Estimates of Station Usage 2012/13

Methodology and Validation Report

Report

February 2014

Prepared for:
Office of Rail Regulation
One Kemble Street
London
WC2B 4AN

Prepared by:
Steer Davies Gleave
28-32 Upper Ground
London SE1 9PD

+44 (0)20 7910 5000
www.steerdaviesgleave.com

CONTENTS

TABLES

APPENDICES

steer davies gleave

Executive Summary

Introduction

1. This report explains the information contained within the ORR's Estimates of Station Usage data set (Station Usage 2012-13.xls) and provides guidance on the methodology followed during the process of creating this file for the financial year 2012/13 and a summary of the validation checks undertaken as part of the production process.

2. The Estimates of Station Usage data set (referred to in the rest of this report as "Station Usage data set") consists of estimates of the total numbers of people:

    ▮ Travelling from or to the station (entries & exits); and
    ▮ Interchanging at the station (interchanges).

3. Information is given for all the national rail stations in England, Scotland, and Wales based on tickets sales data. These results are the most recent in a series produced for the ORR since 1997/98 and the spreadsheet is in a similar format to those previously provided for earlier years.

4. Station Usage data is generated from the Origin Destination Matrix (ODM), a comprehensive matrix of rail flows throughout England, Scotland and Wales, also produced by Steer Davies Gleave, and based on data produced for the MOIRA2 rail planning tool which itself is derived from LENNON, the rail industry's ticketing and revenue system. This does place some limitations on the data which users should be aware of and are detailed in this report.

Methodological Development

5. Consistency with past datasets is important to enable comparisons to be made over time. However, stakeholders have indicated that they are keen to see improvements, even where this reduces consistency with historic data, provided any changes are clearly explained.

6. In the 2012/13 dataset a number of changes have been made to improve the dataset:

    ▮ Improved PTE infills have been included for the following PTEs:

      ▪ West Yorkshire (WYPTE - Metro); and
      ▪ Greater Manchester (GMPTE/TFGM);

    ▮ Entries and Exits at a number of stations which form part of station groups[1] have been calibrated to count data;
    ▮ An estimate of trips using the Freedom Pass product in the London Travelcard area is now included; and
    ▮ Journeys on a number of Ranger/Rover products previously excluded has been added building on products included for the first time in 2011/12.

---

[1] For example the Colchester station group which contains Colchester and Colchester Town stations

Results

7.   In total entries and exits have increased by around 3.3 % to nearly 2.54bn in 2012/13. However, once the impact of methodological improvements is accounted for the underlying increase is circa 2.3%.

Limitations of the data

8.   In the absence of a completely gated system that allows a complete recording of flows through stations or comprehensive and robust count data the use of ticket sales data, LENNON, as the primary source of the station usage data set as described in this report is the best approach available. In particular its national coverage makes it suitable as a basis for the production of official statistics such as those reported by the ORR.

9.   However, this data does have weaknesses when utilised for this purpose and, although some of these are catered for in the methodology, the user should be aware of these acknowledged limitations and bear these in mind when using the data. The key limitations are outlined in Chapter 1 with more extensive discussion of some aspects of the limitations of the dataset is included in Appendix E

1   Introduction

Overview

1.1   Steer Davies Gleave was appointed by the Office of Rail Regulation (ORR) to produce the Estimates of Station Usage data for 2012/13, continuing the historic series that dates back to 1997/98. This report accompanies the Estimates of Station Usage data for 2012/13 and provides details of the process and outputs used to produce the statistics on behalf of the ORR. In the rest of this report the Estimates of Station Usage data set is referred to as the "Station Usage data set."

1.2   Steer Davies Gleave are providing the ORR with an MS Excel file, "Station Usage 2012-13.xls" containing entries, exits and interchanges made at stations throughout England, Scotland and Wales, for the financial year 1st April 2012 to 31st March 2013. For the entries and exits, figures are split into the three main categories of the available ticket products (Full, Reduced, and Season).

1.3   The methodology adopted by Steer Davies Gleave in the production of the Station Usage data is consistent with that adopted by DeltaRail in the production of the Station Usage data in the years prior to 2011/12. In 2012 we produced a Methodological Review of the data and processes used to generate the Station Usage data as well as stakeholder input and identified a number of areas for improvement in the data set. A number of these were implemented in the 2011/12 data set (see Appendix A) and a further tranche of improvements has been included in the 2012/13 dataset. These improvements are summarised in Chapter 3.

Use of the station usage dataset

1.4   When using the station usage data, particularly when comparing with previous years, it is important to be aware of:

   i)   Improvements made to the dataset over time which can impact consistency between years;

   ii)   Limitations of the data and specifically factors e.g. some ticket sales not being included, that may mean that demand on particular flows or stations is underestimated; and

   iii) Factors which can affect reporting of entries and exits.

Improvements to the dataset

1.5   Improvements to the dataset in 2012/13 are set out in Chapter 3. A summary of improvements made over recent years are further detailed in Appendix A. The ORR continues to work with stakeholders and its own consultants to improve the robustness of the dataset by implementing methodological changes that demonstrate value and address acknowledged issues.

Limitations of the data

1.6   In the absence of a completely gated system that allows a complete recording of flows through stations or comprehensive and robust count data the use of ticket sales data, LENNON, as the primary source of the station usage data set as described in the following chapter is the best approach available. In particular its

national coverage makes it suitable as a basis for the production of official statistics such as those reported by the ORR.

1.7   However, this data does have weaknesses when utilised for this purpose and, although some of these are catered for in the methodology, the user should be aware of these acknowledged limitations. The key limitations are outlined below. More extensive discussion of some aspects of the limitations of the dataset is included in Appendix E.

❚ **Non-Point to point tickets** - An overarching issue is the inherent difficulty and uncertainty associated with estimating the number of journeys associated with many rail products which do not simply represent point to point single or return journeys and furthermore the distribution of those journeys. This is a particular issue for the London Travelcard Area and PTE areas;

❚ **Concessionary travel** – Most PTEs subsidise some form of free travel for passengers over a certain age and those with disabilities. This creates a substantial additional element of demand which is very difficult to include in the ODM as information on the level and distribution of journeys associated with these free travel products is not recorded and will not even have point of sale information. The current approach to this in the ODM is to include this demand where data has been made available by PTEs which would generally be estimates as a result of surveys;

❚ **Non-LENNON Sales** - A significant proportion of sales is either not passed directly through LENNON (sold at non-railway sales points) or is included in LENNON in a format which requires additional processing and assumptions i.e. is not associated with a station to station flow;

❚ **Group stations** – Many products to major destinations are sold with the origin or destination as a group of stations (e.g. London Terminals, Manchester BR stations). Current industry data does not distinguish between the component stations and therefore a split between these stations has to be estimated during the production of the ODM; and

❚ **Ticketless travel** – Journeys associated with ticketless travel are not included in the datasets but as with journeys made on other products excluded from the datasets, some journeys would be observed in passenger counts. This is likely to be an issue on some flows and in some areas where ticketless travel is significant. As more stations have become gated over time and TOCs focus on revenue protection activities this is likely to be less of an issue than in the past in contributing to a shortfall in journeys. Finally, there is a strong argument that it is inappropriate to include ticketless travel in the station usage dataset as its purpose is to record bona-fide journeys on the rail network and inclusion of ticketless travel could distort business cases for new investment where these are reliant on station usage data.

1.8   It is important to remember that in aggregate the underlying data, from LENNON, is a rich and comprehensive data source and importantly covers the entirety of Great Britain. The issue is that when using the data source (in particular for Station Usage statistics) the data is being pushed significantly beyond what it was originally designed for which was primarily to report and allocate revenues across train operators.

≣ steer davies gleave

Factors which can affect reporting of entries and exits

Gating Schemes

1.9   Installation of ticket gates can significantly affect not only the usage figures at that station, but also those at neighbouring stations. The gates help to ensure that customers purchase tickets, but customers may also alter their travel patterns to avoid gated stations. We would expect travel patterns to be most affected in the months following the installation of the gates.

Change in Service Pattern

1.10   Alterations in service frequency or stopping pattern would be expected to alter station usage figures. This is particularly apparent where a group of stations along a line show similar increases or decreases. Again, this can be a long-term trend.

Ticket Issuing Facilities Changes or Product Changes

1.11   Some London stations have both underground and National Rail trains operating. LENNON does not capture tickets sold by London Underground, only those sold by TOCs. Changes in ticket facilities provided by TOCs, for example the provision of ticket machines, can therefore increase the ticket sales captured by the system.

1.12   Product changes can have an effect on passengers' purchasing patterns at rail outlets thus affecting station usage data. For example, the introduction of Oyster cards at rail outlets can affect stations inside the Travelcard boundary in the London area.

Engineering Work

1.13   Significant engineering work can alter customers' travel patterns, either causing passengers to not travel, use an alternative mode or use an alternative rail route. Similarly, significant delays can alter travel patterns where, for example, Virgin customers can switch to using Chiltern services to travel between the West Midlands and London.

Advance tickets

1.14   Advance tickets can be sufficiently cheap to incentivise travellers to purchase a number of tickets but only use one dependent on how their circumstances change, creating an inflated number of trips in the sales data. This can be particularly true for business travel and therefore could overstate actual journeys.

Tourism

1.15   Stations near to tourist attractions may show significant changes in usage as a result of weather, promotions or other factors, which affect tourists' journeys.

New/Special Stations

1.16   Some stations serve a particular activity or business. Some fluctuation in usage of such stations is reasonable. Such activities include:

❙ Racecourses e.g. Newbury Racecourse;
❙ Sports Events e.g. Wembley Stadium. In particular the 2012 Olympics and Paralympics in London will have had an impact on a number of stations;
❙ Exhibition Centre Glasgow;
❙ Airports.

1.17   In addition, where there are new stations ramp up effects can cause large demand increases over a number of years.

Trend of Growth or Decline

1.18   For stations with a history of growth or decline, it is reasonable to expect this trend to continue. There are many possible reasons for these trends, such as demographic and employment changes (new developments in the vicinity), changes in rail service levels or new stations abstracting demand.

Changes in the Sales of Individual Ticket Types

1.19   Miscoding of ticket information entered into LENNON can alter station usage results, although this would not be reflecting an actual change in customers' journeys.

Historic Events

1.20   Although not relevant for this year, there are a number of factors worth taking into account when considering generic annual data:

❙ Years may have been affected by industrial action such as 1994/95;

❙ Major incidents affecting services such as Southall, Ladbroke Grove and Hatfield;

❙ Major adverse weather; and

❙ Infrastructure changes e.g. ticket gating can significantly increases revenue - more gates have been installed in recent years which will affect the data but which does not represent higher passenger numbers.

steer davies gleave

2 Methodological Overview

MOIRA2 Demand Matrix – Base Data

Overview

2.1 All estimates of station usage, exits, entries and interchanges included in the station count dataset, are derived from the Origin Destination Matrix (ODM), also produced by Steer Davies Gleave for the ORR. The ODM itself is, in turn derived primarily from the MOIRA2 Demand Matrix.

2.2 The MOIRA2 demand matrix is sourced from MOIRA2 and includes a comprehensive representation of travel on the national rail network. The base data for the MOIRA2 demand matrix is LENNON ticket sales, with the addition of "infills" for London Travelcards, airport links and multi-modal and zonal products sponsored by Passenger Transport Executives (PTEs)[2].

Underlying Base Data - LENNON

2.3 The underlying matrix of ticket sales and associated journeys and revenue used in MOIRA2 is derived from LENNON. It is based on an extract from LENNON, produced by Atos, of total sales revenue and journeys for the year, broken down by flow (origin and destination National Location Code (NLC)), route code and by product type (CTOT). However, as there are known omissions in this data in respect of Transport for London (TfL) and PTE sponsored tickets, and non-National Rail tickets on some airport services, there needs to be a "matrix infilling" exercise undertaken to estimate a more complete origin-destination matrix and include the associated journeys and revenue that do not appear in the underlying matrix.

2.4 There are three main cases:

❚ Tickets with non-geographical destinations, e.g. zonal products, Rovers;

❚ Tickets sold at some non-National Rail (RSP: Retail Settlement Plan) outlets, e.g. newsagents; and

❚ Tickets which do not appear in LENNON at all. This includes some Train Operating Company (TOC) tickets on airport flows, and tickets for TOCs which fall outside the Rail Settlement Plan.

2.5 Certain tickets with destination codes that are not national rail stations are included in the MOIRA2 demand matrices, being mapped to the corresponding rail station. These Rail Links usually include a third party element, such as to a bus zone, or tourist attraction. The MOIRA2 demand matrix includes the journeys and the net revenue associated with such tickets.

2.6 Data excluded from the MOIRA2 demand matrix is set out in Appendix E.

---

[2] Passenger Transport Executives (PTEs) are local government bodies which are responsible for public transport within large urban areas. They are accountable to Integrated Transport Authorities (ITAs) which were formerly known as Passenger Transport Authorities (PTAs) prior to 2008 and the Local Government Act 2008. There are five PTEs in England, for each of the metropolitan counties (Merseyside, South Yorkshire, Tyne and Wear, West Midlands and West Yorkshire) with the former Greater Manchester Passenger Transport Executive being replaced by Transport for Greater Manchester from April 2011. In Scotland the Strathclyde Partnership for Transport is the equivalent body covering the region of Strathclyde. For convenience in this report we continue to refer to these areas as PTEs.

Ticket Type Definitions

2.7 Within the base demand matrices, journeys and revenue have been sub-divided into the following four ticket types, each of which is further split by First & Standard Class:

　　i) Full: all walk-up undiscounted single or return tickets, whether or not issued with a status discount (child, railcard etc);

　　ii) Reduced: all walk-up discounted single or return tickets, whether or not issued with a status discount (child, railcard etc);

　　iii) Advance: all advance-purchase tickets; and

　　iv) Seasons: all multi-use tickets.

2.8 It should be noted that for the purposes of the station usage data, Advance products are included in the Reduced ticket category.

Infills for London Travelcards, Major Urban Areas (PTE) & Airports

2.9 Infills are included within the MOIRA2 demand matrix to add in the missing journeys and revenue identified in para 2.4 in three key areas:

▌ **Within London Travelcard area.** Whilst the underlying matrix includes an estimate of journeys made on Day Travelcards / Travelcard seasons purchased at National Rail stations, it does not include a significant number of national rail trips made using Travelcards purchased at Tube stations, travel shops and newsagents.

▌ **Within Passenger Transport Executive (PTE) areas.** The underlying matrix excludes virtually all rail trips made on PTE-sponsored tickets, which are usually zonal and often multimodal.

▌ **Trips to/from Airports.** The underlying matrix includes many trips to/from airports, but excludes all Heathrow Express journeys, and some tickets sold for Gatwick Express, Stansted Express and other airport operators.

2.10 There are also other ticket sales which are not included in the MOIRA2 demand matrix, but these are generally much less significant. It should also be noted that journeys with no associated ticket sales such as staff travel, and particularly fare evaders, are not included in the MOIRA2 demand matrix and therefore are not included in the ODM either.

2.11 The most significant "infills" are for the London Travelcard area (sales made by Transport for London (TfL)), and for PTEs, since in both cases a substantial proportion of the rail journeys made use multimodal travelcard type of tickets.

2.12 The third infill, for Airports, estimates the significant number of rail journeys on Gatwick and Stansted Express, made on tickets sold outside of the RSP system i.e. not sold by National Rail outlets. Journeys on Heathrow Express are excluded from the MOIRA2 demand matrix.

ODM PTE Infill

2.13 For the production of the ODM the revenue and journeys associated with the MOIRA2 PTE Infill are removed and replaced with a separate estimate.

2.14 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 Davies Gleave for the year 2008/09. This included journeys from tickets sold at non-

steer davies gleave

railway sales points and an estimated distribution of journeys largely based on the distribution of point to point tickets sold in PTE areas.

2.15   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.

2.16   To maintain consistency with previous ORR statistics the PTE infill contained in the ODM has therefore been based on the 2008/09 MOIRA2 PTE infill (as described in para 2.14) adjusted annually using growth rates derived from National Rail Trends data.

2.17   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 was applied at the PTE level based on LENNON data. In addition, a completely new infill was included for the West Midlands Centro PTE infill area based on an infill constructed for the Passenger Demand Forecasting Council (PDFC) by Steer Davies Gleave.

2.18   In 2012/13 new infills have been included for the West Yorkshire (WYPTE) and Greater Manchester (GMPTE/TFGM) PTE areas and this is detailed in Chapter 3. In summary, as a result of these methodological enhancements in the Greater Manchester, West Midlands and West Yorkshire PTEs over the last two years users should be cautious in the comparisons they make over time for stations in these areas.

TABLE 2.1   SUMMARY STATUS OF PTE INFILLS METHODOLOGY

PTE	Status
Greater Manchester	Updated infill methodology adopted for 2012/13.
Merseyside	Original 2008/09 methodology maintained.
South Yorkshire	Original 2008/09 methodology maintained.
Strathclyde	Original 2008/09 methodology maintained.
Tyne & Wear	Original 2008/09 methodology maintained.
West Midlands	Updated infill methodology adopted for 2011/12 and 2012/13
West Yorkshire	Updated infill methodology adopted for 2012/13

Unknown Destinations

2.19   Ticket sales do not always tell us where a passenger is travelling, for example where the Origin or Destination is a London Travelcard. As in previous years, we have converted unknown destinations into an estimate of the actual stations that passengers are travelling to. The full detail of this part of the methodology appears in Appendix D.

Interchanges Methodology

2.20   An estimate of the number of people interchanging at each station is obtained by combining the number of journeys made on each flow (from the ODM) with the information on passenger journeys taken from the Central Allocations File (CAF).

2.21   The CAF is an output of the ORCATS system which predicts passenger choices of rail route and train used, and determines the allocation of passenger revenue between TOCs. Since ORCATS is a model, the CAF contains estimates rather than actual journeys. However, it is used throughout the rail industry, so it is an appropriate source of data to use for this purpose. Since CAFs are updated with the timetable, not with financial years, no CAF will match the ticket sales data exactly. The December 2012 CAF is used in the creation of the 2012/13 Station Usage.

2.22   The CAF contains:

❚   Origin and destination;

❚   Route alternatives for each origin and destination, including all interchange points;

❚   Ticket type data; and

❚   For each flow, the proportion of passengers who choose to travel on each route alternative as calculated by the ORCATS model.

2.23   An overview of the ORCATS allocation process can be found in Appendix C.

steer davies gleave

3 Methodological Changes in 2012/13

Introduction

3.1 Consistency with past datasets is important to enable comparisons to be made over time. However, stakeholders have indicated that they are keen to see improvements, even where this reduces consistency with historic data, provided any changes are clearly explained.

3.2 In the 2012/13 dataset a number of changes have been made to improve the dataset and these are explained in the rest of this chapter, together with some quantification of their impact.

Improved Greater Manchester and West Yorkshire PTE Infill

Methodology

3.3 Building on the inclusion in the 2011/12 dataset of an improved infill for the Centro area, an improved PTE infill has been included in the 2012/13 dataset for two of the remaining PTEs – West Yorkshire (WYPTE) and Greater Manchester (GMPTE/TFGM). This has been produced for 2011/12 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. This element of the data has been supplied by Mott Macdonald and we acknowledge the contributions of the PTEs in supplying the data to allow this methodological enhancement to be progressed.

3.4 The original Rail in the North PTE infill also covered South Yorkshire PTE tickets. However, South Yorkshire PTE was unable to release the requested data within the required timescale and therefore the current PTE infill methodology has been maintained for this PTE for 2012/13. Some data was obtained from South Yorkshire PTE in the form of numbers of boardings at main stations (such as Doncaster), with limited data available from smaller stations (such as Swinton). This data was not compatible with the methodology which was developed for the Rail in the North work, and a decision was taken not to make use of it.

Impact of change

3.5 The impact of the methodological change at the PTE level is shown in Table 3.1:

TABLE 3.1 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: SDG Analysis of PTE infill based on a station classification into PTEs – this necessitates a simplified treatment of cross-PTE boundary flows

3.6 The new infill has 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 is much smaller but there are 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 3.2.

TABLE 3.2   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

Methodology

3.7   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 current methodology based primarily on sales data is becoming less robust as increasing volumes of sales are completed via the internet.

3.8   For the purposes of the 2012/13 dataset we have, therefore, undertaken a significant programme of counts at a number of station to provide a basis of allocating demand at the station group level between these stations. The stations where counts have taken place are listed in Table 3.3.

3.9   Consistent with the approach taken in the 2011/12 dataset for the Liverpool BR station group consistency with the underlying ODM data has been maintained by controlling total entries and exits at the station group level to the total station group demand in the underlying matrix. Count data has then been used to apportion the total station group demand between the individual stations. It is important to emphasise this point – the count data has only been used to distribute demand between stations within each of the relevant station groups, it has not been used to set the overall level of demand. Use of count data to set the total

level of entries and exits by station has not been 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.

TABLE 3.3   STATIONS COUNTED

Group	Station
Farnborough BR	Farnborough (Main)
	Farnborough North
Bedford BR	Bedford Midland
	Bedford St.Johns
Wakefield BR	Wakefield Westgate
	Wakefield Kirkgate
Maidstone BR	Maidstone East
	Maidstone West
	Maidstone Barracks
Dorking BR	Deepdene
	Dorking (Main)
	Dorking West
Newark BR	Newark North Gate
	Newark Castle
Helensburgh BR	Helensburgh Central
	Helensburgh Upper
Dorchester BR	Dorchester South
	Dorchester West
Edenbridge BR	Edenbridge Town
	Edenbridge
Southend BR	Southend Victoria
	Southend Central
	Southend East
Colchester BR	Colchester
	Colchester Town

Group	Station
Portsmouth BR	Portsmouth & Southsea
	Portsmouth Harbour
Hertford BR	Hertford North
	Hertford East

Impact of change

3.10 Following the counts a thorough process of validation has been 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 3.4. Table 3.4 also shows the distribution of entries and exits between the stations with the current 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 3.4   STATIONS IMPACTED BY USE OF COUNT DATA TO DISTRIBUTE DEMAND BETWEEN GROUP STATIONS (2012/13)

Group	Station	Entries and Exits		
		Current 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%

Group	Station	Entries and Exits		
		Current methodology	New methodology	Change (%)
	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%

Inclusion of Freedom Pass journeys in PTE Infill

Methodology

3.11 The TfL concessionary product the 'Freedom Pass' is included in the Oyster system. Unlike paid for Oyster products, travel on the Freedom Pass is not included in the current station usage estimates. 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 is highly desirable.

3.12 TfL have 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'[3] 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

3.13 Inclusion of the Freedom Pass journeys has been 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 uprate the period 4 journeys

3.14 The number of Freedom Pass journeys included is 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 have not been included since it was not practical to categorise every single flow.

---

[3] 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 cannot be used to provide a completely clean estimate of total National Rail Freedom Pass journeys but the periodic data can be used to scale the detailed Period 4 data to the whole year.

Impact of change

3.15   Table 3.5 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 3.5   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%
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%

Additions to the 'Other' infill layer

Methodology

3.16   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 have been included. The products included are summarised in Table 3.6:

steer davies gleave

TABLE 3.6   "OTHER" PRODUCTS INCLUDED IN 2012/13

Product	Description
Anglia Plus	A rover product covering travel within the Anglia Plus area which covers. ▌ Norfolk - Area bounded by the coast, Thetford, Diss and eastwards to Lowestoft. ▌ Suffolk - Area bounded by Somerleyton, Bury St Edmunds, Stowmarket and Ipswich. ▌ Cambridge – Area bounded by Bury St Edmunds, Cambridge, Ely and Thetford.
Devon Evening Ranger	Ranger product offering unlimited off-peak/evening travel on all routes in Devon and as far as Tiverton Parkway and Axminster, plus the Tamar Valley Line from Plymouth to Gunnislake.
Devon Day Ranger	
Ride Cornwall	Ranger product offering unlimited off-peak rail and bus journeys in Cornwall and to/from Plymouth.
Freedom Travel Pass (West of England product)	Pass that provides unlimited travel on all train and most bus services in Bristol, Bath, North Somerset or South Gloucestershire.

3.17   Journey estimates for these products have been constructed using LENNON data and distributing journeys based on point of sale and the underlying reduced[4] ticket travel distribution of the stations covered.

Impact of change

3.18   The total number of entries and exits arising from inclusion of these journeys is 1.05m. Table 3.7 lists the top ten stations impacted most significantly:

TABLE 3.7   TOP TEN STATIONS IMPACTED BY INCLUSION OF THE 'OTHER' PRODUCTS

Station Name	Entries and Exits			Reason
	Without "Other" Products	With "Other" Products	Change (%)	
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%	
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

---

[4] 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			Reason
	Without "Other" Products	With "Other" Products	Change (%)	
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

Other methodological variations

3.19 During the dataset construction process highly variable LENNON sales data has been identified as causing problems with the distribution of demand for the following station groups in both 2012/13 and 2011/12:

❙ Manchester BR
❙ Wigan BR
❙ Warrington BR

3.20 Therefore, it has not been possible to follow the generic methodology for separating out group stations for these station groups. For Warrington and Wigan BR we have maintained the same split of journeys between the respective stations as seen in 2010/11 at a flow and route code level for both the revised 2011/12 statistics and the 2012/13 statistics. For Manchester the split has been maintained at the station level.

4 Summary of Results

4.1 The following table gives the total number of entries, exits, and interchanges made over the whole network for 2012/13, compared with the previous year.

TABLE 4.1   ENTRIES, EXITS AND INTERCHANGES FOR 2011/12 – 2012/13

Year	Entries	Exits	Entries & Exits	Interchanges
2011/12	1,227,960,111	1,227,960,111	2,455,920,222	200,615,271
2012/13	1,268,980,418	1,268,980,418	2,537,960,837	211,140,901

4.2 Overall, the increase in entries and exits is around 3.3% in 2012/13, compared with the previous year although the underlying increase once methodological improvements have been accounted for is 2.3%.

Overview of the Entries and Exits Results

4.3 In this section we set out a summary of the overall entries and exits results. The spreadsheet contains entries and exits results for 2,535 stations, compared with 2,533 last year. The table below shows the new stations that have been opened in 2012/13:

TABLE 4.2   STATIONS IN 2012/13 BUT NOT IN 2011/12

NLC	Name	Note
6393	Conon Bridge	New station
6680	Fishguard & Goodwick	New station

4.4 Table 4.3 shows data for the ten stations with the highest numbers of entries and exits for 2012/13.

TABLE 4.3   TOP 10 STATIONS BASED ON 2012/13 ENTRIES AND EXITS

Rank This Year	NLC	Station Name	Entries and Exits			Rank Last Year
			2012/13	2011/12	Change	
1	5598	Waterloo	95,936,542	94,127,282	2%	1
2	5426	Victoria	77,346,676	76,163,428	2%	2
3	6965	Liverpool Street	58,448,814	57,105,400	2%	3
4	5148	London Bridge	53,351,116	52,603,158	1%	4
5	5143	Charing Cross	38,607,238	38,113,546	1%	5
6	1444	Euston	38,299,206	36,520,544	5%	6
7	3087	Paddington	34,143,220	33,709,272	1%	7
8	1127	Birmingham New Street	32,090,346	31,235,638	3%	8
9	6121	King's Cross	28,454,460	27,840,484	2%	9
10	9813	Glasgow Central	27,185,020	26,610,016	2%	10

4.5   The total journeys made at one of the top ten stations account for a total of 484 million, 2.1% more than the 474m journeys made at the top ten stations last year although it should be noted that this includes a substantial increase for the London stations due to the inclusion of the Freedom Pass journeys. If the Freedom Pass journeys are excluded the increase is only 1.0%. The top ten stations account for 19% of all entries and exits, the same as in 2011/12.

Merseyside

4.6   Some stations within or on the edge of the Merseyside area are showing unexplained decreases in entries and exits[5]. In addition the Merseyside area as a whole is showing a reduction of nearly 6%. A possible explanation is that the current PTE infill methodology is not adequately capturing changes in travel on PTE tickets. This is an area currently being looked at actively by the ORR.

Overview of the Interchanges Results

4.1   In all, around 211 million interchanges are estimated to have been made among National Rail operated services (interchanges between rail and tube or other modes are excluded except for cross-London journeys). This is an increase of 5.2% compared to the 2011/12 results (200.6 million). The ten top stations are listed in the table below. The large change in interchanges at Stratford is likely to be at least partially caused by the Olympics and Paralympics.

---

[5] For example, Overpool, Little Sutton and St. Michaels all have decreases in excess of 15%.

steer davies gleave

Overview of the Interchanges Results

TABLE 4.4   TOP 10 STATIONS BASED ON THE INTERCHANGES MADE FOR 2012/13

Ranking 2012/13	NLC	Station Name	Interchanges			Ranking 2011/12
			2012/13 I	2011/12	Change	
1	5595	Clapham Junction	23,334,118	21,539,545	8%	1
2	5598	Waterloo	9,389,235	9,493,972	-1%	2
3	5148	London Bridge	8,568,138	8,609,746	0%	4
4	5426	Victoria	8,311,851	9,061,260	-8%	3
5	5355	East Croydon	6,525,943	6,317,257	3%	5
6	1127	Birmingham New Street	5,164,606	5,104,384	1%	6
7	3149	Reading	3,831,718	3,803,680	1%	7
8	6969	Stratford	3,671,078	2,060,920	78%	16
9	6121	King's Cross	3,583,561	3,157,047	14%	11
10	1555	St.Pancras	3,469,060	3,595,900	-4%	10

4.2   Interchanges occurred at 539 stations in 2012/13 compared to the 538 stations in 2011/12. Stations appearing for the first time in 2012/13 and those not seen this time are listed below.

TABLE 4.5   CHANGES IN INTERCHANGE STATIONS IN 2012/13

	Interchanges		Reason
	2012/13	2011/12	
New			
Hackney Central	482,264	0	Change to ORCATS routing assumptions
Grangetown (South Glamorgan)	7,988	0	
Barry	2,812	0	
Old			
Thetford	0	Combined total of 35 interchanges	
Huntingdon	0		
Altrincham	0		

Methodology and Validation Report

4.3   The numbers in this table are estimated numbers for actual passenger interchanges made during the year.

4.4   It is important to note that interchanges can change significantly from year to year for a variety of reasons. Factors such as new service patterns and changes in journey times play a part. The number of interchanges is based on the rail industry ORCATS model, which predicts passenger choices of rail route and trains used. Refer to Appendix C for more information on the ORCATS allocation process.

steer davies gleave

5   Validation

Introduction

5.1   Checks undertaken on the station usage dataset encompass a number of elements, including:

■ Investigation of large increases and decreases for individual stations
■ Checks at different geographical levels
■ Validation against alternative data sources

Data Checks

Large increases and decreases

5.2   Table 5.1 shows the 10 stations with the largest increases in total flow for stations with more than 10,000 entries and exits. The most common cause for large increases is the use of count data to allocate demand between group stations as described earlier.

TABLE 5.1   TOP 10 INCREASES

NLC	Station Name	Entries and Exits			Reason
		2012/13	2011/12	Increase (%)	
5297	Dorking West	55,830	16	348838%	Entries and Exits distribution between stations in this station group adjusted to reflect count data
1510	Bedford St.Johns	154,976	10,140	1428%	Entries and Exits distribution between stations in this station group adjusted to reflect count data
4787	Southend Airport	340,814	57,208	496%	Continued ramp-up of demand from opening of station in previous year
9023	Broughty Ferry	23,180	9,288	150%	Reflects improved train service introduced in December 2011
7501	Buckshaw Parkway	225,250	91,630	146%	Continued ramp-up of demand from opening of station in previous year
5237	Maidstone Barracks	267,765	118,108	127%	Entries and Exits distribution between stations in this station group adjusted to reflect count data
6909	Angel Road	63,040	28,240	123%	Part of a wider pattern of high growth across Lea Valley Lines
5962	Dorchester West	130,838	64,920	102%	Entries and Exits distribution between stations in this station group adjusted to reflect count data
5753	Digby and Sowton	742,622	374,488	98%	Continues and accelerates high growth from previous years. Could be linked to new houses being built in this area

NLC	Station Name	Entries and Exits			Reason
		2012/13	**2011/12**	**Increase (%)**	
6971	Northumberland Park	415,526	213,458	95%	Continues and accelerates high growth from previous years

5.3   Table 5.2 shows the 10 stations with the largest decreases in total flow for stations with more than 10,000 entries and exits.

5.4   There is a cluster of substantial decreases on the Esk Valley Line (Lealholm, Glaisdale, Grosmont) for which the reasons are unclear. Examination of the underlying LENNON data shows that the decrease is driven primarily by large decreases on flows to Whitby. In the case of Grosmont this could be linked to incorrect use of North Yorkshire Moors Railway tickets but this should not affect the other stations on this route.

TABLE 5.2   TOP 10 DECREASES

NLC	Station Name	Entries and Exits			Reason
		2012/13	**2011/12**	**Decrease (%)**	
9790	Dalmarnock	21,506	79,558	-73%	Station closed for revamp from June 2012
9668	Bogston	29,902	62,992	-36%	Reason for decrease unclear - reverses 2011/12 increase, suggesting anomalously high usage for that year
7925	Lealholm	11,422	20,010	-26%	Reason for decrease unclear - could be related to ticketing issues on this line
7921	Glaisdale	11,194	18,564	-23%	Reason for decrease unclear - could be related to ticketing issues on this line
3195	Tackley	20,934	34,374	-22%	Reason for decrease unclear
5538	Bedhampton	171,554	249,212	-21%	Reason for decrease unclear - partially reverses large increase seen in the previous year. Could be linked to fluctuations in usage at the much more significant Havant station close by.
8155	Grosmont	16,376	23,662	-21%	Reason for decrease unclear - could be related to ticketing issues on this line
6498	Newark Castle	237,509	336,398	-21%	Entries and Exits distribution between stations in this station group adjusted to reflect count data
4314	Pwllheli	44,520	62,590	-19%	Reason for decrease unclear - accelerates decline seen over recent years
5036	Doleham	28,102	38,666	-19%	Reason for decrease unclear - comes after a year of exceptional growth

5.5   As in the 2012/13 dataset two flags have been included identifying:

▌ Stations with more than 10,000 entries and exits a year where entries and exits have increased or decreased by more than 10%

▌ Stations with less than 10,000 entries and exits a year where entries and exits have increased or decreased by more than 25%

5.6   These flags have been used to identify stations where further investigation should be carried out to ensure, where possible, the reported changes reflect reality. The limits set are demanding (10% of 10,0000, for example could represent just two extra season ticket holders per year)and investigations have been focussed on the most significant changes but where obvious explanations for less significant changes are available these have been included in the Station Usage dataset. In total 498 stations were captured by one of the two flags.

5.7   Whilst reasons for large changes at some stations are specific to that station, in many instances there are groups of stations where there is a common cause for the changes seen. In Table 5.3 we have grouped reasons for large changes into a number of clusters, with the number of stations in each category. The table shows that the highest identifiable drivers of significant change are the methodological improvements and the continuing increase in patronage on London Overground routes including the recent Surrey Quays to Clapham Junction extension. In total, the types of reasons summarised in Table 5.3 account for 58% of all flagged stations when we include stations where there is a trend of high growth, albeit not for obvious reasons.

TABLE 5.3   SUMMARY OF LARGE CHANGES

Reason	Note	Stations affected
Improved PTE infill	Methodological improvement	59
Station Group count adjustment		13
Anglia Plus		12
Freedom Pass		6
London Overground		53
Lea Valley Lines		15
Timetable Improvement		9
Merseyside		8
Airdrie - Bathgate		7
Esk Valley		5
New station demand ramp-up		4
North Cotswolds improvements		4
HS1		3
Station Improvements		3

Reason	Note	Stations affected
New station		2
Hatfield Colliery landslip		1
Engineering works		1
High growth trend		87

Checks at different geographical levels

5.8　It is possible that in certain areas changes at the individual station level might not be large enough to be flagged but as a group the results might be unexpected. For this reason we have carried out some checks at a number of levels of detail. In this section we summarise the station count data for the following aggregations of data:

▌ PTE area;

▌ Government Office Region (GOR); and

▌ Station Facility Owner (SFO).

TABLE 5.4   ENTRIES AND EXITS BY PTE AND LONDON TRAVELCARD AREA

PTE	Entries and Exits		Growth
	2011/12	**2012/13**	
London Travelcard Area	1,168,302,924	1,229,517,048	5.2%
Greater Manchester	68,802,620	69,804,168	1.5%
Merseyside	91,535,354	86,196,056	-5.8%
South Yorkshire	19,764,478	20,058,546	1.5%
Strathclyde	112,807,982	115,574,690	2.5%
Tyne & Wear	8,972,648	9,128,070	1.7%
West Midlands	88,257,934	90,038,668	2.0%
West Yorkshire	62,509,470	64,473,940	3.1%

5.9　This table shows reasonable increases by PTE with the exception of Merseyside which has already been noted as an area for future improvement (see para 4.6). In addition separate data (e.g. DfT arrivals and departures data for central Liverpool stations which shows a 1.6% fall between autumn 2011 and autumn 2012) does indicate that demand growth is weak in the Merseyside area.

steer davies gleave

TABLE 5.5   ENTRIES AND EXITS BY GOVERNMENT OFFICE REGION

GOR	Entries and Exits		Growth
	2011/12	2012/13	
London	1,155,958,212	1,216,779,288	5.3%
South East	355,396,414	361,089,813	1.6%
East	181,806,848	189,184,958	4.1%
South West	68,000,416	69,307,542	1.9%
East Midlands	38,540,996	38,752,850	0.5%
West Midlands	119,379,578	121,953,360	2.2%
North East	20,028,448	20,057,944	0.1%
North West	200,131,616	196,617,966	-1.8%
Yorkshire And The Humber	102,899,546	105,107,634	2.1%
Wales - Cymru	47,132,262	47,633,884	1.1%
Scotland	166,645,886	171,475,598	2.9%

5.10   Changes by GOR are, again, all within the range of what would be expected with highest growth in London (driven partly by the inclusion of Freedom Pass data). The decrease for the North West will be partially driven by the decrease in the Merseyside area.

TABLE 5.6   ENTRIES AND EXITS BY STATION FACILITY OWNER

SFO	Entries and Exits		Growth
	2011/12	2012/13	
Arriva Trains Wales	54,928,144	55,538,820	1.1%
c2c	47,761,568	50,961,140	6.7%
Chiltern Railways	36,007,544	38,447,304	6.8%
East Coast	33,740,070	34,000,624	0.8%
East Midlands Trains	39,547,914	39,453,813	-0.2%
First Capital Connect	115,835,036	119,381,500	3.1%
First Great Western	119,988,034	124,222,049	3.5%
First ScotRail	121,343,698	124,692,896	2.8%
First TransPennine Express	22,366,630	22,813,920	2.0%
Glasgow Prestwick Airport	336,980	343,782	2.0%
London Midland Trains	76,340,722	78,939,822	3.4%

SFO	Entries and Exits		Growth
	2011/12	**2012/13**	
London Overground	98,484,224	116,516,158	18.3%
London Underground	50,117,748	56,799,898	13.3%
Merseyrail	72,145,769	67,792,053	-6.0%
Abellio Greater Anglia	161,548,972	171,614,865	6.2%
Network Rail	628,812,528	641,782,294	2.1%
Northern Rail	112,216,659	113,900,464	1.5%
South West Trains	266,241,056	274,433,125	3.1%
South West Trains (Island Line)	1,668,384	1,543,278	-7.5%
Southeastern	180,265,478	183,268,488	1.7%
Southern	177,574,974	181,788,363	2.4%
Stobart Rail	57,208	340,814	495.7%
Virgin Trains (West Coast)	38,590,882	39,385,368	2.1%

5.11 Changes at the SFO level are also within reasonable bounds. The large increase for London Overground is consistent with the strong growth on the Overground network. The exceptional increase for Stobart Rail is due to rapid demand growth at the recently opened Southend Airport station, the only station for which Stobart Rail is SFO.

Validation against alternative data sources

Comparison with ORR journey data on the ORR data portal

5.12 The ORR produces journey data by sector and TOC and makes this available on the ORR website via its data portal through a separate data analysis exercise[6]. Growth from 2011/12 to 2012/13 from this data was 2.9% at the national level for franchised TOCs. The station usage data shows an increase of 3.3% over the same period, within the expected level of variation from the ORR data.

Comparison with PIXC data

5.13 The DfT collects count data for major cities throughout the UK. The method of collection means that for through stations it is often not possible to calculate boarders and alighters but for terminal stations this is usually possible. Using data provided by the DfT we have compared growth rates at the major London termini covered by the count data with those seen in the calculated station usage data (excluding methodological improvements for a like for like comparison). The only regional station where the comparison is possible using DfT data is Manchester Victoria.

---

[6] Formerly this formed part of the National Rail Trends publication

steer davies gleave

TABLE 5.7   COMPARISION OF STATION USAGE AND PIXC GROWTH RATES 2011/12 – 2012/13

Station	Station usage growth rate (all day, pre-methodological changes)	PIXC growth rate
Euston	4.3%	1.4%
Fenchurch Street	-1.7%	1.1%
King's Cross	2.1%	7.0%
Liverpool Street	1.3%	-2.0%
Marylebone	9.1%	5.4%
Moorgate	4.8%	-20.4%
Paddington	0.8%	2.8%
Victoria	-0.4%	3.0%
Waterloo	0.6%	-0.2%
Manchester Victoria	1.9%	-2.1%

Source: PIXC data from:

i)   https://www.gov.uk/government/publications/rail-passenger-numbers-and-crowding-on-weekdays-in-major-cities-in-england-and-wales-2011

ii)   https://www.gov.uk/government/publications/rail-passenger-numbers-and-crowding-on-weekdays-in-major-cities-in-england-and-wales-2012

5.14   The comparison shows considerable discrepancy between the station usage and PIXC growth rates. However, there are a number of reasons why differences in growth rates are to be expected:

I 2012/13 is an exceptional year for London due to the Olympics and Paralympics. This will have caused significant distortion of demand in the summer which will not be reflected in the PIXC counts but will be reflected to some extent in the station usage numbers

I The PIXC counts are weekday only – they won't capture weekend variations. They also represent growth for a particular time of year and will not reflect changing demand conditions over the year

5.15   Given the Olympics and Paralympics, in particular, it is not surprising that there are discrepancies between the annual station usage numbers and the more restricted PIXC counts for the London stations. Also, the steady growth for Moorgate in the station usage numbers seems more realistic than the 20% demand drop seen in the PIXC counts. Finally, the station usage growth rate for Manchester Victoria effectively reflects the average Manchester BR growth rate due to the methodology employed and hence some discrepancy with the count data is not surprising.

steer davies gleave

APPENDIX

A

HISTORICAL METHODOLGICAL CHANGES

A1   HISTORICAL METHODOLOGICAL CHANGES

A1.1   In the five years prior to the 2011/12 dataset a number of improvements were made to the ODM and Station Usage methodology which are described in the section. This includes the inclusion since 2009/10 of Oyster PAYG data in the ODM which represented a significant improvement to the estimates for rail travel across London. These improvements are described in the first section of this Appendix.

A1.2   The 2011/12 dataset included a raft of improvements reflecting recommendations in the Methodological Review and details of these changes are included as a separate section in this Appendix.

Historical methodology changes prior to 2011/12

A1.3   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 - t*his 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.

A1.4   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.

A1.5   When the 2010/11 dataset was constructed it emerged that the original 2008/9 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. Thus the overall effect of this correction was relatively small.

Oyster PAYG

A1.6   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 and recorded by flow.

A1.7   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 will be largely estimates made without the benefit of Oyster records.

Methodological Improvements in 2011/12

Improved PTE Infill growth rate

A1.8   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 Davies Gleave 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.

A1.9   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.

A1.10   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.

A1.11   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

A1.12   Steer Davies Gleave 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.

A1.13   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.

A1.14   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 Appendix Table A.1. 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.

APPENDIX TABLE A.1 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

A1.15   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
❚ Cambrian Coaster Ranger

A1.16   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.

A1.17   The total number of entries and exits arising from inclusion of these journeys was 760k.Appendix Table A.12 lists the top five stations impacted most significantly:

APPENDIX TABLE A.2 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)

A1.18   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 based primarily on sales location data which is becoming less robust as increasing volumes of sales are completed via the internet.

A1.19   For the purposes of the 2011/12 dataset a pilot was therefore 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.

A1.20   Count data sourced from the DfT and Merseytravel enabled the calculation of the split of demand between the central Liverpool stations as shown in Appendix Table A.3. 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.

steer davies gleave

APPENDIX TABLE A.3 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

steer davies gleave

APPENDIX

B

STATION USAGE FILE DEFINITION

B1   STATION USAGE FILE DEFINITION

B1.1   The Station Usage spreadsheet (Station Usage 2012-13.xls) lists the entries, exits and interchanges made at stations throughout England, Scotland and Wales in the financial year 2012/13 (1st April 2012 to 31st March 2013). It also gives details about the entries and exits for different ticket categories. It contains data on entries and exits made at rail stations by passengers using the rail network. The fields included in the Station Usage data set are:

APPENDIX TABLE B.1   STATION USAGE FILE

Field	Description
Station (Name, NLC, TLC)	Station Name, NLC: National Location Code, TLC: Three Letter Code District, County, Region, NUTS2
District, Country, Region, NUTS2 Code and NUTS2 Spatial Unit for the Station	Station's geographical location
Station Facility Owner (SFO)	The company that is the station facility owner (provided by Network Rail in 2008 and updated as appropriate for changes in status)
Station Group	Name of the Group where applicable. The user of this data may wish to filter on the 'Station Group' column, or create pivot tables, to investigate the results at a group level
PTE Urban Area Station	Stations within the urban areas covered by PTE services are identified with a flag: 'PTE Urban Area Station'
London Travelcard Area	Stations with the urban areas covered by PTE services and TfL services are identified with a flag: 'London Travelcard Area Station'
Entries (Full, Reduced, Season, Total)	Entries made at the stations split by ticket categories and in total
Exits (Full, Reduced, Season, Total)	Exits made at the stations split by ticket categories and in total
12/13 Entries & Exits	Sum of Entries and Exits for 2012/13
11/12 Entries & Exits	Sum of Entries and Exits for 2011/12
12/13 Interchanges	Total Interchanges made for 2012/13
Large station Flag	Flags change in Entries and Exits greater than 10% for stations with over 10,000 Entries and Exits
Small station Flag	Flags change in Entries and Exits greater than 25% for stations with under 10,000 Entries and Exits
Explanation of large change	Identified reason(s) for large changes for flagged stations
Sources	Links to source(s) of information where appropriate

≡ steer davies gleave

Regions, Counties and Districts

B1.2   For all rail stations, the District, County, Region and NUTS2 Region & Code are provided for the origin and destination to describe the geographical location.

B1.3   The source of this data is:

I   District or the Unitary Authority – ATOC (dated January 2008) and ORR (dated January 2008)

I   District, County & Region – ONS[7] website (dated January 2008)

I   NUTS2 Code and Description – ORR (dated January 2010)

---

[7] http://www.statistics.gov.uk/geography/geographic_area_listings/administrative.asp#04

steer davies gleave

APPENDIX

C

OVERVIEW OF THE ORCATS ALLOCATION PROCESS

C1   OVERVIEW OF THE ORCATS ALLOCATION PROCESS

C1.1   This section gives an outline of the Central Allocations File (CAF), which is used in producing the interchange figures, and the ORCATS process which is used to create the CAF.

C1.2   Most of the train tickets that are sold are inter-available – the customer has a choice of routes and operators. For example, when a customer buys a ticket to travel from Leicester to Leeds, that customer may travel on various combinations of East Midlands Trains, East Coast, CrossCountry Trains and Northern, and may interchange at Doncaster, Sheffield, Derby or Nottingham. LENNON captures the sale of the ticket, but unless the ticket has stringent route restrictions, the route actually taken by the customer is not recorded.

C1.3   The route taken by any particular customer may never be known, but some route options are more attractive than others. The customer is more likely to choose a faster, more frequent service than a slower, less frequent one. This likelihood can be translated into the proportions of customers choosing each route option, on a particular flow. (A 'flow' represents all journeys from a given origin station to a given destination station, irrespective of the route taken.) The revenue received from all customers on that flow should be split between different operators to reflect the proportion of customers which each operator carried.

C1.4   ORCATS was developed to model the choice made by the customers, and to allow revenue to be split between operators. It applies passenger choice modelling to the train timetable, to determine the relative attractiveness of different route alternatives. It then weights the results by journey mileage.

C1.5   For any given timetable, ORCATS works out the possible routes between each origin and destination, and calculates the percentage of the passengers that are expected to choose each route based on the services in that timetable.

C1.6   The output from ORCATS is the Central Allocations File (CAF). This lists the proportion of journeys on each flow (or origin-destination pair) estimated to be made by each route alternative. For journeys involving interchanges, each leg of the journey is listed. By combining this information with the ODM data, which contains journeys for all flows, the number of interchanges occurring at individual stations has been estimated.

APPENDIX

D

METHODOLOGY: NON-STATION TICKETS

D1   METHODOLOGY: NON-STATION TICKETS

D1.1   Ticket sales do not always tell us where a passenger is travelling. Ticket sales can be divided into the seven categories listed in table below. Ticket sales data has been converted into an estimate of the actual stations that passengers are travelling from/to.

D1.2   The processing of ticket sales data is undertaken in the creation of the MOIRA2 demand matrix, and then subsequently in the creation of the ODM. For each of the flow categories, the table below states where the flow is processed: MOIRA2 or ODM.

APPENDIX TABLE D.1 CATEGORISATION OF TICKET SALES IN LENNON

Flow Category	Description	Processing
Category 1	Origin and Destination Stations Known	No processing required
Category 2	Origin or Destination a Group Station (excl. London BR)	ODM
Category 3	Origin or Destination is London Terminals	ODM
Category 4	Origin or Destination a London Travelcard including Zone 1	ODM
Category 5	Origin or Destination a London Travelcard excluding Zone 1	MOIRA2 Demand Matrix
Category 6	Origin or Destination a London Travelcard Boundary Zone	MOIRA 2 Demand Matrix
Category 7	Non-National Rail Stations	MOIRA 2 Demand Matrix

Category 1 – Origin and Destination Stations Known

D1.3   Both the origin and destination were known stations so no further processing is required for such flows.

Category 2a – Origin or Destination a Group with all Stations Having a Ticket Office

D1.4   In 2005/06 all origins or destinations that were a group station (with the exception of London BR) were changed to the major station within the group. For example, all ticket sales to or from Reading BR were recoded to Reading. This was clearly over-simplistic.

Methodology and Validation Report

D1.5   In 2006/07 the ODM was based on the journeys from ticket sales to the individual stations within a group. We assumed that passengers travelling **to** the stations in a group would act in the same way as passengers travelling **from** the stations in that group. We believed that this was, in general, a valid assumption to make, and no bias would be introduced into the journey figures.

D1.6   From 2007/08 onwards this process is still used where all stations in the group have ticket offices, so that the relative flows from the individual stations are credible.

D1.7   For example, in 2006/07 the journeys between stations in the 'Manchester BR' group and Crewe and vice-versa are shown by the column "jnys" in the table below. First the proportion of journeys **from** each of the individual Manchester stations **to** Crewe is determined, as shown in column "%split".

D1.8   Then these proportions are applied to both the 'Manchester BR to Crewe' and 'Crewe to Manchester BR' flows, giving the breakdowns to individual stations shown in column 'BR portion'. These are added to the base values to give "Total Journeys", before the 'Manchester BR to Crewe' and 'Crewe to Manchester BR' flows are deleted, to avoid double counting. The slight discrepancy between the Grand Totals is due to rounding error.

APPENDIX TABLE D.2 EXAMPLE OF BREAKING DOWN JOURNEYS TO/FROM A BR GROUP OF STATIONS

Orig	Dest	Origin Name	Destination Name	Jnys	%Split	BR portion	Total Jnys
2963	1243	DEANSGATE	CREWE	83	**0.32%**	85	168
2966	1243	MANCH OXF RD	CREWE	5,464	**21.03%**	5580	11,044
2968	1243	MANCH PICC	CREWE	19,733	**75.95%**	20152	39,885
2970	1243	MANCH VICT	CREWE	700	**2.69%**	714	1,414
0438	1243	MANCH BR	CREWE	26,533		Remove	
1243	2963	CREWE	DEANSGATE	207		1478	1,685
1243	2966	CREWE	MANCH OXF RD	2,262		97287	99,549
1243	2968	CREWE	MANCH PICC	8,017		351349	359,366
1243	2970	CREWE	MANCH VICT	343		12464	12,807
1243	0438	CREWE	MANCH BR	462,578		Remove	
		Grand Total:		525,920		525,918	

D1.9   The above methodology has been applied to all flows with more than 1,000 journeys in total, based on sales data, leaving the individual group stations (i.e. not including the 'BR Group NLC to destination' flow). For the smaller flows an average split is applied based on the flow with more than 1,000 journeys.

steer davies gleave

D1.10   In addition to this generic methodology this year entries and exits for the Southend, Colchester, Portsmouth and Hertford station groups have been obtained by apportioning total station group entries and exits using count data.

Category 2b – Origin or Destination a Group with some Stations Having no Ticket Office

D1.11   For this class of stations the above process breaks down because the proportion of journeys **to** the group stations with no ticket offices will tend to be estimated as zero because the sales **from** those stations are necessarily zero. For these groups bespoke methodology has tended to be used based on the best available data. This year entries and exits for the majority of stations in this group have been obtained by apportioning total station group entries and exits using count data.

D1.12   For the remaining stations splits between stations have been fixed at an origin and destination and route code level at the proportions estimated in the 2010/11 dataset.

Category 3 – Origin or Destination is London BR

D1.13   This category contained all flows that had London BR as either the origin or destination. In order to assign an appropriate London station on flows where either the origin or destination is London BR (NLC=1072) or a London Travelcard involving Zone 1, we analysed responses from the 2001 London Area Travel Survey (LATS). For journeys from any given station, we established the percentage of passengers using each London terminus.

D1.14   For example, if the flow was from Ashford International to London BR, we used our pre-generated table showing the percentage spilt between the alternative London termini for passengers starting at Ashford International. From this we apportioned the exits between London Bridge, Charing Cross, Victoria and other London termini.

D1.15   Stations with small sample sizes were removed from the 2001 LATS data. Where there was insufficient data in the 2001 LATS to generate the split for a particular station, a similar process with the Non London Groups methodology was applied. Firstly for all the flows with more than 1000 journeys leaving London BR and having as a destination the particular station we used split factors as above. However, if the sum of journeys was less than 1000 we assigned to the flow the top origin from the London BR stations.

Category 4 – Origin or Destination a London Travelcard including Zone 1

D1.16   All origins and destinations that were London Travelcard Zones that include Zone 1 were converted to 'London BR' under the assumption that they will travel to the same stations as point-to-point passengers and then transfer to another mode. The methodology set out above for Category 3 was then applied.

Category 5 – Origin or Destination a London Travelcard excluding Zone 1

D1.17   This category contained all Travelcards that did not include Zone 1, for example Zone R2345 London.

D1.18   For flows with origin or destination a London Travelcard (excluding zone 1) we use a set of assumptions based on survey responses from the 2001 LATS. They use the starting station to work out which stations it is possible for the passenger to be travelling to, and also give the proportion of passengers travelling to each of these stations. This is based on the assumption that a passenger holding a Zones 2-6 Travelcard would travel as far as Zone 2.

D1.19   This processing is undertaken during the production of the MOIRA2 demand matrix.

Category 6 – Origin or Destination a Boundary Zone

D1.20   All origins and destinations that were a London Travelcard Boundary Zone were converted to 'London Travelcard including Zone 1' under the assumption that a passenger travelling from or to a Boundary Zone will hold a Travelcard that includes Zone 1. The methodology set out above for Category 3 was then applied.

D1.21   This processing is undertaken during the production of the MOIRA2 demand matrix.

Category 7 – Non-National Rail Stations

D1.22   This final category contains all those flows in the original ticket sales data that do not fall into one of the above categories. Refer to Appendix E for a detailed description of this data and what has been included and excluded from the ODM.

D1.23   This processing is undertaken during the production of the MOIRA2 demand matrix.

steer davies gleave

APPENDIX

E

STATION USAGE DATASET LIMITATIONS

E1   STATION USAGE DATASET LIMITATIONS

Limitations of the LENNON data

E1.1   The LENNON database captures ticket sales for the entire national rail network from many different input machines. It is as a consequence a very large data set. With all large data sources there will always be input errors resulting in a certain amount of invalid data. Generally such errors will be small, and are more likely to occur in the journeys rather than revenue fields.

E1.2   Checks are performed on the data when the MOIRA2 demand matrix is compiled, but due to the size and complexity of the dataset it is not possible to validate each and every entry.

E1.3   We have used similar information extensively in the last ten years or more, and have found the data to be reliable, particularly when examining the data at an aggregated level.

E1.4   There are a number of areas where we know that LENNON does not capture the data correctly, or instances where it is not possible to derive passenger journeys from ticket sales data. These areas are expanded upon below.

Known Problems of Data Capture

E1.5   The data in LENNON from which the ODM is derived is based on ticket transactions. In order for the data to be included in the ODM it must include an origin station and a destination station. However if this is not the case then the data will automatically be excluded.

E1.6   Human error at the point the ticket sale is entered into the input machines will also produce invalid data in LENNON.

Travelcards

E1.7   As Travelcards are for multi-modal travel they allow the purchaser to make journeys on the rail system and on other modes. Equally, tickets purchased elsewhere on the local transport system will be valid for rail travel. Therefore LENNON gives only a partial picture of the rail travel in conurbation areas, such as: London, Birmingham, Glasgow, Leeds, Liverpool, Manchester, Newcastle and Sheffield.

E1.8   The ODM contains reasonably robust estimates of journeys within London and other conurbation areas where travelcards are widely used. An infill for London Travelcards has been included in the ODM since 2006/07, and an infill for PTE tickets is included from 2008/09.

Return and Single Journey Tickets

E1.9   It is possible that on certain routes the cost of a return ticket could be lower than a single ticket. This leads to the cheaper return ticket being purchased even though the passenger has no intention of making the return journey by rail. This results in two journeys being recorded instead of one.

Multiple Tickets

E1.10   It is possible to buy special cheaper tickets between certain stations for example under a promotion by one of the train companies. In these cases a local ticket may be bought to gain access to a main station and a second ticket bought for the rest of the journey. This results in two journeys being recorded in the ODM and will not accurately represent the journey undertaken.

Rail Staff Passes

E1.11   Prior to the privatisation of the rail network, British Rail employees and their families were eligible to various levels of free or reduced rate rail travel. When the various rail companies were converted to private companies, this benefit often continued.

E1.12   If you consider the network as a whole, the effect of staff passes is unlikely to be significant. However, it may be significant on certain routes, for example on routes out of Derby due to large concentration of companies in Derby relating to British Rail both pre and post privatisation.

E1.13   Ticketless Travel On every route on the network there will always be passengers who travel without purchasing a ticket. This is referred to as ticketless travel. As LENNON data is derived from ticket transactions it cannot reflect this travel.

Other Rail Systems

E1.14   There are a number of rail systems in operation in the country that are not covered by LENNON. For Heathrow Express and Eurostar revenue and journeys data were not available.

Journey Factors

E1.15   Ticket transactions are converted into an estimate of the number of journeys made by applying a series of ticket type journey factors. Single and return tickets unambiguously translate into one and two journeys respectively, for season tickets, the factors used represent a rough historic estimate as set out in Table 9-1 overleaf.

E1.16   Ticket periods of other lengths are converted to a number of journeys using a proportion of the monthly journey factor.

E1.17   Therefore the journeys data in the ODM represents an assumed number of journeys made based on the ticket type sold and the above journey factors. In particular it should be noted that the journeys data has not been cross-checked against other data sources of the actual number of journeys made on the network.

E1.18   These journey factors have been used within the LENNON system for a number of years at their current values. The source of the factors is unclear, and there is some indication that they were based on reasonable estimates of ticket use made in excess of fifteen years ago. It can therefore be argued that these journey factors do not provide an accurate estimate of the number of journeys that result on the rail system at present, or in any ODM.

APPENDIX TABLE E.1 JOURNEY FACTORS USED IN LENNON

Description	Journeys Per Issue
Single Journey Ticket	1
Return Journey Ticket	2
Return Journey 2 Persons	4
3 Day Return/ 6 Single Journeys	6
4 Day Return/ 8 Single Journeys	8
5 Day Return/ 10 Single Journeys	10
6 Day Return	12
5 Day Single	5
1.5 Journeys	1.5
Weekly Ticket	10.3
10 Day Return/ 20 Single Journeys	20
2 Weekly Ticket	22
Seasons-Variable Periods	***
Monthly Ticket	45
Not Used	0
3 Monthly Tickets	135
Not Used	0
6 Monthly Tickets	270
Summary Group Codes	***
Annual Ticket	480
8 Day Ticket	22
22 Day Ticket	44
14 Day Ticket	30
50 Journeys	50
10 Weeks	103

Data Excluded From Station Usage

E1.19   Some of the LENNON data has been excluded from the MOIRA2 Demand Matrix, and subsequently from the ODM.

E1.20   All the products that were classified into the 'miscellaneous' ticket pot were excluded. These products were:

  ❚ Car Parking
  ❚ Railcard Sales
  ❚ Penalty/Excess Fares
  ❚ Seat Reservations
  ❚ Sleeper Supplements.

E1.21   Also excluded from the analysis were all the flows that had either an Origin or Destination that did not represent a geographical location (these are mainly "I codes"), e.g.

  ❚ Rover and Ranger Tickets (except those included in the new 'Other' Infill in 2011/12)
  ❚ BritRail Tickets
  ❚ Gate passes usually used by staff
  ❚ Passenger Charter Discounts
  ❚ Headquarters Input Items, other than those which can be identified as TfL or PTE

E1.22   Finally for flows that have either Origin or Destination a Private Settlement Code some are included and some are excluded.

  ❚ PTE tickets and TfL sold London Travelcard records from LENNON are removed, and replaced with an estimate of all rail travel using these tickets via 'infill's to the MOIRA2 demand matrix (refer to chapter 2).
  ❚ PlusBus – all significant flows have been included since 2007/08 and minor flows are excluded.
  ❚ Attractions – the rail element of the significant flows have been included since 2007/08, which include:
    ▪ Bluewater Shopping Centre
    ▪ Alton Towers
    ▪ Whipsnade
    ▪ Chatsworth House

E1.23   All other flows involving Private Settlement are excluded, e.g. Irish Stations.