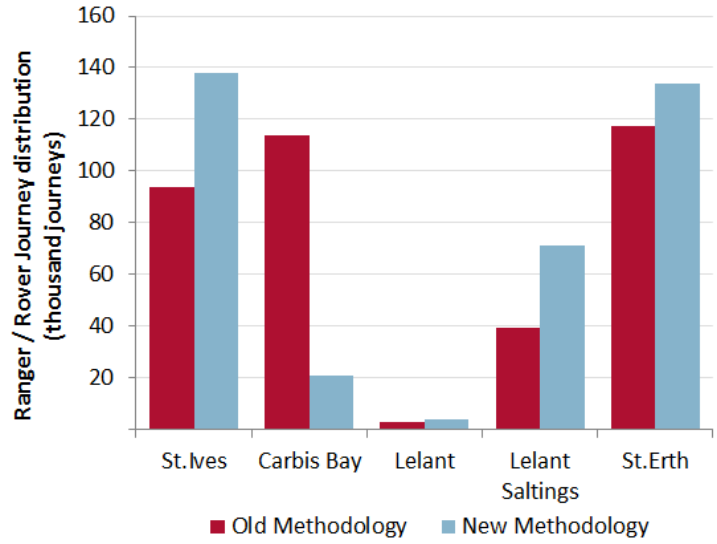
Figure 1.1: Counted entries and exits on St.Ives Bay line 0600-2100 (1/8/2016 – 7/8/2016 inclusive)



1.55 The counts were used to allocate journeys associated with sales of St Ives Ranger tickets where there was not a physical location for the sale. This was done by allocating journeys to origins according to the proportion of entries and exits at each station implied by the count data.

1.56 The splits of Ranger/Rover journeys only (i.e. not including the point to point journeys) from the new methodology are shown in Figure 1.2. There is a noticeable reduction in the allocation of demand to Carbis Bay. This is due to a larger proportion of point-to-point journeys having Carbis Bay as an origin than is implied by the usage observed in the survey. The opposite is true for St.Ives, Lelant Saltings, and St.Erth. Lelant shows low usage in both the survey and the MOIRA2.2 data.

Figure 1.2: Total infill journeys in 2015/16 under the Old and New methodology (excl. Point-to-Point journeys)



1.57 Table 1.16 shows the entries and exits on the St.Ives Bay line as reported in the 2014/15 statistics and the 2015/16 figures incorporating the changes discussed in this section. The entries and exits associated with the Ranger ticket infills are shown separately for comparison. It should be noted that while the infill associated with Lelant is relatively small compared to the other stations, it has a noticeable effect on the final station usage numbers as under the previous infill methodology no journeys were associated to Lelant.

1.58 The table includes a percentage growth between 2014/15 and 2015/16 reported entries and exits but it needs to be borne in mind that this is a mixture of underlying growth and the methodology change.

Table 1.16: St Ives bay line entries and exits in 2014/15 and 2015/16

Entries + Exits					
Station	2014/15 Infill	2014/15 Total demand	2015/16 Infill	2015/16 Total demand	%age 2014/15 – 2015/16
St.Ives	329,676	**638,754**	360,684	**657,750**	3.0%
Carbis Bay	149,908	**231,800**	106,611	**191,408**	-17.4%
Lelant	508	**2,874**	6,291	**8,104**	182.0%
Lelant Saltings	91,094	**116,798**	103,034	**125,064**	7.1%
St.Erth	101,045	**204,806**	157,540	**257,802**	25.9%

PTE Infills

1.59 In the production of the 2015/16 dataset it was identified that some products (specifically add-on tickets associated with local Metros and Airport links) that formed part of the infill were already included in the MOIRA2.2 dataset. For the 2015/16 dataset these products have been removed from the PTE infills to ensure they are not double-counted. The relevant products are:

- Leeds-Bradford Airport bus link products;
- Manchester Metrolink add-on products;
- Liverpool Airport bus link products;
- Tyne & Wear Metro (incl. Newcastle Airport) add-on products; and
- Strathclyde Airport, Ferry, and Glasgow Subway add-on products.

1.60 There were a total of 983,707 journeys associated with these products in the 2015/16 statistics. Under the previous methodology station usage would have been overstated by approximately this amount. Whilst this represents a very small number of journeys in aggregate, due to the nature of the products there is a more significant impact on specific stations. The top ten stations affected are shown in Table 1.17 (ranked in order of percentage change from removing these products).

Table 1.17: Approximate impact of removing double-counted infill products

Rank	Station Name	Published 2015/16 statistics	Estimated 2015/16 usage if double counting was included	Percentage reduction due to removing double counting
1	Prestwick International Airport	93,026	142,599	-34.8%
2	Altrincham	507,592	685,253	-25.9%

Rank	Station Name	Published 2015/16 statistics	Estimated 2015/16 usage if double counting was included	Percentage reduction due to removing double counting
3	Ardrossan Harbour	111,086	136,090	-18.4%
4	Wemyss Bay	166,472	181,100	-8.1%
5	Riding Mill	27,986	30,320	-7.7%
6	Hyde Central	81,512	85,378	-4.5%
7	Wylam	105,572	110,279	-4.3%
8	Reddish North	174,334	181,413	-3.9%
9	Levenshulme	512,654	533,227	-3.9%
10	Marple	454,858	472,000	-3.6%

1.61 The largest impacts on the 2015/16 statistics are at Prestwick International Airport (due to the double-counted airport products not being included), Altrincham (interchange with Manchester Metrolink), and Ardrosson Harbour (due to the double-counted ferry products not being included).

Methodological Changes in 2014/15

Redistribution of demand around Southend

1.62 At some locations on the rail network, ticket prices are the same for a number of stations in close geographic proximity. An area where this is particularly noticeable is on the southern fork of the Shenfield to Southend branch line. This line links Southend Victoria to Wickford and the Great Eastern Mainline serving the following stations:

- Rayleigh;
- Hockley;
- Rochford;
- Southend Airport;
- Prittlewell; and
- Southend Victoria.

1.63 At these stations the season ticket price to London[4] is the same, therefore London season tickets are generally sold as being from Southend Victoria, regardless of the actual origin station. This means that the ticket sales data shows that there are more people travelling to/from Southend Victoria than is actually the case as there are passengers travelling from Prittlewell with Southend Victoria tickets, for example. In order to account for this, LENNON sales data was used to estimate the number of tickets with Southend Victoria as the origin, but with the issuing office at one of the branch line stations. In these cases, it was assumed that

[4] For the purposes of the Southend Area redistribution, “London tickets” include seasons to London Terminals and London Travelcards.

the journey was actually being made from a point on the branch line and not from Southend Victoria.

Example:

If a Southend Victoria to London season ticket was bought at Prittlewell, its journeys are assumed to be from Prittlewell to London.

A similar process was carried out for journeys from Westcliff to London, where season tickets to London are the same price as from Southend Central and Southend East.

Table 1.18 shows the season ticket journeys before and after the adjustment. Southend Victoria journeys are redistributed among Prittlewell, Rayleigh, Rochford, Hockley and Southend Airport; Southend East and Southend Central journeys are redistributed to Westcliff only.

1.64 The methodology associated with addressing this issue was updated for the 2015/16 statistics to be consistent with a revised methodology adopted for other stations following further scoping and analysis.

Table 1.18: Reallocated Southend to London season journeys in 2014/15 under the old and new methodology

Origin Station	Destination	New Methodology Journeys (2014/15)	Old Methodology Journeys (2014/15)
Southend Victoria	London (ALL)	130,944	1,689,770
Prittlewell	London (ALL)	383,195	56,511
Rayleigh	London (ALL)	270,238	6,997
Rochford	London (ALL)	873,041	173,084
Hockley	London (ALL)	275,511	27,085
Southend Airport	London (ALL)	43,995	23,477
Southend East	London (ALL)	372,199	446,698
Southend Central	London (ALL)	152,261	227,223
Westcliff	London (ALL)	274,576	125,115

Pay As You Go (PAYG)

1.65 In January 2014 a change was made to the way PAYG journeys were recorded in LENNON with non-National Rail origins and destinations recorded as well as National Rail origins and destinations.

1.66 The underlying methodology used to construct the MOIRA2 demand matrix had not been updated to reflect this with the result that PAYG journeys starting or ending at a non-National Rail station were allocated by default to London BR as their origin or destination in the MOIRA2 demand matrix rather than the station at which they joined the National Rail

network. For example, a PAYG journey between Canary Wharf and Clapham Junction prior to January 2014 would most likely have been recorded in LENNON as being a journey from Canada Water to Clapham Junction whereas post January 2014 it would be recorded as Canary Wharf to Clapham Junction with the result that in the MOIRA2 demand matrix is recorded as being a London BR to Clapham Junction journey.

1.67 In the 2014/15 statistics an adjustment process was included to account for the change in LENNON treatment of PAYG journeys to make the statistics more consistent with previous years. This reduced the number of entries and exits associated with London Terminals and increases entries and exits at key interchange stations. It, however, remains the case that this change in LENNON affected the last quarter of the 2013/14 statistics and therefore for some interchange stations there is a substantial increase between 2013/14 and 2014/15. The stations where this change resulted in an increase greater than 10% in 2014/15 are set out in Table 1.19.

Table 1.19: Percentage change in Entries and Exits due to PAYG adjustment

NLC	Station	Percentage change in Entries & Exits due to PAYG adjustment
1659	Canada Water	1091%
7474	West Ham	184%
4935	Whitechapel	175%
598	Harrow-On-The-Hill	121%
8875	West Brompton	117%
7400	Blackhorse Road	109%
1082	Shadwell	53%
6931	Seven Sisters	48%
6009	Highbury & Islington	41%
1457	Willesden Junction	36%
6969	Stratford	32%
3136	Greenford	30%
1553	Kentish Town	30%
3190	Ealing Broadway	27%
1419	Queen's Park (Gt London)	24%
7492	Barking	24%
1421	West Hampstead	19%
9587	Shepherds Bush	19%
5399	Balham	17%
5081	Brixton	15%
7491	Limehouse	14%

NLC	Station	Percentage change in Entries & Exits due to PAYG adjustment
5597	Vauxhall	12%
6953	Walthamstow Central	12%
5146	Greenwich	12%
5301	Clapham High Street	11%
5578	Wimbledon	11%
5152	Woolwich Arsenal	10%
5148	London Bridge	-10%
6965	Liverpool Street	-10%
7490	Fenchurch Street	-19%
577	Farringdon	-22%
6005	Moorgate	-28%
3092	Kensington Olympia	-33%

1.68 For the 2015/16 dataset it has not been necessary to include this adjustment as the MOIRA2.2 matrix has been updated to address this issue.

London Bridge Adjustment

1.69 Engineering work as part of the Thameslink Programme resulted in changes in service patterns to London Bridge in 2014/15. As many tickets 'to London' do not distinguish between specific terminals, the existing methodology for the production of the Station Usage statistics has been to use the proportions implied by the London Area Travel Survey (LATS) to split total journeys between specific terminals. As the LATS data does not account for the ongoing engineering work at London Bridge, an alternative approach was required to enable an adjustment in station entries and exits arising due to changes in journey patterns as a result of the London Bridge works.

1.70 Transport for London's Oyster Clicks Model (OCM) contains historical data of journeys made using Oyster cards, as well as estimates for paper tickets. This data was used to estimate the number of journeys 'to London Bridge' and the number of journeys 'to London Terminals' as a whole in the following process:

1. A list of stations which have journeys to or from London Bridge was created;
2. The OCM data was used to estimate the proportions of journeys that were made to and from London Bridge following the engineering work;
3. The proportions of London Bridge journeys implied by the OCM superseded the proportions implied by LATS; and
4. The residual splits to and from other London Terminals were scaled up or down to account for changes in London Bridge proportions, but held in the same proportion to each other as implied by the LATS data.

Example:

For a given station (Station A), the LATS implies that 25% of Journeys go to London Bridge, 50% to Waterloo East and 25% to Charing Cross. The OCM implies that the new proportion to London Bridge should be 10%. 10% of journeys are therefore assigned to London Bridge, leaving 90% of journeys unassigned. Previously, Waterloo East was assigned 2/3 of non-London Bridge journeys while Charing Cross was assigned 1/3. The remaining 90% is therefore split between Waterloo East and Charing Cross in this proportion.

Digby & Sowton Adjustment

1.71 Count data provided by the Avocet Line Rail User Group (ALRUG) suggested that the previous Station Usage estimates at Digby & Sowton were higher than expected. Additional data from First Great Western suggested that a season ticket product for students are likely a part of the cause of this discrepancy. This is due to a large number of journeys being made to Exeter Central and Exeter St.David's on tickets with a recorded destination of Digby & Sowton. These season journeys were redistributed to Exeter Central and Exeter St.Davids from Digby & Sowton. Journeys were allocated to Exeter Central and Exeter St. David's according to the proportion of season ticket journeys in the MOIRA2 matrix. The journey adjustment made at these stations is shown in Table 1.20.

Table 1.20: Digby & Sowton Journey Adjustment (2014/15)

Station	Journeys before adjustment (2014/15)	Journeys after adjustment (2014/15)	Percentage change
Digby and Sowton	894,020	571,510	-36%
Exeter Central	2,105,408	2,343,636	11%
Exeter St. David's	2,424,954	2,509,220	3%

Count-based redistribution of demand at Group Stations

1.72 For tickets where the destination is a station group (such as 'Bedford Stations'), demand was allocated to individual stations based on the methodology described in the accompanying station usage main report.

1.73 In Spring 2015, passenger counts were conducted at a number of group stations. For 10 Station Groups (21 stations in total), the proportions of demand implied by the station counts were adopted to allocate demand between individual stations in the group. This adjustment only affects the split of total group station demand and not the absolute level of journeys to/from that station group. Where applicable, this updates the existing methodology described previously. Table 1.21 shows the 2013/14 and 2014/15 demand allocations for the stations in question.

Table 1.21: Changes arising to station group proportions from Spring 2015 station counts

Name	Station Group	2013/14 demand allocation	2014/15 demand allocation (including changes from Spring 2015 counts)
Bedford Midland	Bedford BR	95.5%	95.5%
Bedford St. Johns		4.5%	4.5%

Name	Station Group	2013/14 demand allocation	2014/15 demand allocation (including changes from Spring 2015 counts)
Canterbury East	Canterbury BR	29.8%	30.1%
Canterbury West		70.2%	69.9%
Deepdene	Dorking BR	26.1%	24.7%
Dorking		70.7%	71.9%
Dorking West		3.2%	3.5%
Edenbridge	Edenbridge BR	32.1%	48.8%
Edenbridge Town		67.9%	51.2%
Falkirk Grahamston	Falkirk BR	34.1%	44.2%
Falkirk High		65.9%	55.8%
Helensburgh Central	Helensburgh BR	98.6%	98.2%
Helensburgh Upper		1.4%	1.8%
Newark Castle	Newark BR	16.8%	35.3%
Newark North Gate		83.2%	64.7%
Portsmouth Harbour	Portsmouth BR	52.8%	50.6%
Portsmouth & Southsea		47.2%	49.4%
Southend Central	Southend BR	25.8%	49.1%
Southend East		25.1%	28.0%
Southend Victoria		49.1%	22.9%
Wakefield Kirkgate	Wakefield BR	17.7%	17.5%
Wakefield Westgate		82.3%	82.5%
Worcester Foregate Street	Worcester BR	65.4%	78.8%
Worcester Shrub Hill		34.6%	21.2%

1.74 Note that these counts based splits are only applied to the Station Usage dataset, not the ODM.

Methodological Changes in 2013/14

Improved South Yorkshire PTE Infill

1.75 Building on the inclusion in the 2012/13 dataset of an improved infill for the West Yorkshire (WYPTE) and Greater Manchester (GMPTE/TfGM) PTE areas, an improved infill for the South Yorkshire (SYPTE) PTE area was included in the 2013/14 dataset. This was produced using a process derived to construct infill demand for the Rail in the North (RiN) demand and revenue model produced by Mott MacDonald and MVA for the RiN consortium and was supplied by Mott MacDonald. This is consistent with the methodology underlying the improved West

Yorkshire (WYPTE) and Greater Manchester (GMPTE/TfGM) infills. At the total PTE level the impact of the new infill was to reduce demand by 1.3m. However, there was also a significant distributional impact as can be seen in Table 1.22, which shows the top ten largest changes as a result of the new South Yorkshire infill.

Table 1.22: Top Ten Changes (in absolute terms) in Entries and Exits with Inclusion of new SYPTE PTE Infill (2013/14)[5]

Station	Change in entries and exits with new infill	% Change
Doncaster	-497,139	-13%
Sheffield	-256,998	-3%
Barnsley	-150,784	-10%
Mexborough	-104,966	-34%
Rotherham Central	-69,654	-9%
Adwick	-57,110	-24%
Wombwell	49,918	30%
Bentley (South Yorkshire)	-47,014	-28%
Kirk Sandall	-45,582	-32%
Swinton (South Yorkshire)	-45,086	-11%

Improved Merseyside PTE Infill

1.76 Prior to 2013/14 the infill for the Merseyside area was derived from the generic PTE infill produced as part of the MOIRA2 Replacement project which was based on a 2008/09 base year. To produce updated estimates in succeeding years, the distribution of demand in the infill matrix was maintained and the total volume of demand grown, initially by the journey growth shown by the Regional Sector in the ORR's rail usage data and, since 2011/12, by the growth in journeys (from LENNON) on service codes associated with the Merseyside area.

1.77 Since 2008/09 there have been a number of developments which mean that the 2008/09 distribution is inappropriate. Of particular importance has been a movement away from RSP products to PTE products on some routes on the edges of the Merseytravel area (e.g Town Green, Aughton Park and Ormskirk on the Northern line) which means that the existing distribution underestimates demand in these areas.

1.78 Recognising the deficiencies of the existing infill, a new infill was produced by Mott MacDonald building on the PTE infill in the Liverpool City Region Model (LCRM) produced for Merseytravel. Unlike the other PTE infills, journeys in the Merseyside infill have been scaled to count data at an aggregate level across all affected stations where complete counts are

[5] As all the new Mott MacDonald infills were incorporated into the ODM at the same time, it is not possible to definitively isolate each infill. For the purposes of this exercise, stations within the Yorkshire and Humber Government Office Region were considered to be those affected by the new SYPTE infill.

available to ensure a robust match with 'reality'. This is possible since count data in the Merseyside area is more extensive and comprehensive across stations than in other areas.

1.79 The inclusion of the new infill increased entries and exits by 10.8m (5.1% of total North West entries and exits). Table 1.23 shows the top ten changes in entries and exits by station. Some of the largest changes are outside the Merseytravel area (e.g. Chester) and this is because some Merseytravel products can be used outside the core Merseytravel area.

Table 1.23: Top Ten Changes (in absolute terms) in Entries and Exits with inclusion of new Merseyside PTE Infill (2013/14)[6]

Station	Change in entries and exits with new infill	% Change
Southport	1,452,670	57%
Ormskirk	1,302,182	172%
Chester	1,204,048	39%
Liverpool South Parkway	1,025,900	135%
Waterloo (Merseyside)	1,005,970	214%
Liverpool Central	898,367	7%
Liverpool Lime Street	874,711	7%
West Kirby	851,062	314%
Sandhills	768,598	160%
Kirkby (Merseyside)	553,690	31%

Improved Strathclyde Passenger Transport (SPT) infill

1.80 A more sophisticated infill was developed by Mott MacDonald to capture demand in the Strathclyde area on a number of SPT products, namely:

- Zonecard;
- Roundabout; and
- Daytripper

1.81 Total sales data for these tickets was obtained from a combination of LENNON data and off rail sales figures from SPT. The number of journeys on each ticket type was established by applying appropriate tip rate proxies for each type. The data was distributed using Zonecard forum travel diary data and LENNON station-station reduced ticket proportions to produce an estimate of station-to-station movements. The new infill resulted in a drop in entries and exits of approximately 4.4m (2.5% of total Scotland entries and exits). The top ten changes by station are shown in Table 1.24.

[6] As all the new Mott MacDonald infills were incorporated into the ODM at the same time, it is not possible to definitively isolate each infill. For the purposes of this exercise, stations within the North West Government Office Region were considered to be those affected by the new Merseyside infill.

Table 1.24: Top Ten Changes (in absolute terms) in Entries and Exits with inclusion of new Strathclyde Infill (2013/14)[7]

Station	Change in entries and exits with new infill	% Change
Glasgow Central	-1,254,874	-4%
Glasgow Queen Street	-1,025,052	-6%
Helensburgh Central	-391,278	-32%
Motherwell	-232,668	-17%
Charing Cross (Glasgow)	-154,791	-8%
Kilwinning	-138,187	-13%
Paisley Gilmour Street	131,984	3%
Johnstone	-129,954	-10%
Ayr	-124,246	-8%
Airdrie	-110,906	-9%

Other methodological variations

1.82 As for 2011/12 and 2012/13 the generic methodology for separating out group stations was not followed for Manchester BR, Wigan BR and Warrington BR. For Warrington BR and Wigan BR we maintained the same split of journeys between the respective stations as seen in 2010/11 at a flow and route code level. For Manchester BR the split was maintained at the station level.

Methodological Changes in 2012/13

Improved Greater Manchester and West Yorkshire PTE Infill

1.83 Building on the inclusion in the 2011/12 dataset of an improved infill for the Centro area, an improved PTE infill was included in the 2012/13 dataset for two of the remaining PTEs – West Yorkshire (WYPTE) and Greater Manchester (GMPTE/TFGM). This was produced using a process derived to construct infill demand for the Rail in the North demand and revenue model produced by Mott MacDonald and MVA for the Rail in the North (RiN) consortium and was supplied by Mott MacDonald.

1.84 The impact of the methodological change at the PTE level is shown in Table 1.25.

[7] As all the new Mott MacDonald infills were incorporated into the ODM at the same time, it is not possible to definitively isolate each infill. For the purposes of this exercise, stations within the Glasgow Government Office Region were considered to be those affected by the new SPT infill.

Table 1.25: West Yorkshire and Greater Manchester PTE Infill (2012/13)

PTE	Journeys (m)	
	Old Methodology	New Methodology
West Yorkshire PTE	6.83	8.67
Greater Manchester PTE	5.05	5.10

Source: Steer Analysis of PTE infill based on a station classification into PTEs – this necessitates a simplified treatment of cross-PTE boundary flows

1.85 The new infill had a significant impact at the total level for the West Yorkshire PTE area with a 27% increase in the number of journeys on West Yorkshire PTE tickets. The impact on the total size of the GMPTE infill was much smaller but there were still significant distributional impacts as demonstrated by the presence of a number of GMPTE stations in the top ten changes from the improved infill as shown in Table 1.26.

Table 1.26: Top Ten Changes (in absolute terms) in Entries and Exits with Inclusion of New PTE Infill for GMPTE and WYPTE (2012/13)

Station	Entries and Exits (with old infill)	Entries and Exits (with new infill)	Change in Entries and Exits (%)
Leeds	24,450,682	26,200,916	7%
Huddersfield	4,022,672	4,656,700	16%
Manchester Airport	3,414,466	3,136,816	-8%
Bolton	3,313,742	3,583,392	8%
Bradford Interchange	2,782,466	3,004,718	8%
Dewsbury	1,389,050	1,603,702	15%
Manchester Piccadilly	23,358,295	23,158,477	-1%
Guiseley	945,722	1,134,560	20%
Shipley	1,497,954	1,666,542	11%
Castleford	413,318	537,898	30%

Calibration of entries and exits to count data at group stations

1.86 The key addition to the underlying MOIRA2 data in the construction of the Station Usage dataset is the breakdown of group station flows into their component stations. This is a significant task and the existing methodology based primarily on sales data is becoming less robust as increasing volumes of sales are completed via the internet.

1.87 For the purposes of the 2012/13 dataset we therefore undertook a significant programme of counts at a number of stations to provide a basis for allocating demand at the station group level between these stations.

1.88 In the application of the count data, consistency with the underlying ODM data was maintained by controlling total entries and exits at the station group level to the total station group demand in the underlying matrix. Count data was then used to apportion the total station group demand between the individual stations. It is important to emphasise this point – the count data was only used to distribute demand between stations within each of the relevant station groups. It was not used to set the overall level of demand. Use of count data to set the total level of entries and exits by station was not implemented for a number of reasons, including:

- Consistency with underlying data in the ODM matrix;
- Seasonal variation in demand would need to be accounted for on a robust basis; and
- Counts would need to be undertaken in succeeding years and on a sufficiently robust basis to ensure random variation between years was minimal.

1.89 Following the counts a thorough process of validation was completed, utilising, where possible, information and data provided by Train Operators to corroborate the count data. On completion of the validation it was agreed with the ORR that the outputs of the count data would be used to allocate demand between stations for the stations listed in Table 1.27. This table also shows the distribution of entries and exits between the stations with the previous and new methodology. The dominant trend in the changes is an increase in demand at the smaller (and often ticket office-less) stations at the expense of the larger stations in the group.

Table 1.27: Stations Impacted by use of Count Data to Distribute Demand Between Group Stations (2012/13)

Group	Station	Entries and Exits		
		Previous methodology	New methodology	Change (%)
Farnborough BR	Farnborough (Main)	3,149,316	2,859,700	-9%
	Farnborough North	328,684	618,300	88%
Bedford BR	Bedford Midland	3,448,926	3,303,270	-4%
	Bedford St.Johns	9,320	154,976	1563%
Wakefield BR	Wakefield Westgate	2,240,342	2,266,915	1%
	Wakefield Kirkgate	514,862	488,289	-5%
Maidstone BR	Maidstone East	1,796,012	1,343,900	-25%
	Maidstone West	529,796	834,293	57%
	Maidstone Barracks	120,150	267,765	123%
Dorking BR	Deepdene	389,786	454,909	17%
	Dorking	1,354,864	1,234,007	-9%
	Dorking West	40	55,774	139435%
Newark BR	Newark North Gate	1,096,442	1,179,491	8%

	Newark Castle	320,558	237,509	-26%
Dorchester BR	Dorchester South	533,304	469,294	-12%
	Dorchester West	66,828	130,838	96%
Colchester BR	Colchester	4,574,692	4,291,055	-6%
	Colchester Town	459,380	743,017	62%
Portsmouth BR	Portsmouth & Southsea	2,352,460	1,965,324	-16%
	Portsmouth Harbour	1,809,936	2,197,072	21%
Hertford BR	Hertford North	1,342,800	1,338,227	0%
	Hertford East	769,974	774,547	1%

1.90 Note that these counts based splits are only applied to the Station Usage dataset, not the ODM.

Methodological Changes in 2011/12

Improved PTE Infill growth rate

1.91 With the initial version of MOIRA2 an improved representation of PTE demand was included in the base demand matrix based on work undertaken by Steer for the year 2008/09. This included journeys from tickets sold at non-railway sales points and an estimated distribution of journeys largely based on the distribution of point to point tickets sold in PTE areas.

1.92 Subsequent versions of the MOIRA2 demand matrix have included a PTE infill but the journeys are now based directly on LENNON data and are therefore not consistent with the 2008/09 infill.

1.93 To maintain consistency with previous ORR statistics the PTE infill contained in the ODM was therefore based on the 2008/09 MOIRA2 PTE infill grown by growth rates derived from National Rail Trends data.

1.94 Up until 2010/11 the application of growth was carried out at a highly aggregate level based on growth seen for 'franchised regional operators' as reported in National Rail Trends data. In the construction of the 2011/12 dataset a more disaggregate set of growth rates were applied at the PTE level based on LENNON data to improve the appropriateness of the growth rates applied and reflect geographical variations in demand growth.

Inclusion of revised West Midlands PTE (Centro) Infill

1.95 Steer were commissioned in 2011 by the Passenger Demand Forecasting Council (PDFC) to construct a PTE infill matrix for the Centro area for the rail year 2010/11. The methodology followed that used for the construction of the original MOIRA2 infill but included use of additional data sources and specific adjustments for known issues such as directionality.

1.96 This infill represented a significant improvement on the infill in the ODM and therefore as part of the 2011/12 update the PDFC infill was updated to 2011/12 data and included in the ODM and hence the Station Usage dataset.

1.97 The inclusion of the Centro infill represented a significant change for stations within the Centro area and also a number of stations not in the Centro area but where Centro tickets can be purchased for travel into the Centro area. For the majority of stations the inclusion of the infill resulted in an increase in entries and exits although in a small number of instances there was a decrease. A comparison of the 2011/12 Centro infill with the 2010/11 ODM infill is included in Table 1.28. This shows that the new infill added approximately 5 million journeys (10 million entries and exits) compared to what would have been derived had the previous methodology been used.

Table 1.28: Centro area infill comparison

	2010/11 ODM infill	2010/11 infill grown to 2011/12 using previous methodology	2011/12 updated infill
Journeys (m)	15.5	16.6	21.3

New 'Other' infill layer

1.98 In some non-PTE areas there are zonal products which are not captured within the MOIRA2 demand matrix (e.g. Rover and Ranger products). Whilst volumes of travel on these tickets are relatively small, in the area of use they can be significant. Therefore, in the 2011/12 update we included journey estimates for a number of Rover and Ranger products. These were:

- St Ives Group Day Ranger;
- St Ives Day Ranger;
- St Ives Family Day Ranger;
- Valleys Night Rider; and
- Cambrian Coaster Ranger.

1.99 Journeys on these products were included as an 'Other' infill in the ODM, together with journeys from some non-LENNON season ticket products previously included in the airport flow infill. Journey estimates for these products were constructed using LENNON data and distributing journeys based on point of sale and the underlying reduced ticket travel distribution of the stations covered.

1.100 The total number of entries and exits arising from inclusion of these journeys was 760k. Table 1.29 lists the top five stations impacted most significantly:

Table 1.29: Top five stations impacted by inclusion of the 'Other' infill

NLC	Station Name	2010/11 entries and exits	2011/12 entries and exits	Reason
3538	St.Ives	258,530	578,214	Inclusion of St Ives branch line rover products
3542	Carbis Bay	55,334	206,736	
3537	St.Erth	120,770	202,362	
3498	Lelant Saltings	17,224	101,284	
3899	Cardiff Central	11,259,968	11,502,080	Inclusion of Valley Night Rider product

Calibration of entries and exits to count data at group stations (pilot)

1.101 A key addition to the underlying MOIRA2 data in the construction of the Station Usage dataset is the breakdown of group station flows into their component stations. This is a significant task and based primarily on sales location data which is becoming less robust as increasing volumes of sales are completed via the internet.

1.102 For the purposes of the 2011/12 dataset a pilot was conducted for stations within the Liverpool BR group of stations, using count data to allocate journeys between the stations. The stations that this impacted were:

- Liverpool Lime Street;
- Liverpool Central;
- Liverpool James Street; and
- Moorfields.

1.103 Count data sourced from the DfT and Merseytravel enabled the calculation of the split of demand between the central Liverpool stations as shown in Table 1.30. These percentages were then used to divide total central Liverpool demand, as calculated by the Station Usage process, between the central Liverpool stations. The same splits were applied across all ticket types.

1.104 Note that this count based methodological change is only applied to the station usage dataset, not the underlying ODM.

Table 1.30: Modification of central Liverpool Station Usage data

Station	2011/12 Entries and Exits old methodology	Implied split between stations	Implied split between stations from counts	Adjusted Liverpool station entries and exits
Liverpool Lime Street	11,882,144	32%	37%	13,835,314
Liverpool Central	17,497,878	47%	38%	14,209,241
Liverpool James Street	3,524,654	9%	8%	2,991,419
Moorfields	4,488,064	12%	17%	6,356,766

Inclusion of Freedom Pass journeys in PTE Infill

1.105 The TfL concessionary product the 'Freedom Pass' is included in the Oyster system. However, unlike paid-for Oyster products, travel on the Freedom Pass was not included in the Station Usage estimates prior to 2012/13. Given the volume of rail travel on the Freedom Pass (circa 21 million entries and exits in 2012/13) inclusion of these journeys where possible in the Station Usage dataset was highly desirable.

1.106 To facilitate the inclusion of Freedom Pass journeys TfL provided the following data to enable an estimate of Freedom Pass journeys on the rail network:

- Total journeys on Freedom Pass with touch in/out at least one end of the journey at a 'NR subsystem'8 station for each period in the 2012/13 year
- Origin and destination breakdown of Freedom Pass journeys where the passenger touched in or out for period 4 of 2012/13 (July 2012), including a distinction between London Underground and National Rail services e.g. entries and exits at London Bridge National Rail and London Bridge London Underground are recorded separately

1.107 Inclusion of the Freedom Pass journeys was then achieved through a two-stage process:

- Calculation of period 4 Freedom Pass journeys on National Rail/London Overground services by assigning each origin destination in the sample period 4 data as being either a National Rail/London Overground journey or not. This was required to exclude journeys not on the National Rail/London Overground network.
- Estimation of total 2012/13 Freedom Pass journeys on National Rail/London Overground by flow by using the periodic 'NR subsystem' data to inform an expansion of the period 4 journeys.

1.108 The number of Freedom Pass journeys included was necessarily a conservative estimate since it does not capture journeys where the passenger did not have to touch in or out. In addition, the smallest flows in the period 4 dataset were not being included since it was not practical to categorise every single flow.

1.109 Table 1.31 shows the top ten increases in Station Usage from the inclusion of Freedom Pass journeys. This shows that the numbers of Freedom Pass journeys are sufficient to have a significant impact at even relatively heavily used stations such as West Croydon.

Table 1.31: Top Ten Changes (in absolute terms) in Station Usage from Inclusion of Freedom Pass Data

Station	Entries and Exits		
	Without Freedom Pass	With Freedom Pass	Change (%)
Victoria	75,884,234	77,346,676	1.9%
Waterloo	94,673,486	95,936,542	1.3%
London Bridge	52,342,710	53,351,116	1.9%
East Croydon	20,060,778	20,965,248	4.5%

[8] The NR subsystem is a set of stations which is used for recording purposes by TfL. It is composed primarily of National Rail stations but does include some joint stations (e.g. Wimbledon). As such it could not be used to provide a completely clean estimate of total National Rail Freedom Pass journeys but the periodic data was informative when scaling the detailed Period 4 data to the whole year.

Station	Entries and Exits		
	Without Freedom Pass	With Freedom Pass	Change (%)
Clapham Junction	22,916,064	23,622,718	3.1%
Liverpool Street	57,856,458	58,448,814	1.0%
Charing Cross	38,140,698	38,607,238	1.2%
Stratford	25,129,740	25,564,250	1.7%
Wimbledon	18,475,254	18,902,016	2.3%
West Croydon	3,880,666	4,300,582	10.8%

1.110 From 2015/16 Freedom Pass journeys were already included in the MOIRA2.2 dataset and therefore no further adjustments were required as part of production of Estimates of Station Usage.

Additions to the 'Other' infill layer

1.111 In 2011/12 a number of zonal products outside PTE areas and not captured within the MOIRA2 demand matrix were included for the first time in the dataset as part of a new 'Other' infill layer. In the 2012/13 dataset a further five non-PTE zonal products were included. The products included were:

- Anglia Plus;
- Devon Evening Ranger;
- Devon Day Ranger;
- Ride Cornwall; and
- Freedom Travel Pass (West of England product).

1.112 Journey estimates for these products were constructed using LENNON data and distributing journeys based on point of sale and the underlying reduced[9] ticket travel distribution of the stations covered.

1.113 The total number of entries and exits arising from inclusion of these journeys is 1.05m. Table 1.32 lists the top ten stations impacted most significantly:

Table 1.32: Top Ten Stations Impacted by Inclusion of the 'Other' Products

Station Name	Entries and Exits		Change (%)	Reason
	Without "Other" Products	With "Other" Products		
Norwich	3,949,610	4,126,012	4.5%	Inclusion of Anglia Plus products
Ipswich	3,202,062	3,348,394	4.6%	
Cambridge	9,080,762	9,168,936	1.0%	

[9] With the exception of the Anglia Plus product which has both Reduced and Season variants. For the Season variants of this product the underlying Full ticket travel distribution of the stations covered was used given that the coverage of Season tickets in the base matrix was limited.

Station Name	Entries and Exits		Change (%)	Reason
	Without "Other" Products	With "Other" Products		
Bury St.Edmunds	501,966	566,110	12.8%	
Plymouth	2,530,000	2,579,316	1.9%	Inclusion of Devon/Cornwall Rangers
Lowestoft	411,536	459,166	11.6%	Inclusion of Anglia Plus products
Exeter St. David's	2,361,172	2,401,276	1.7%	Inclusion of Devon Rangers
Stowmarket	897,376	927,856	3.4%	Inclusion of Anglia Plus products
Thetford	264,318	287,024	8.6%	
Bristol Temple Meads	9,076,954	9,099,332	0.2%	Inclusion of Freedom Travel Pass products

2 Methodology changes prior to 2011/12

2.1 A series of methodological improvements were made to the ODM and Station Usage dataset between 2006/07 and 2010/11. These methodology changes were implemented by Resonate (formerly DeltaRail) who were the consultants working for the ORR to produce the statistics prior to 2011/12.

It should be noted that the information in this section has been reproduced from previous reports on the Station Usage statistics produced by Resonate.

2.2 Between 2006/07 and 2008/09 the accuracy and usefulness of the ODM was improved by applying new procedures on the way journeys with unknown origin and/or destination have been treated, and by including journeys that were previously excluded from the file or did not appear in the LENNON sales data. In summary, the main changes were:

- Adding in previously missing journeys, e.g. TfL sold Travelcards, and some airport link tickets - this is undertaken in the production of the MOIRA2 demand matrix.
- Rail Links such as PlusBus and Attractions. The rail element of these ticket sales is now included - this is undertaken in the production of the MOIRA2 demand matrix.
- Estimating the split of records for station groups, including London BR, into the constituent individual stations. This methodology was further refined for those groups with no ticket office at one or more stations within the group - this processing is undertaken in the ODM,
- Via the integration with the process that creates the MOIRA2 Demand Matrix, PTE ticket sales are now included, in addition to TfL sold Travelcards, and some airport link tickets – this is undertaken in the production of the MOIRA2 demand matrix.
- The method for estimating passenger journeys from ticket sales has changed. This is a result of using the MOIRA2 Demand Matrix as a starting point. The MOIRA2 Demand Matrix does not disaggregate single journeys, and so when estimating passenger journeys all ticket sales have been split equally into the two directions of travel. This will only have an impact on the ODM if there is more travel on single tickets away from a station compared to travel to the station, which is not likely to be material. Therefore, in the Station Usage file, entries are the same as exits.

2.3 In 2009/10 further improvements were made:

- Adding in data for journeys undertaken by Oyster “pay-as-you-go” (PAYG) in the London area. This is undertaken within the base LENNON data, in the production of the MOIRA2 demand matrix. This applies to journeys made after 1 January 2010.
- Refinement of the methodology used to calculate journeys undertaken using PTE tickets.

2.4 When the 2010/11 dataset was constructed it emerged that the original 2008/09 figures which were given for one PTE, West Yorkshire, were not a complete record of all the rail journeys on

multimodal tickets which should have been included in the PTE infill. A correction was therefore made by uplifting the West Yorkshire PTE Infill, both revenue and journeys figures, by 53% on top of the generic PTE infill growth rate. Note that within West Yorkshire PTE area, the majority of rail journeys are made on rail-only tickets, i.e. not PTE Infill tickets. Therefore the overall effect of this correction was relatively small.

Oyster PAYG

2.5 Oyster 'Pay As You Go' (PAYG) was rolled out at National Rail stations in January 2010. Prior to this date Oyster PAYG was available on selected routes only and was not recorded (in LENNON) on a flow or station basis. After this date Oyster PAYG was available at all National Rail stations in the Travelcard Area are recorded by flow.

2.6 The 2009/10 data contained roughly 9 months of data prior to January 2010 and 3 months of data after, while the 2010/11 data which was wholly after January 2010 when Oyster PAYG, with data capture, had been fully implemented contains a full year of data. This lead to some very large reported growth figures for some stations within the London Travelcard (/Oyster PAYG) area. The 2010/11 figures, based on recorded use of Oyster PAYG should be accurate, but the percentage growth may be over-represented since the old figures would be largely estimates made without the benefit of Oyster records.

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