Transport for London

Performance Information - Buses

iBus Data Aggregation

for Quality of Service Indicators (QSIs)

v2.1 01.04.2015

The purpose of this document is to assist Bus Operators in understanding how the QSI generated in iBus are aggregated to produce the full range of QSI reports.

This document replaces the ‘QSI Data Aggregation in iBus’ v2.0 published in December 2013.

The document introduces new Passenger Journey Factors applicable in Data Aggregation from 01 April 2015 and further clarifies the process for QSI Point allocation.

The document is part of a set describing the QSI processes under iBus which also includes ‘iBus Missing Data Mitigation for QSIs’, ‘iBus Data Cleansing for QSIs’ and ‘iBus QSI Statistics Explained’.

Contents

1. Introduction

Overview

1.1. QSI statistics are stored in the LRD (London Reporting Database).

1.2. QSI statistics are first calculated and stored for one QSI Point in one route and direction, for one hour (e.g. Route X, Direction 1, 05:00 - 06:00).

1.3. Hourly figures are then combined or “aggregated” across locations and over time in order to produce QSI results.

1.4. Whilst the same basic aggregation techniques apply to all routes, the actual performance measures for High Frequency and Low Frequency routes are different. These are summarised below but for a more detailed explanation, see the related document entitled ‘QSI Statistics Explained’.

High Frequency Routes

1.5. QSI statistics are intended to measure the *regularity* of the service, i.e. the interval (or headway) between buses.

1.6. Thus High frequency QSIs are measured in terms of waiting time and statistics stored in the LRD include ‘Scheduled Waiting Time’ (SWT), ‘Actual Waiting Time’ (AWT), ‘Chance of Waiting’ and the Excess Waiting Time (EWT) minimum standard.

Low Frequency Routes

1.7. QSI statistics are intended to measure the *punctuality* of the service, i.e. how late or early the bus was at a bus stop.

1.8. Thus Low frequency QSIs are measured in terms of timetable adherence and statistics stored in the LRD include ‘% On-Time’, ‘% Early’, ‘% Late’, ‘% Non Arrival’ and the‘% On Time Minimum Standard’.

2. Aggregation Across Locations & Over Time

Aggregation Across Locations

2.1. Aggregating across locations combines statistics for two or more QSI points to provide reports to route, garage, operator, borough or network level. When aggregating across locations, QSI statistics are first combined for individual routes, then across multiple routes.

2.2. Where a trip is curtailed (for any reason) the service within 4 stops of the curtailment is deemed to be of little passenger benefit. Consequently, observations at QSI points within 4 stops of a curtailment will be ignored in the calculations.

2.3. For high frequency calculations, ‘Expected Buses’ are used as a weighting factor for SWT plus ‘Chance of Waiting’, ‘Long Gaps’ and Minimum Performance Standards. ‘Observed Buses’ are used as a weighting factor for AWT.

2.4. For low frequency calculations ‘Expected Buses’ are used as the weighting factor for ‘% On Time’ plus ‘% Early’, ‘% Late’, ‘% Non Arrival’ and Minimum Performance Standards.

2.5. The weighting factors ensure that busy QSI points or routes are weighted more heavily than quieter ones.

2.6. Appendix A shows the guidelines used to determine monitoring locations.

Aggregating Over Time

2.7. Aggregating over time combines statistics across more than one hour to provide results for a specific part of the day (e.g. morning peak, late evening, Saturday afternoon), a full day, four weekly period, a quarter or a full year. Whether the aggregation is for two hours or one year, the method used is the same as the calculation always combines the results stored at an hour level (for one QSI point, route and direction).

2.8. Passenger Journeys (PJ), rather than ‘Expected Buses’, are used to weight results to better reflect actual passenger demand by hour and day of the week. This applies to both high and low frequency calculations.

2.9. PJ weightings allow QSI results to give greater emphasis to those times with very high levels of demand (e.g. Monday to Friday 08:00 - 09:00) rather than times when demand is typically much lower (e.g. Monday to Friday 05:00 - 06:00). Using PJ values also allows for differences in hourly weightings on different days of the week. For example, 08:00 - 09:00 will be heavily weighted on a weekday but less so on a Saturday.

2.10. The same PJ factors are applied to all routes (i.e. they are not route specific).

2.11. The latest set of factors applies to data aggregation calculations on dates from 01 April 2015. These and the previous factors to 31 March 2015 are shown in Appendix B. It is intended that PJ Factors will be refreshed every 5 years with the next update expected 01 April 2020. Revised PJs will be advised no later than 5 months before their date of introduction.

Aggregation Steps and Sequence

2.12. There are three aggregation steps for calculating QSI results:

2.12.1. Step I: For a single hour, aggregate across QSI points for one route weighted by 'Expected Buses' (EB) or by 'Observed Buses' (OB) as appropriate.

2.12.2. Step II: Aggregate across all hours for one route weighted by Passenger Journeys (PJ).

2.12.3. Step III: Aggregate across routes weighted by 'Expected Buses' or by 'Observed Buses' as appropriate.

2.13. These steps are always followed in the same order, although individual steps may be omitted if not applicable to the results required. So, for example, for a single route, step iii) will be omitted.

3. High Frequency Aggregation Examples

Overview

3.1. Three examples are shown below. In all of these examples, the calculation of SWT, AWT and Excess Wait Time (EWT) are shown.

Single Route Aggregation (Example 1)

3.2. Single route aggregation employs Steps I and II. In this example four QSI points are used, but the aggregation method would be the same for any number of QSI points. A time period of three hours across two days is used, but the aggregation method would be the same if 05:00 to 24:00 was used, for all days in any period.

3.2.1. Calculation of SWT:

- Step I
  An aggregate value of SWT for each hour, weighted by 'Expected Buses', is calculated from the results for all four individual QSI points:

Step I		**ROUTE 'X'**	**QSI Point / Direction 1**				
DAY_ TYPE	**HOUR**		**A**	**B**	**C**	**D**	
Mon-Fri	07:00-08:00	SWT Expected Buses	3.00 10	3.00 10	3.00 10	6.00 5	= (3.00*10)+(3.00*10)+(3.00*10)+(6.00*5))/(10+10+10+5) **= 3.43**
Mon-Fri	08:00-09:00	SWT Expected Buses	2.50 12	2.50 12	2.50 12	5.00 6	= ((2.50*12)+(2.50*12)+(2.50*12)+(5.00*6))/(12+12+12+6) = **2.86**
Mon-Fri	09:00-10:00	SWT Expected Buses	3.00 10	3.00 10	3.00 10	6.00 5	= (3.00*10)+(3.00*10)+(3.00*10)+(6.00*5))/(10+10+10+5) **= 3.43**
Sat	07:00-08:00	SWT Expected Buses	5.00 6	5.00 6	5.00 6	7.50 4	= ((5.00*6)+(5.00*6)+(5.00*6)+(7.50*4))/(6+6+6+4) = **5.45**
Sat	08:00-09:00	SWT Expected Buses	3.75 8	3.75 8	3.75 8	6.00 5	= ((3.75*8)+(3.75*8)+(3.75*8)+(6.00*5))/(8+8+8+5) = **4.14**
Sat	09:00-10:00	SWT Expected Buses	5.00 6	5.00 6	5.00 6	7.50 4	= ((5.00*6)+(5.00*6)+(5.00*6)+(7.50*4))/(6+6+6+4) = **5.45**

- Step II
  A value of SWT is calculated across all the hours selected; factored by Passenger Journeys.
  This provides a single SWT value of 3.79 minutes for the selected QSI points and hours:

Step II		ROUTE 'X'	QSI Point / Direction 1	
DAY_ TYPE	HOUR		All	
Mon-Fri	07:00-08:00	SWT Passenger Journeys	3.43 342,878	=((3.43*342878)+(2.86*483245)+(3.43*370609)+(5.455*127972)+(4.14*17577)+(5.45*258728))/(342878+483245+370609+127972+177577+258728) Route SWT = **3.79**
Mon-Fri	08:00-09:00	SWT Passenger Journeys	2.86 483,245	
Mon-Fri	09:00-10:00	SWT Passenger Journeys	3.43 370,609	
Sat	07:00-08:00	SWT Passenger Journeys	5.45 127,972	
Sat	08:00-09:00	SWT Passenger Journeys	4.14 177,577	
Sat	09:00-10:00	SWT Passenger Journeys	5.45 258,728	

3.2.2. Calculation of AWT:

- Step I,
  An aggregate value of AWT for each hour, weighted by 'Observed Buses', is calculated from the results for all four individual QSI points.
  If no buses are observed for a particular QSI point during an hour (in this example at QSI point D during Saturday 09:00 - 10:00), this point/time will be excluded from the calculations as shown below:

Step I		ROUTE 'X'	QSI Point / Direction 1				
DAY_ TYPE	HOUR		A	B	C	D	
Mon-Fri	07:00-08:00	AWT Observed Buses	3.00 10	4.00 9	4.00 9	7.00 4	= (3.00*10)+(4.00*9)+(4.00*9)+(7.00*4))/(10+9+9+4) **= 4.06**
Mon-Fri	08:00-09:00	AWT Observed Buses	3.00 12	4.00 10	3.50 11	6.00 5	= ((3.00*12)+(4.00*10)+(3.50*11)+(6.00*5))/(12+10+11+5) = **3.80**
Mon-Fri	09:00-10:00	AWT Observed Buses	3.00 10	3.00 10	4.00 9	9.00 3	= (3.00*10)+(3.00*10)+(4.00*9)+(9.00*3))/(10+10+9+3) **= 3.84**
Sat	07:00-08:00	AWT Observed Buses	5.50 6	5.50 6	5.50 6	8.00 4	= ((5.50*6)+(5.50*6)+(5.50*6)+(8.00*4))/(6+6+6+4) = **5.95**
Sat	08:00-09:00	AWT Observed Buses	4.00 8	4.00 8	4.00 8	6.00 5	= ((4.00*8)+(4.00*8)+(4.00*8)+(6.00*5))/(8+8+8+5) = **4.34**
Sat	09:00-10:00	AWT Observed Buses	6.00 6	6.00 6	6.00 6	# 0	= ((6.00*6)+(6.00*6)+(6.00*6))/(6+6+6) = **6.00**

- Step II
  A value of AWT is calculated across all the hours selected factored by Passenger Journeys.
  This provides a single AWT value of 4.39 minutes for the selected QSI points and hours:

Step II		ROUTE 'X'	QSI Point / Direction 1	
DAY_ TYPE	HOUR		All	
Mon-Fri	07:00-08:00	AWT Passenger Journeys	4.06 342,878	=((4.06*342878)+(3.80*483245)+(3.84*370609)+(5.95*127972)+(4.34*17577)+(6.00*258728))/(342878+483245+370609+127972+177577+258728) Route AWT = **4.39**
Mon-Fri	08:00-09:00	AWT Passenger Journeys	3.80 483,245	
Mon-Fri	09:00-10:00	AWT Passenger Journeys	3.84 370,609	
Sat	07:00-08:00	AWT Passenger Journeys	5.95 127,972	
Sat	08:00-09:00	AWT Passenger Journeys	4.34 177,577	
Sat	09:00-10:00	AWT Passenger Journeys	6.00 258,728	

3.2.3. Calculation of EWT:

- The aggregate SWT value is subtracted from the aggregate AWT value to give EWT:

  EWT = AWT (4.39 minutes) – SWT (3.79 minutes) = 0.60 minutes

Multiple Route Aggregation (Example 2)

3.3. Multiple route aggregation uses steps I, II and III. This example shows how two routes are aggregated, but the same principles would apply to any number of routes.

3.3.1. Calculation of SWT:

- Steps I and II
  From Example 1, Route ‘X’ has an SWT of 3.79 minutes with 185 ‘Expected Buses’.
  Consider a second route (Route ’Y’), which has an SWT of 4.20 minutes with 130 ‘Expected Buses’.

- Step III
  An aggregate value for the two routes is calculated as follows:

  SWT = ((3.79 * 185) + (4.20 * 130)) / (185 + 130) = 3.96 minutes

3.3.2. Calculation of AWT:

- Steps I and II
  From Example 1, Route ‘X’ has an AWT of 4.39 minutes with 171 ‘Observed Buses’.
  Consider a second route (Route ‘Y’) which has an AWT of 5.50 minutes with 100 ‘Observed Buses’.

- Step III
  An aggregate value for the two routes is calculated as follows:

  AWT = ((4.39 * 171) + (5.50 * 100)) / (171 + 100) = 4.80 minutes

3.3.3. Calculation of EWT:

- Thus EWT for Routes X and Y is:

  EWT = AWT (4.80 minutes) – SWT (3.96 minutes) = 0.84 minutes

Aggregation for One QSI Point in One Direction (Example 3)

3.4. Where only one QSI point in one direction is to be aggregated, Step I is omitted and the aggregation starts at Step II..

3.4.1. Calculation of SWT:

- Step II
  Taking ‘Route X’ from Example 1 and using results for QSI point A in Direction 1 only, a value of SWT is calculated across all the hours selected; factored by Passenger Journeys.
  This provides a single SWT value of 3.37 minutes for the selected QSI point and hours.

Step II		**Route ‘X’**	**QSI Point / Direction 1**	
DAY_ TYPE	**HOUR**		**A**	
Mon-Fri	07:00-08:00	SWT Passenger Journeys	3.00 342,878	=((3.00*342878)+(2.50*483245)+(3.00*370609)+(5.00*127972)+(3.75*17577)+(5.00*258728))/(342878+483245+370609+127972+177577+258728) Route AWT = **3.37**
Mon-Fri	08:00-09:00	SWT Passenger Journeys	2.50 483,245	
Mon-Fri	09:00-10:00	SWT Passenger Journeys	3.00 370,609	
Sat	07:00-08:00	SWT Passenger Journeys	5.00 127,972	
Sat	08:00-09:00	SWT Passenger Journeys	3.75 177,577	
Sat	09:00-10:00	SWT Passenger Journeys	5.00 258,728	

- If there were other routes passing QSI point A in direction 1, then combining these routes would require Step III as demonstrated in Example 2.

3.4.2. Calculation of AWT:

- Step II
  Taking ‘Route X’ from Example 1 and using results for QSI point A in Direction 1 only, a value of AWT is calculated across all the hours selected; factored by Passenger Journeys.
  This provides a single AWT value of 3.72 minutes for the selected QSI point and hours.

Step II		**Route ‘X’**	**QSI Point / Direction 1**	
DAY_ TYPE	**HOUR**		**A**	
Mon-Fri	07:00-08:00	AWT Passenger Journeys	3.00 342,878	=((3.00*342878)+(3.00*483245)+(3.00*370609)+(5.50*127972)+(4.00*17577)+(6.00*258728))/(342878+483245+370609+127972+177577+258728) Route AWT = **3.72**
Mon-Fri	08:00-09:00	AWT Passenger Journeys	3.00 483,245	
Mon-Fri	09:00-10:00	AWT Passenger Journeys	3.00 370,609	
Sat	07:00-08:00	AWT Passenger Journeys	5.50 127,972	
Sat	08:00-09:00	AWT Passenger Journeys	4.00 177,577	
Sat	09:00-10:00	AWT Passenger Journeys	6.00 258,728	

3.4.3. Calculation of EWT:

- Thus for ‘Route X’ at QSI point A in Direction 1 the aggregated EWT value is.

  EWT = AWT (3.72 minutes) – SWT (3.37 minutes) = 0.35 minutes

4. Low Frequency Aggregation Examples

Overview

4.1. Three examples are shown below. In all of these examples, the calculation of '% On-Time' is shown

Single Route Aggregation (Example 1)

4.2. Single route aggregation employs Steps I and II. In this example four QSI points are used, but the aggregation method would be the same for any number of QSI points. A time period of three hours across two days is used, but the aggregation method would be the same if 05:00 to 24:00 was used, for all days in any period.

4.2.1. Calculation of % On-Time:

- Step I
  An aggregate value of % On-Time for each hour, weighted by 'Expected Buses', is calculated from the results for all four individual QSI points:

Step i		**ROUTE 'X'**	**QSI Point / Direction 1**				
DAY_ TYPE	**HOUR**		**A**	**B**	**C**	**D**	
Mon-Fri	07:00-08:00	% On Time Expected Buses	50 5	50 5	50 5	50 5	= ((50*5)+(50*5)+(50*5)+(50*5))/(5+5+5+5) **= 50.0**
Mon-Fri	08:00-09:00	% On Time Expected Buses	100 5	40 5	60 5	50 5	= ((100*5)+(40*5)+(60*5)+(50*5))/(5+5+5+5) = **62.5**
Mon-Fri	09:00-10:00	% On Time Expected Buses	100 5	70 5	60 5	50 5	= ((100*5)+(70*5)+(60*5)+(50*5))/(5+5+5+5) = **70.0**
Sat	07:00-08:00	% On Time Expected Buses	100 5	50 5	50 5	50 5	= ((100*5)+(50*5)+(50*5)+(50*5))/(5+5+5+5) = **62.5**
Sat	08:00-09:00	% On Time Expected Buses	90 5	50 5	60 5	40 5	= ((90*5)+(50*5)+(60*5)+(40*5))/(5+5+5+5) = **60.0**
Sat	09:00-10:00	% On Time Expected Buses	80 5	40 5	50 5	40 5	= ((80*5)+(40*5)+(50*5)+(40*5))/(5+5+5+5) = **52.5**

- Step II
  A value of % On-Time is calculated across all the hours selected; factored by Passenger Journeys.
  This provides a single % On-Time value of 54.5% for the selected QSI points and hours:

Step ii		**Route 'X'**	**QSI Point / Direction 1**	
DAY_ TYPE	**HOUR**		**All**	
Mon-Fri	07:00-08:00	% On Time Passenger Journeys	50 342,878	=((50*342878)+(62.5*483245)+(70*370609)+(62.5*127972)+(60*17577)+(52.5*258728))/(342878+483245+370609+127972+177577+258728) Route % On Time = **54.5%**
Mon-Fri	08:00-09:00	% On Time Passenger Journeys	62.5 483,245	
Mon-Fri	09:00-10:00	% On Time Passenger Journeys	70.0 370,609	
Sat	07:00-08:00	% On Time Passenger Journeys	62.5 127,972	
Sat	08:00-09:00	% On Time Passenger Journeys	60.0 177,577	
Sat	09:00-10:00	% On Time Passenger Journeys	52.5 258,728	

Multiple Route Aggregation (Example 2)

4.3. Multiple route aggregation uses Steps I, II and III. This example shows how two routes are aggregated, but would apply to any number of routes.

4.3.1. Calculation of % On-Time:

- Steps I and II
  From Example 1, Route 'X' has an % On-Time value of 95.0% with 100 'Expected Buses'.
  Consider a second route (Route 'Y'), which has a % On-Time Value of 70.0 % minutes with 130 'Expected Buses'.

- Step III
  An aggregate value for the two routes is calculated as follows:

  % On-Time = ((95.0 * 100) + (70.0 * 130)) / (100 + 130) = 80.9%

Aggregation for One QSI Point in One Direction (Example 3)

4.4. Where only one QSI point in one direction is to be aggregated, Step I is omitted and the aggregation starts at Step II

4.4.1. Calculation of % On-Time:

- Step II
  Taking ‘Route X’ from Example 1 and using results for QSI point A in Direction 1 only, a value of % On-Time is calculated across all the hours selected; factored by Passenger Journeys.
  This provides a single % On-Time value of 54.5% for the selected QSI point and hours.

Step ii		**Route ‘X’**	**QSI Point / Direction 1**	
DAY_ TYPE	**HOUR**		**A**	
Mon-Fri	07:00-08:00	% On Time Passenger Journeys	50 342,878	=((50*342878)+(62.5*483245)+(70*370609)+(62.5*127972)+(60*17577)+(52.5*258728))/(342878+483245+370609+127972+177577+258728) Route % On Time = **54.5%**
Mon-Fri	08:00-09:00	% On Time Passenger Journeys	62.5 483,245	
Mon-Fri	09:00-10:00	% On Time Passenger Journeys	70.0 370,609	
Sat	07:00-08:00	% On Time Passenger Journeys	62.5 127,972	
Sat	08:00-09:00	% On Time Passenger Journeys	60.0 177,577	
Sat	09:00-10:00	% On Time Passenger Journeys	52.5 258,728	

- If there were other routes passing QSI point A in direction 1, then combining these routes would require Step III as demonstrated in Example 2.

Appendix A - QSI Monitoring Location Guidelines

The aim of selecting QSI monitoring point locations is to ensure that there is balanced and adequate coverage throughout the course of the route in both directions.

When defining QSI point locations each route is reviewed on an individual basis to ensure sensible coverage is maintained. A number of factors are considered:

- The distance between timing points.
- The scheduled running time between timing points.
- The number of stops between timing points.
- Physical boundaries such as rivers, motorways etc.
- Particular attention is given to key travel objectives and high usage stops.

To be considered for a ‘QSI Point’, a location must first be defined as a ‘Timing Point’ in the schedule. Thus for any given route / direction, the QSI points represent a subset of the scheduled timing points.

Bus operators will be notified in advance of QSI point allocation and any subsequent revisions that may arise, for example due to route extensions or long term diversions. Whilst Bus Operators will have an opportunity to comment, the final decision on whether to use a particular location as a QSI point rests with London Buses.

The key factors used in deciding the location of QSI points for iBus monitoring purposes are outlined below.

General Conditions

- As a starting point all scheduled timing points will be considered for inclusion as QSI points with the exception of the route terminus in each direction. Where there is inappropriately large gap in scheduled timing points it may be necessary to add a new timing point for QSI monitoring purposes.
- QSI points should provide good coverage of key passenger travel objectives and stops with high passenger demand.
- QSI points are located over the 'in-service' part of the route only.
- The same monitoring locations will generally be used in both directions on a route but other specific criteria may mean this is not always appropriate.

Special circumstances may apply for point definitions with respect to route bifurcations, circular routes, or routes that have varying or extended legs of service, for example ad-hoc school extensions for isolated trips.

Route Termini

- The ultimate scheduled timing point (terminus) for a route in the direction of travel will not be defined as a QSI point.
- The penultimate timing point for a route will not be defined as a QSI point if it is within 1km of the route terminus. This is based on actual route distance not “as the crow flies' which may bring the terminus within 1km.
- Service changes are monitored to identify any timing points added within 1km of the route terminus.
- Where a planned curtailment is made via a service change, for example, where construction works cause a route to be cut back for a number of months, the route will not be monitored within 1km of it’s temporary terminus. It should be noted that this relates only to planned curtailments where there is a structural change with a revised schedule and not to temporary ‘ad-hoc’ curtailments.

Spacing

The spacing between points is derived from the scheduled distance and scheduled time (for peak hour journeys) between stops.

The following guidelines are used when considering an acceptable spacing between points *but may not be appropriate in all circumstances*:

- An approximate minimum chronological gap of 5 minutes between QSI point locations during peak hour journey times.
- An approximate minimum route distance of 1km between adjacent QSI points in the direction concerned.

It should be emphasised that where these conditions are met, the impact of point removal will be considered on adjacent point locations.

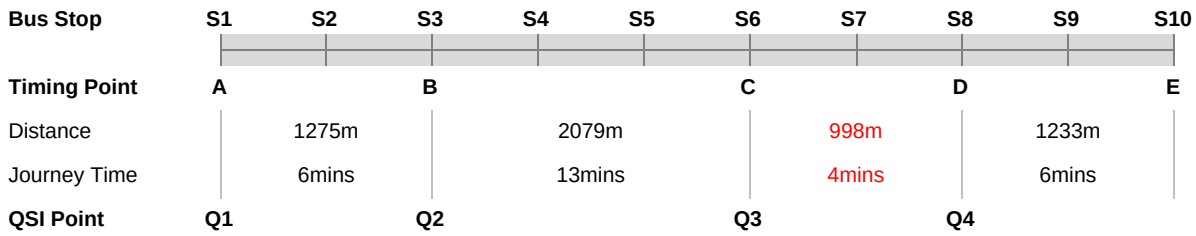
Example 1: Impact of removal on adjacent points

A route operates between bus stops S1 and S10 with timing points at ‘A’, ‘B’, ‘C’, ‘D’ and ‘E’, the latter being the terminus.

Point ‘D’ fails to meet either the chronological or distance spacing in the guidelines

However, ignoring ‘C’ as a QSI point would create a 17 minute 3067m gap between ‘B’ and ‘D’. Similarly, ignoring ‘D’ would create a 2231m 10 minute gap towards the end of the route.

Thus timing points at ‘A’, ‘B’, ‘C’ and ‘D’ would be used as QSI points.



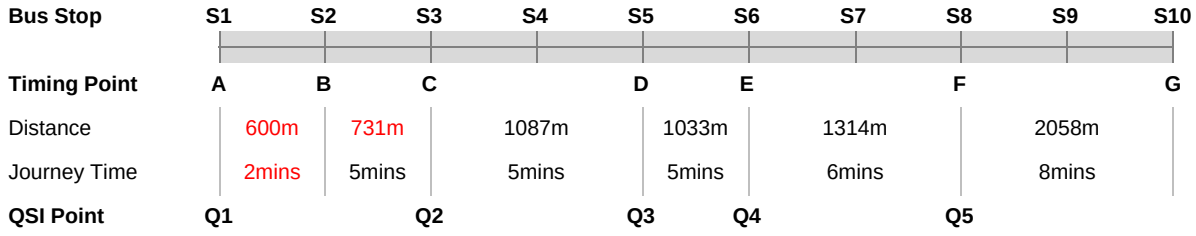
Example 2: Points failing to meet spacing criteria

A route operates between bus stops S1 and S10 with timing points at ‘A’, ‘B’, ‘C’, ‘D’, ‘E’, ‘F’ and ‘G’, the latter being the terminus.

Points ‘B’ and ‘C’ fail to meet distance spacing in the guidelines and point ‘B’ also fails on chronological spacing.

In this scenario ‘B’ would not be used as a QSI point because of its proximity to both points ‘A’ and ‘C, thus creating a 1331m 7 minute gap between ‘A’ and ‘C’.

Thus timing points at ‘A’, ‘C’, ‘D’, ‘E’ and ‘F’ would be used as QSI points.



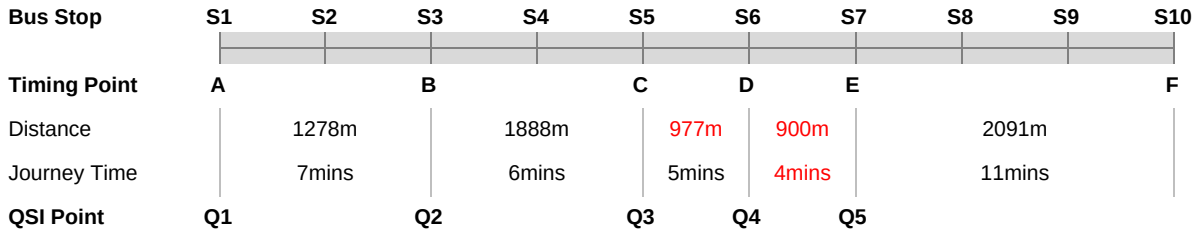
Example 3: Points failing to meet spacing criteria – key passenger objective nodes.

A route operates between bus stops S1 and S10 with timing points at ‘A’, ‘B’, ‘C’, ‘D’, ‘E’ and ‘F’, the latter being the terminus.

Point ‘E’ fails to meet either the chronological or distance spacing in the guidelines *but point ‘D’, which fails on distance spacing is a major passenger objective*.

In this scenario, removal of point ‘C’ would create a large 2865m 11 minute gap between points ‘B’ and ‘D’. Removal of point ‘D’ would create a 1877m 9 minute gap between points ‘C’ and ‘E’ but since point ‘D’ is a major passenger objective, this would be retained. Removal of point ‘E’ would cause a deficiency in coverage towards the extremity of the route.

Thus timing points at ‘A’, ‘B’, ‘C’, ‘D’ and ‘E’ would be used as QSI points.



Schedule / Operational

For routes with scheduled short workings, the QSI point definition will be based on the ultimate scheduled destination. This may result in scheduled short leg trips, which are not to the ultimate scheduled destination, being monitored at points within 1km of their “terminus”, but they will not be counted at the “short leg terminus” itself.

Changeover points should not be defined as QSI points if another timing point exists within 500m (before or after). This is based on the actual route service distance between points.

Normally, stops will not be defined as QSI points unless they are classified as ‘live’ under iBus. The most common example of where stops are ‘not live’ under iBus would be locations within Hail & Ride sections.

Other Services

Timing points for school bus bifurcations or curtailments will not be included as QSI points, where trips are included as part of the schedule for the primary contract route.

Seasonal extensions may have an impact on the locations chosen as monitoring points. For example it may be necessary to define a point within 1km of the ‘normal’ terminus to avoid an abnormally large gap between monitoring locations when a seasonal extension is operating. Each relevant route is reviewed on a case by case basis.

Hail and ride publicity points are not defined as QSI Points.

Night Buses – 24 hour routes follow the point monitoring structure of the daytime service but this is currently under review.

Appendix B – Passenger Journey Factors

These tables show the actual Passenger Journey Factors (PJs) used in iBus together with the Day/Night monitoring period PJs expressed as percentages for each day type, and the Day/Night PJs monitoring period relative to the lowest weekly value.

Latest PJ Factors

Applicable to Data Aggregation for dates from 01 April 2015

It is intended that these PJ Factors will apply for a period of 5 years, i.e. to 31 March 2020

Time Period	Hour	Passenger Journey Factors (Actual Values)			As a Percentage of the DAILY Night/Day total			As a Percentage of the WEEKLY Night/Day value		
		Mon-Fri	Sat	Sun	Mon-Fri	Sat	Sun	Mon-Fri	Sat	Sun
00:00 - 05:00	00:00 - 01:00	52,317	98,003	96,125	39.1%	38.5%	37.2%	22.1%	8.3%	8.1%
	01:00 - 02:00	22,148	54,130	55,843	16.5%	21.3%	21.6%	9.4%	4.6%	4.7%
	02:00 - 03:00	14,559	38,601	42,069	10.9%	15.2%	16.3%	6.2%	3.3%	3.6%
	03:00 - 04:00	15,583	31,382	34,960	11.6%	12.3%	13.5%	6.6%	2.7%	3.0%
	04:00 - 05:00	29,338	32,310	29,496	21.9%	12.7%	11.4%	12.4%	2.7%	2.5%
Night QICs Monitoring Period		133,944	254,426	258,492	100%	100%	100%	57%	22%	22%
05:00 - 07:00	05:00 - 06:00	76,271	48,694	36,120	1.1%	0.9%	1.0%	0.89%	0.11%	0.08%
	06:00 - 07:00	190,728	94,011	64,240	2.8%	1.8%	1.7%	2.23%	0.22%	0.15%
07:00 - 10:00	07:00 - 08:00	477,802	138,259	88,764	7.1%	2.7%	2.4%	5.59%	0.32%	0.21%
	08:00 - 09:00	570,156	184,559	113,803	8.4%	3.5%	3.0%	6.67%	0.43%	0.27%
	09:00 - 10:00	388,331	260,495	168,065	5.7%	5.0%	4.5%	4.54%	0.61%	0.39%
10:00 - 13:00	10:00 - 11:00	334,596	316,099	221,990	5.0%	6.1%	5.9%	3.91%	0.74%	0.52%
	11:00 - 12:00	349,270	367,555	262,418	5.2%	7.0%	7.0%	4.09%	0.86%	0.61%
	12:00 - 13:00	378,755	406,428	299,773	5.6%	7.8%	8.0%	4.43%	0.95%	0.70%
13:00 - 16:00	13:00 - 14:00	388,860	425,373	322,880	5.8%	8.2%	8.6%	4.55%	1.00%	0.76%
	14:00 - 15:00	416,917	417,445	318,773	6.2%	8.0%	8.5%	4.88%	0.98%	0.75%
	15:00 - 16:00	598,141	409,372	308,432	8.9%	7.8%	8.2%	7.00%	0.96%	0.72%
16:00 - 19:00	16:00 - 17:00	546,722	401,819	295,731	8.1%	7.7%	7.9%	6.39%	0.94%	0.69%
	17:00 - 18:00	536,862	389,408	283,349	7.9%	7.5%	7.6%	6.28%	0.91%	0.66%
	18:00 - 19:00	474,487	351,757	255,572	7.0%	6.7%	6.8%	5.55%	0.82%	0.60%
19:00 - 22:00	19:00 - 20:00	339,967	294,107	209,444	5.0%	5.6%	5.6%	3.98%	0.69%	0.49%
	20:00 - 21:00	242,515	233,666	171,463	3.6%	4.5%	4.6%	2.84%	0.55%	0.40%
	21:00 - 22:00	187,443	182,907	134,580	2.8%	3.5%	3.6%	2.19%	0.43%	0.31%
22:00 - 24:00	22:00 - 23:00	148,305	157,107	110,532	2.2%	3.0%	2.9%	1.73%	0.37%	0.26%
	23:00 - 24:00	109,671	137,938	85,346	1.6%	2.6%	2.3%	1.28%	0.32%	0.20%
Day QICs Monitoring Period		6,755,800	5,216,998	3,751,272	100%	100%	100%	79%	12%	9%
Total		6,889,743	5,471,424	4,009,764						

Previous PJ Factors

Applicable to Data Aggregation for dates to 31 March 2015

Time Period	Hour	Passenger Journey Factors (Actual Values)			As a Percentage of the DAILY Night/Day total			As a Percentage of the WEEKLY Night/Day value		
		Mon-Fri	Sat	Sun	Mon-Fri	Sat	Sun	Mon-Fri	Sat	Sun
00:00 - 05:00	00:00 - 01:00	43,006	86,899	83,390	42.6%	41.0%	42.0%	23.5%	9.5%	9.1%
	01:00 - 02:00	16,652	42,414	46,016	16.5%	20.0%	23.2%	9.1%	4.6%	5.0%
	02:00 - 03:00	10,375	41,654	29,050	10.3%	19.7%	14.6%	5.7%	4.5%	3.2%
	03:00 - 04:00	9,551	22,393	31,573	9.5%	10.6%	15.9%	5.2%	2.4%	3.4%
	04:00 - 05:00	21,445	18,556	8,509	21.2%	8.8%	4.3%	11.7%	2.0%	0.9%
Night QICs Monitoring Period		101,029	211,916	198,538	100%	100%	100%	55%	23%	22%
05:00 - 07:00	05:00 - 06:00	47,824	38,229	19,807	0.8%	0.9%	0.7%	0.65%	0.10%	0.05%
	06:00 - 07:00	134,055	77,409	34,027	2.3%	1.7%	1.1%	1.82%	0.21%	0.09%
07:00 - 10:00	07:00 - 08:00	342,878	127,972	68,064	5.9%	2.9%	2.3%	4.66%	0.35%	0.19%
	08:00 - 09:00	483,245	177,577	80,758	8.2%	4.0%	2.7%	6.57%	0.48%	0.22%
	09:00 - 10:00	370,609	258,728	130,035	6.3%	5.8%	4.3%	5.04%	0.70%	0.35%
10:00 - 13:00	10:00 - 11:00	299,936	298,188	200,125	5.1%	6.6%	6.7%	4.08%	0.81%	0.54%
	11:00 - 12:00	309,863	375,731	181,606	5.3%	8.4%	6.1%	4.21%	1.02%	0.49%
	12:00 - 13:00	331,577	340,300	237,248	5.7%	7.6%	7.9%	4.51%	0.93%	0.65%
13:00 - 16:00	13:00 - 14:00	342,183	431,601	250,952	5.8%	9.6%	8.4%	4.65%	1.17%	0.68%
	14:00 - 15:00	377,889	369,290	227,226	6.4%	8.2%	7.6%	5.14%	1.00%	0.62%
	15:00 - 16:00	485,829	343,673	226,781	8.3%	7.7%	7.6%	6.60%	0.93%	0.62%
16:00 - 19:00	16:00 - 17:00	493,125	323,808	240,810	8.4%	7.2%	8.1%	6.70%	0.88%	0.65%
	17:00 - 18:00	493,227	319,034	245,807	8.4%	7.1%	8.2%	6.71%	0.87%	0.67%
	18:00 - 19:00	423,451	269,431	228,361	7.2%	6.0%	7.6%	5.76%	0.73%	0.62%
19:00 - 22:00	19:00 - 20:00	300,736	229,740	163,888	5.1%	5.1%	5.5%	4.09%	0.62%	0.45%
	20:00 - 21:00	219,222	187,801	145,030	3.7%	4.2%	4.8%	2.98%	0.51%	0.39%
	21:00 - 22:00	165,030	117,955	118,251	2.8%	2.6%	4.0%	2.24%	0.32%	0.32%
22:00 - 24:00	22:00 - 23:00	136,045	107,516	104,306	2.3%	2.4%	3.5%	1.85%	0.29%	0.28%
	23:00 - 24:00	103,498	91,524	88,036	1.8%	2.0%	2.9%	1.41%	0.25%	0.24%
Day QICs Monitoring Period		5,860,222	4,485,507	2,991,118	100%	100%	100%	80%	12%	8%
Total		5,961,251	4,697,423	3,189,656						