

**In Confidence
DeltaRail-LD-15717 Issue 1**

**2008 Rail Traffic Data
to support the
London Atmospheric
Emissions Inventory**




Title	2008 Rail Traffic Data to support the London Atmospheric Emissions Inventory
Customer	Greater London Authority
Customer reference	
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File reference	
Report number	DeltaRail-LD-15717
Issue number	Issue 1

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1 Introduction

DeltaRail are pleased to provide data for train movements for 2008 to the Greater London Authority, for use in the London Atmospheric Emissions Index. Similar data has been provided for previous years, most recently for 2005.

2 Source data

As in previous years' deliveries, results have been generated from intermediate data files produced in ACTRAFF processing. ACTRAFF uses source data from Network Rail's BIFS (Billing Infrastructure for Freight System) and CCF systems. The results are therefore subject to the same limitations as the source data. Similarly the quality of the results is dependent on the quality of the raw data.

ACTRAFF assumes that passenger trains are fully occupied, and assumes an average passenger weight of 0.08 tonnes. This may therefore marginally over-estimate the weight, and therefore the energy consumption, of passenger trains.

3 Data contents

The delivery for 2008, as for previous deliveries, comprises:

- a GIS file in .TAB format, defining the London rail network as a series of links
- database tables in .DBF format

In addition, two tables in .XLS format are also supplied.

3.1 GIS file

The GIS file is unchanged from that supplied for the 2005 delivery. This file covers the LAEI study area and denotes the rail links as linear features with unique identification numbers (Link IDs) using the same Link IDs provided in the previous rail datasets. This will allow the GLA to link between the two sources of data. The CrossRef field in the GIS file will also allow the GLA to cross-reference the energy consumption results with the network links in their past study.

The GIS file includes the following information:

Field Name	Type	Description
Link	Numeric	A unique ID for a section of railway line (between two junctions)
Xcoord1	Numeric	X coordinate for the start of the link
Ycoord1	Numeric	Y coordinate for the start of the link
Xcoord2	Numeric	X coordinate for the end of the link
Ycoord2	Numeric	Y coordinate for the end of the link
Distance	Numeric	Approximate distance of the link in kilometres
Descript	Char	A description of the link in words
CrossRef	Char	This field will be used to cross-reference with the links used in the previous London Energy study.

3.2 Database tables

Four database files in .DBF format are provided. These each comprise a table, as follows:

Field Name	Type	Description
Year	Char	2008
Link	Numeric	A unique ID for a section of track
Distance	Numeric	Distance of link in kilometres
Number	Numeric	Total number of passenger trains in this period, for this link.
Tonnage	Numeric	Total tonnage of passenger trains, in this period, for this link

Table 1A – volume and weight of passenger trains

Field Name	Type	Description
Year	Char	2008
Link	Numeric	A unique ID for a section of track
Type	Char	Train type
Seats	Numeric	Average number of seats, for this train type, in this period, for this link
Tare	Numeric	Average tare weight in tonnes, for this train type, in this period, for this link
Gross	Numeric	Average gross weight in tonnes, for this train type, in this period, for this link

Table 1B – details of passenger trains by type

Field Name	Type	Description
Year	Char	2008
Link	Numeric	A unique ID for a section of track
Distance	Numeric	Distance of link in km
Number	Numeric	Total number of freight trains, in this period, for this link
Tonnage	Numeric	Total tonnage of freight trains, in this period, for this link

Table 2A – volume and weight of freight trains

Field Name	Type	Description
Year	Char	2008
Link	Numeric	A unique ID for a section of track
Type	Char	Train type
Wagons	Numeric	Average number of wagons, for this train type, in this period, for this link
Tare	Numeric	Average tare weight in tonnes, for this train type, in this period, for this link
Gross	Numeric	Average gross weight in tonnes, for this train type, in this period, for this link

Table 2B – details of freight trains by type

3.3 Excel files

Two spreadsheets in .XLS format are provided. These include the following data fields:

Field Name	Type	Description
Year	Char	2008
Link	Numeric	A unique ID for a section of track
Type	Char	Train type
Total	Numeric	Number of trains, in this period, for this link
Seats	Numeric	Average number of seats, for this train type, in this period, for this link
Tare	Numeric	Average tare weight in tonnes, for this train type, in this period, for this link
Gross	Numeric	Average gross weight in tonnes, for this train type, in this period, for this link
Energy_Tot	Numeric	Total energy consumption in kWh
Energy_Avg	Numeric	Average energy consumption in kWh/train km
Energy_Spc	Numeric	Specific energy consumption in kWh/tonne/km

Excel table 1: Passenger trains

Field Name	Type	Description
Year	Char	2008
Link	Numeric	A unique ID for a section of track
Type	Char	Train type
Total	Numeric	Number of trains, in this period, for this link
Wagons	Numeric	Average number of wagons, for this train type, in this period, for this link
Tare	Numeric	Average tare weight in tonnes, for this train type, in this period, for this link
Gross	Numeric	Average gross weight in tonnes, for this train type, in this period, for this link
Energy_Tot	Numeric	Total energy consumption in kWh
Energy_Avg	Numeric	Average energy consumption in kWh/train km
Energy_Spc	Numeric	Specific energy consumption in kWh/tonne/km

Excel Table 2: Freight trains

4 Infrastructure changes

Since 2005, a small number of changes have been made to London's railway infrastructure. These include:

- the opening of "High Speed 1" between St Pancras International and the Greater London boundary
- the introduction of services to Heathrow Terminal 5
- closure of the route between Stratford and North Woolwich;

ACTRAFF results are based on infrastructure existing at June 2006, therefore data relating to High Speed 1 and Heathrow Terminal 5 is very limited. Since the 2008 results are based on the same network as 2005, there is no GIS link data for new infrastructure.

4.1 High Speed 1

Limited ACTRAFF data is available for services using High Speed 1, on the approaches to St Pancras International. This data has been used to generate results for train types and numbers over High Speed 1, based on the following assumptions:

- Eurostar trains operating in passenger service will run to or from the GLA boundary
- Eurostar trains operating out of service will run to or from the depot at Temple Mills
- Southeastern trains (operating for training or test purposes) will operate to or from the GLA boundary

Although there is no GIS data against which to match these services, two additional links (998 High Speed 1 to/from Temple Mills depot, 999 High Speed 1 to/from GLA boundary) have been created in the data tables for train movements. Distances are assumed to be 12.50km (St Pancras International to Temple Mills Depot) or 31.75km (St Pancras International to the GLA boundary – this includes the section between the actual GLA boundary and the Thurrock river crossing).

5 Categorisation of train type

The trains are placed into one of the categories set out below, which follow those used in the previous delivery :

- E1 25kV AC Electric locomotive & coaches
- E2 25kV AC 8/12-coach Electric Multiple Unit
- E3 25kV AC 4-coach Electric Multiple Unit
- E4 750V DC Electric locomotive & coaches
- E5 750V DC 8/12-coach Electric Multiple Unit
- E6 750V DC 4-coach Electric Multiple Unit
- E7 750V DC 3-coach Electric Multiple Unit
- E8 750V DC 2-coach Electric Multiple Unit
- E9 750V DC 6-coach Electric Multiple Unit
- Ey 750V 5-coach Electric Multiple Unit
- D1 Intercity 125 2-Engine
- D2 Diesel locomotive and coaches
- D3 Diesel Multiple Units – 6 coaches
- D4 Diesel Multiple Units – 4 coaches
- D5 Diesel Multiple Units – 3 coaches
- D6 Diesel Multiple Units – 2 coaches
- D7 High Speed Diesel Multiple Units – 5 coaches
- F1 Freight – other
- M1 Missing from "CONSIST" (see section 6.5)
- P1 Preserved – Locomotive

There are some gaps in the data for the rolling stock formation of trains, where the consist data is missing from the source BIFS data. This happens occasionally when the data is not input into BIFS. Where this occurs, the consist type is assigned as M1 (missing from “consist”).

6 Traffic data

The traffic data for 2008 has again been taken from ACTRAFF.

The number of trains reported on many links for 2008 is comparable with the 2005 data. Differences should still be expected since traffic across the network can vary, as can the rolling stock used by the train operators. These differences are discussed below.

6.1 New rolling stock types

During the process a number of new vehicle types was identified. Each was allocated an appropriate energy category, comprising similar trains with similar energy consumption profiles. Similar trains are the same kind of vehicle (Diesel / Electric), with similar length and used for either passenger or freight. The new vehicles are summarised below.

New Class	Category	Reason
Classes 08, 09, 20, 26, 37	F1	Diesel locomotives, in same group as other diesel locos.
Classes 86, 89	E1	Electric locomotive, same group as other electric locos
Class 98	P1	Preserved steam locomotive
Classes 143, 144, 155, 175 and 185	D6, D5, D4, D3	Diesel multiple units, classed as D6 (2-car), D5 (3-car), D4 (4-car) or D3 (5 cars or more).
Classes 314, 318, 320 and 323	E3, E2	Electric multiple units (AC power), classed as E3 (up to 5 cars) or E2 (6 cars or longer)
Class 334	Ey	High energy-consuming electric multiple unit (AC power)
Class 507	E7, E5	Electric multiple unit (DC power), classes as E7 (3-car) or E5 (6 or 9 cars)

6.2 Changes to train category totals

Train categories recording significant changes are as follows:

Table 1: Train Category Checks

Category	Trains	Change	Explanation
D1	"HST" high speed diesel trains	+31%	Increased use of High Speed Trains by: - National Express East Coast (in place of loaned Eurostar electric trains) - Grand Central (new operator) - First Great Western (in place of category D7 "Adelante" units)
D2	Diesel locomotives	-54%	Significant reduction in diesel locomotive usage reported over the West Coast and Great Western Main Lines
D6	2-car diesel multiple units	+57%	Significant increase in recorded 2-car diesel multiple units on - Chiltern Railways services to/from Marylebone (combination of restoration of normal service compared to tunnel collapse in 2005, and reduction in missing formations) - the Gospel Oak to Barking line (frequency increase)
D7	High-speed diesel multiple units	-71%	"Adelante" units withdrawn from service by First Great Western, replaced with category D1 High Speed Trains
E2	25kV AC 8- or 12-car electric multiple units	+25%	Significant increases reported over: - the Great Western Main Line (Heathrow Connect) - "West Anglia" routes between Liverpool Street/Stratford and Enfield Town/Lea Valley
E3	25kV AC 4-car electric multiple units	+26%	Significant increases reported on: - Liverpool Street to Chingford line (increased numbers of trains) - lines from Kings Cross/Moorgate (where the number of missing formations is significantly reduced)
E4	750V DC electric locomotive and coaches	-93%	Removal of Eurostar services from lines in South London, where they operated under DC power
E9	750V DC 6-car electric multiple units	+117%	Increased number of 6-car formations recorded on services from Moorgate/Kings Cross towards Hertford North and Welwyn Garden City
F1	Freight locomotives	new	Numbers reported are small, therefore no further investigation undertaken
M1	Missing formations	-60%	Significant reductions in missing formations, particularly relating to: - services from Kings Cross/Moorgate and Hertford North, Welwyn Garden City or beyond - Chiltern Railways services to/from Marylebone

6.3 Changes to traffic levels

To validate our results we have undertaken a comparison of the number of trains reported on each link section in the 2008 and 2005 data.

Some variance in the levels of traffic using each link, compared to the 2005 study, is to be expected. This results not only from changes to service patterns or infrastructure, but also to short-term changes such as planned engineering works and, to a lesser extent, service disruptions. Freight traffic, by its nature, is more variable than passenger traffic. Comparison against 2005 has therefore focussed on links reporting a change to passenger traffic levels. Links where the change was fewer than 3,620 trains (equating to 10 trains per day, excluding Christmas), or was less than 20% of the total, have not been investigated. The links reporting larger variances are listed in the following table:

Link	Between	Trains 2005	Trains 2008	Absolute change	% change	See para
69	Courthill Loop Jn – Lewisham	34844	51773	+16929	+49%	6.3.1
96	Farningham Road – Swanley	69293	49712	-19581	-28%	6.3.2
116	Willesden Brent Jn – Willesden No 7	671	6045	+5374	+801%	6.3.3
122	Acton Canal Wharf – Willesden No 7	1101	5850	+4749	+431%	6.3.3
123	Acton Canal Wharf – Neasden Jn	668	5413	+4745	+710%	6.3.3
132	Camden Jn – Camden Road Jn	7268	15849	+8581	+118%	6.3.5
173	Dagenham Dock – Barking	13645	33308	+19663	+144%	6.3.1
174	Ripple Lane Stora – Dagenham Dock	13243	0	-13243	-100%	6.3.1
183	Canonbury West Jn – Finsbury Park	7691	580	-7111	-92%	6.3.15
210	Brent Curve Jn – Cricklewood Curve Jn	93794	138151	+44357	+47%	6.3.14
213	Cricklewood Curve Jn – Cricklewood	94538	144542	+50004	+53%	6.3.14
214	Cricklewood – Cricklewood South Jn	94638	142077	+47439	+50%	6.3.14
219	Kentish Town – London St Pancras	76779	53263	-23516	-31%	6.3.6
220	Kings Cross Thameslink – Kentish Town	56266	92003	+35737	+64%	6.3.6
222	Barbican – Farringdon	11140	16376	+5236	+47%	6.3.6
223	Barbican – Moorgate (Thameslink)	11137	16376	+5239	+47%	6.3.6
229	Bow Jn – Thornton Fields CS	7681	2055	-5626	-73%	6.3.7
251	Stratford LL Sig 616 – West Ham	28012	0	-28012	-100%	6.3.8
252	Canning Town – West Ham	28011	0	-28011	-100%	6.3.8
253	Canning Town – Custom House	28008	0	-28008	-100%	6.3.8
254	Custom House – Silvertown & City Airport	26909	0	-26909	-100%	6.3.8
255	North Woolwich – Silvertown & City Airport	26910	0	-26910	-100%	6.3.8
256	Navarino Road Jn – Reading Lane Jn	4207	3	-4204	-100%	6.3.15

278	Tottenham Hale – Tottenham South Jn	91544	113332	+21788	+24%	6.3.9
279	Northumberland Park – Tottenham Hale	91567	114501	+22934	+25%	6.3.9
280	Coppermill Jn – Tottenham South Jn	92639	113540	+20901	+23%	6.3.9
281	Angel Road – Northumberland Park	91568	114498	+22930	+25%	6.3.9
282	Angel Road – Ponders End	91568	114496	+22928	+25%	6.3.9
284	Brimsdown – Ponders End	91569	114499	+22930	+25%	6.3.9
285	Brimsdown – Enfield Lock	91568	114498	+22930	+25%	6.3.9
286	Enfield Lock – Waltham Cross	91568	114498	+22930	+25%	6.3.9
287	Clapton Jn – St James' Street	45809	58548	+12739	+28%	6.3.9
288	St James' Street – Walthamstow Central	45806	58545	+12739	+28%	6.3.9
289	Wood Street – Walthamstow Central	45747	58515	+12768	+28%	6.3.9
290	Highams Park – Wood Street	45748	62802	+17054	+37%	6.3.9
291	Chingford – Highams Park	45747	62802	+17055	+37%	6.3.9
292	Coppermill Jn – Temple Mills East Jn	1994	13879	+11885	+596%	6.3.9
295	Stratford – Temple Mills East Jn	1556	19759	+18203	+1170%	6.3.9
301	Neasden South Jn – Neasden Jn	362	5350	+4988	+1378%	6.3.3
302	Denham Golf Club – Gerrards Cross	55453	73969	+18516	+33%	6.3.4
303	Denham – Denham Golf Club	55453	73969	+18516	+33%	6.3.4
304	Denham – West Ruislip	58660	73971	+15311	+26%	6.3.4
305	South Ruislip – West Ruislip	58547	74021	+15474	+26%	6.3.4
306	Northolt Jn – South Ruislip	58149	73761	+15612	+27%	6.3.4
307	Northolt Jn – Northolt Park	56781	72158	+15377	+27%	6.3.4
308	Northolt Park – Sudbury Hill Harrow	56783	72156	+15373	+27%	6.3.4
309	Sudbury Hill Harrow – Sudbury & Harrow Road	56783	72156	+15373	+27%	6.3.4
310	Sudbury & Harrow Road – Wembley Stadium	56783	72156	+15373	+27%	6.3.4
311	Neasden South Jn – Wembley Stadium	57794	75632	+17838	+31%	6.3.4
320	Canonbury West Jn – Dalston Jn	7601	489	-7112	-94%	6.3.15
334	Gospel Oak – Junction Road Jn	25148	30481	+5333	+21%	6.3.10
335	Junction Road Jn – Upper Holloway	25331	30479	+5148	+20%	6.3.10
336	Crouch Hill – Upper Holloway	21957	27223	+5266	+24%	6.3.10
337	Crouch Hill – Harringay Park Jn	21956	27222	+5266	+24%	6.3.10
338	Harringay Green Lanes – Harringay Park Jn	21687	27216	+5529	+25%	6.3.10
339	Harringay Green Lanes – South Tottenham	21687	27218	+5531	+25%	6.3.10

341	Blackhorse Road – South Tottenham	21148	26767	+5619	+27%	6.3.10
342	Blackhorse Road – Walthamstow Queens Road	21149	26770	+5621	+27%	6.3.10
343	Leyton Midland Rd – Walthamstow Queens Rd	21149	26769	+5620	+27%	6.3.10
344	Leyton Midland Road – Leytonstone High Road	21149	26772	+5623	+27%	6.3.10
345	Leytonstone High Road – Wanstead Park	21149	26772	+5623	+27%	6.3.10
347	Woodgrange Park – Wanstead Park	21149	26774	+5625	+27%	6.3.10
348	Woodgrange Park Sig L920 – Woodgrange Park	25704	31381	+5677	+22%	6.3.10
349	Barking – Woodgrange Park Sig L920	25704	31381	+5677	+22%	6.3.10
350	Barking – Ripple Lane West S.S.	15142	33306	+18164	+120%	6.3.1
351	Kew Gardens – Richmond North London Line	43517	101062	+57545	+132%	6.3.11
352	Gunnerybury – Kew Gardens	43519	101092	+57573	+132%	6.3.11
380	Latchmere Jn – West London Jn	4915	34	-4881	-99%	6.3.2
401	Heathrow Apt Sig 342 – Heathrow Terminals 1,2,3	14048	43388	+29340	+209%	6.3.12
447	Battersea Pier Jn – Stewarts Lane Jn	55902	39252	-16650	-30%	6.3.1
448	Battersea Pier Jn – Linford Street Jn	75835	100052	+24217	+32%	6.3.1
450	Factory Jn – Stewarts Lane Jn	46461	32788	-13673	-29%	6.3.1
454	Factory Jn – Wandsworth Road	68568	54220	-14348	-21%	6.3.1
456	Voltaire Road Jn – Wandsworth Road	68568	54220	-14348	-21%	6.3.1
457	Clapham High Street – Shepherds Lane Jn	128415	98295	-30120	-23%	6.3.1
461	Brixton – Cambria Jn	24100	40934	+16834	+70%	6.3.1
462	Cambria Jn – Denmark Hill	57012	69199	+12187	+21%	6.3.1
463	Denmark Hill – Shepherds Lane Jn	41957	28990	-12967	-31%	6.3.1
477	Bickley Jn – Petts Wood Jn	36460	47976	+11516	+32%	6.3.1
540	Nine Elms Jn – Vauxhall (Main Line)	354455	516918	+162463	+46%	6.3.13
541	Linford Street Jn – Nine Elms Jn	18165	13	-18152	-100%	6.3.2
542	Vauxhall (Main Line) – London Waterloo (Main)	358530	512788	+154258	+43%	6.3.13
543	London Waterloo (Int) – London Waterloo (Main)	23117	184	-22933	-99%	6.3.2
552	Clapham Jn Windsor Line - Clapham Jn Sig. 1049	126457	100451	-26006	-21%	6.3.1
555	Clapham Jn Signal 1049 - West London Jn	125987	100451	-25536	-20%	6.3.1

Changes to train numbers over these links are discussed in the following paragraphs.

6.3.1 Minor routeing changes

A number of links in inner South London and in the Barking/Dagenham area reported a significant change in the number of trains compared to 2005. In these areas, there are alternative routeings which can be used. Further checks confirmed that the number of trains reported was consistent across successive sections, suggesting that the routeings being recorded had changed. For some of the links in South London, the overall number of trains was also affected by the rerouteing of Eurostar services to St Pancras International in place of Waterloo International (see 6.3.2).

6.3.2 Farningham Road to Waterloo

In 2007, Eurostar services were rerouted to St Pancras International using the new “High Speed 1” line. Consequently there was a reduction in the number of trains recorded over the previous routeing from the GLA boundary to Waterloo International, and also between Waterloo International and the former Eurostar depot at North Pole which closed at the same time.

6.3.3 Acton and Willesden areas

During 2008, the West Coast Main Line was subjected to a number of planned closures for major upgrade work. During these closures, a special train service operated between Euston and the West Midlands using a diversionary route. In the Acton/Willesden area, this was recorded over sections of line which otherwise see little regular use by passenger train services. See also section 6.3.4.

6.3.4 Marylebone to Gerrards Cross

Services between Marylebone and Gerrards Cross had been disrupted for a number of weeks during 2005, due to the collapse of a tunnel at Gerrards Cross. The restoration of normal services explains part of the increase reported during 2008. However, the increase in services was also due, in part, to the introduction of new services by the Wrexham Shropshire & Marylebone Railway, and by the use of this route for diverted services between Euston and the West Midlands (see section 6.3.3)

6.3.5 Camden Road to Camden Junction

Part of the North London Line was closed for a number of weeks during Autumn 2008, for engineering works to be carried out in Hampstead Heath tunnel. During this period, services were diverted. This resulted in increased usage of the line between Camden Road Junction and Camden Junction, which otherwise sees limited use by passenger train services.

6.3.6 Kentish Town to Moorgate

Services through the “Thameslink” tunnel were suspended between Autumn 2004 and Spring 2005, in connection with work for the new platforms beneath St Pancras station. There was a consequent increase in train services between Kentish Town and St Pancras itself during this period. This significantly affected the results for 2005, with the 2008 results being consistent with normal train service patterns in this area. While not all links have reported consistent levels of change, the numbers of trains reported in 2008 are consistent throughout this area, suggesting that data is more robust.

6.3.7 Thornton Fields Carriage Sidings

Thornton Fields Carriage Sidings were closed in mid-2008, in connection with work on the Olympics site. The usage figures for 2008 reflect this.

6.3.8 Stratford to North Woolwich

The line between Stratford and North Woolwich was closed in December 2006. As a result, no trains were recorded over these links for 2008.

6.3.9 Lea Valley and Chingford Lines

Timetable changes in December 2005 increased services between Waltham Cross, Tottenham Hale and Stratford, and over the line between Liverpool Street and Chingford. This has resulted in an increased number of passenger train movements for 2008 compared to 2005.

6.3.10 Gospel Oak to Barking

Additional services have been introduced on the line between Gospel Oak and Barking. This is reflected in the increased number of trains recorded over these links in 2008 compared to 2005.

6.3.11 Gunnersbury to Richmond

Data for 2008 includes London Underground (District Line) services on the Richmond branch. These were not recorded during 2005.

6.3.12 Heathrow Airport

Heathrow Terminal 5 station opened in Spring 2008. It is not, however, on the infrastructure database used by ACTRAFF, which reflects the rail network in June 2006. Trains to Terminal 5 have therefore been assigned to the link between Heathrow Terminals 1,2,3 and Heathrow Airport Signal 342 as a proxy for Terminal 5.

6.3.13 Nine Elms Junction to Waterloo

Despite the withdrawal of Eurostar services (see section 6.3.2), the links between Nine Elms Junction, Vauxhall and Waterloo have reported a significant increase in trains in 2008 compared to 2005. The numbers of trains recorded over these links during 2008 are consistent with those from Nine Elms Junction westwards towards Clapham Junction. This suggests that data capture and accuracy has improved since the 2005 study, producing results which are more robust.

6.3.14 Cricklewood area

It was noted that three consecutive links in the Cricklewood area were reporting significantly fewer trains than those adjoining on the same route. A similar pattern was observed in the results which had been produced for 2005. On investigation, it was discovered that certain trains were being missed over these three links. This was addressed by creating records for the affected trains over these links, so that the traffic levels reported are consistent with the adjoining links. The reported increase in traffic levels therefore reflects greater data accuracy.

6.3.15 Lightly-used links

A small number of links reported significant reductions in train services, but with low numbers of trains. These links see little regular use by passenger train services, and further investigation has not therefore been undertaken.

6.3.16 Data corrections

A small number of further links reported unexpectedly large variations in train numbers compared to 2005. On investigation, it was discovered that the numbers of trains were not consistent with preceding or following links. Further investigations revealed routeing errors which resulted either in some trains being counted more than once, or in trains missing certain links altogether. This was addressed by removing double-counting, and creating records over “missing” links for trains which were recorded over preceding and following links. This produced results for the affected links which were consistent with those preceding and following.

6.4 Energy consumption rates

The energy consumption rates used were the same as those used in previous years' studies.

6.5 Missing and assumed consists

In some cases, BIFS data does not include information about the rolling stock formation of a particular train. Where this has occurred, the train is reported as a "Missing" stock type (M1).

During the checking process, a large number of Missing (M1) consist types were noted, concentrated on specific routes and operators. In order to reduce the level of Missing consist information in the output data, we have assumed a generic train type for routes where a high number of Missing consists were reported. These are detailed in the following table. It should be noted that, in some cases, the data enables peak trains to be identified, but in other cases this is not possible.

Operator	Route	Peak type	Assumed consist	Notes
c2c	All	Off-peak	E3	Assumed all services are formed of 4-car AC electric multiple unit.
c2c	All	Peak	E2	Assumed all services are formed of 8 or 12-car AC electric multiple unit.
First Capital Connect	Moorgate/Kings Cross towards Welwyn GC or Hertford North (inner suburban)	Off-Peak or not identified	E3	Assumed all services are formed of 4-car AC electric multiple units.
First Capital Connect	Moorgate/Kings Cross towards Welwyn GC or Hertford North (inner suburban)	Peak (where identified)	E2	Assumed all services are formed of 8-car AC electric multiple units.
First Capital Connect	Kings Cross towards Cambridge or Peterborough	Off-Peak or not identified	E3	Assumed all services are formed of 4-car AC electric multiple units.
First Capital Connect	Kings Cross towards Cambridge or Peterborough	Peak (where identified)	E2	Assumed all services are formed of 8-car AC electric multiple units.
First Capital Connect	Bedford – Brighton (north of London)	All	E2	Assumed all services are formed of 8-car AC electric multiple units.
First Capital Connect	Luton – Sutton (north of London)	All	E3	Assumed all services are formed of 4-car AC electric multiple units.
First Capital Connect	Bedford – Brighton (south of London)	All	E5	Assumed all services are formed of 8-car DC electric multiple units.

First Capital Connect	Luton – Sutton (south of London)	All	E6	Assumed all services are formed of 4-car DC electric multiple units.
Grand Central	All	All	D1	Assumed all services are formed of High Speed Train diesel units.
Heathrow Connect	All	All	E2	Assumed all services are formed of 8-car AC electric multiple units.
Heathrow Express	All	All	E2	Assumed all services are formed of 8-car AC electric multiple units.
Hull Trains	All	All	D7	Assumed all services are formed of 5-car high speed diesel multiple units.
London Overground	Euston – Watford, Richmond – Stratford, Clapham - Willesden	All	E7	Assumed all services are formed of 3-car DC electric multiple units.
London Overground	Gospel Oak – Barking	All	D6	Assumed all services are formed of 2-car diesel multiple units.
Southern	Victoria – Horsham	Off-peak	E6	Assumed all services are formed of 4-car DC electric multiple units.
Southern	Victoria – Horsham	Peak	E5	Assumed all services are formed of minimum 8-car DC electric multiple units.
Southern	Victoria – Gatwick and Sussex Coast	All	E5	Assumed all services are formed of minimum 8-car DC electric multiple units.
Southern	Watford – Gatwick and Brighton	All	E6	Assumed all services are formed of 4-car DC electric multiple units.

