

Appendix 1

CONGESTION HOTSPOTS IN LEEDS

Executive Summary

1. A comprehensive analysis of congested junctions across Leeds District has been undertaken. In total 96 junctions have been evaluated. The use of TrafficMaster data has enabled the average delay for each approach to be determined for seven time periods during an average term time weekday. The resulting outputs have enabled the junctions to be ranked on the basis of total delay.

Introduction

2. The Department for Transport (DfT) provide all local authorities with data on vehicle travel times that has been collected from vehicles with GPS devices. This information is currently supplied to the DfT by TrafficMaster (TM) and allows average journey times and speeds to be analysed by individual road and time of day.
3. Leeds City Council officers undertook a review of congestion hotspots using 2011-12 TM data in 2015. This identified a list of sites ranked by average weekday delays. Since then monitoring of radial and orbital journey times has shown that congestion has increased across the District, with inbound morning peak hour journey times rising by 18% and outbound evening peak by 17% between 2009-10 and 2015-16.
4. As a follow up to this route analysis further work has been undertaken to update the analysis of delays at individual junctions using the 2015-16 data. The same 96 junctions have been analysed to determine average delays. These junctions were originally selected on the basis of officer knowledge supported by a review of the radial/orbital average speed plots and also online data from Google Traffic.
5. In the light of the analysis it is clear that a number of the 96 junctions only suffer from very marginal levels of congestion while others are severely congested. Total junction delays summed across all approaches during both the morning and evening peak hours range from 0.4 minutes to just under 28 minutes. It must be recognised that these figures represent an average over all term time weekdays and over full hours. Delays at the peak of the peak are likely to be much greater, however, this analysis does provide a robust evaluation of congestion on a comparable basis that allows future interventions to be targeted at locations with the greatest need.
6. Junctions within Leeds City Centre have not been included; the only exceptions being Domestic Rd/Domestic St and Woodhouse Lane/Clay Pit Lane. Junctions within this area will all be affected by the proposed WYPTF City Centre Package.

7. TrafficMaster data was utilised for weekdays during 2015-16 (September-July), excluding bank holidays and school holidays, and covering seven time periods:
 - A1 – 0700-0800
 - A2 – 0800-0900
 - A3 – 0900-1000
 - IP – 1000-1600
 - P1 – 1600-1700
 - P2 – 1700-1800
 - P3 – 1800-1900
8. For each junction data was extracted for each approach going back as far as the previous significant junction – usually a roundabout or signals. This was subsequently reviewed to ensure that this didn't include any notable intermediate congestion points. The average distance covered per approach was just under one kilometre, although some were significantly shorter.
9. Once journey time had been extracted the level of 'congestion delay' was determined for each approach and time period. This approach was developed for the radial and orbital route analysis and is calculated by comparing travel times with daytime 'free-flow' times (determined from the minimum observed times for each highway segment between 7 a.m. and 7 p.m.). This provides a representative figure for uncongested travel and is considered more appropriate than using night-time or inter-peak data.
10. In order to rank the sites the congestion delay outputs were summed to obtain the total level of delay on all approaches to each junction during the morning and evening peak hours. In addition, the total level of daytime (0700-1900) delay was also calculated. Two rankings were therefore derived: a peak hour and a 12 hour figure. In many cases the results were similar, but for some sites there were notable differences with 8 sites changing by more than 20 places.
11. In order to obtain a single ranking therefore, the peak hour and 12 hour delay data was added together (so that the peak hours were counted twice to give more emphasis to these time periods) and the resulting rank calculated. It must be emphasised that this is effectively a presentational tool and that junctions with lower levels of delay but higher traffic volumes may merit interventions more than other sites, where for example all the delay relates to minor arms.
12. In addition to the overall combined ranking an examination was also made of the sites to determine whether there were junctions with perhaps one approach that suffers from excessive levels of delay while the others are relatively congestion free. A threshold of a 2 minute peak hour delay or an 8 minute daytime (12 hour) delay was utilised for this – these represent the top 10% of individual delays. This identified 21 junctions outside the top 30 with this level of delay on at least one approach.

Analysis Results

13. Table 1 lists the sites ranked within the top 30 (based on the combined ranking). Eight of the top 10 are also within the top 10 in both the peak and 12 hour rankings.

Table 1 – Leeds Top 30 Congestion Hotspots (2015-16)

Combined rank	Junction	Peak delay (mins)	12 hour delay (mins)	Peak rank	12 hour rank	Peak delays >2 mins	12 hr delays >8 mins	Change in Rank from 2011-12
1	A6110 / A62 Gelderd Rd, Wheatstheaf	25.2	67.6	3	1	4	3	4
2	Armley Gyrotory	25.4	55.4	2	3	4	2	2
3	B6157 Leeds & Bradford Rd / Wyther La	26.8	52.7	1	5	6	3	9
4	A647 / Ledgard Way	22.4	55.5	4	2	4	3	-2
5	A660 / B6157 North La	15.2	55.2	10	4	1	2	-2
6	Burley Rd / Cardigan Rd	18.7	43.2	6	7	3	2	0
7	A6120 / A65 Rawdon Rd, Horsforth	19.5	39.8	5	8	5	3	0
8	A659 / B6451 Clapgate, Otley	12.0	44.5	16	6	2	4	5
9	B6157 Kirkstall La / Morris La	16.9	34.8	7	12	3	2	9
10	Wetherby Rd / Princes Ave, Oakwood	15.3	36.4	9	9	4	2	0
11	B6157 Stonegate Rd / King La	15.2	36.3	11	10	2	2	14
12	A6120 / A647, Dawsons Corner	13.1	34.6	12	13	1	1	8
13	A660 / Hyde Park Rd	10.2	36.1	21	11	1	1	-2
14	A653 / Ring Rd Beeston Park	12.5	33.7	15	14	3	2	8
15	A6120 / A657 Rodley La	16.1	28.6	8	17	3	2	-14
16	A660 / B6157 Shaw La	13.0	29.7	13	16	2	1	-7
17	A58 / B6159 Harehills La, Fforde Green	10.8	27.5	19	18	3	1	-3
18	A58 / Harehills Rd	7.8	30.1	27	15	2	2	-10
19	A6120 / A58 Wetherby Rd	12.6	25.0	14	22	4	2	-3
20	A61 / A659 (E), Harewood	11.1	25.0	17	20	3	2	7
21	A660 / A658, Dyneley Arms	9.7	25.0	22	21	1	2	8
22	A65 / Willow Rd	8.7	22.9	23	24	1	1	4
23	A6120 / B6159 Selby Rd, Colton	11.0	20.5	18	26	0	0	11
24	A61 / B6159 Potternewton La	10.5	19.3	20	27	3	0	-7
25	A64 / B6159 Harehills La	4.4	25.2	65	19	0	2	-1
26	A65 / Oxford Rd, Guiseley	6.2	23.4	46	23	0	0	18
27	A658 / Bayton La, Yeadon	6.6	22.8	39	25	1	1	4
28	A6120 / Low La, Horsforth	8.3	17.9	24	29	0	0	18
29	A61 / Sharp La, Robin Hood	8.3	17.1	25	32	1	1	10
30	A61 / A659 (W), Harewood	7.2	17.0	35	33	2	1	26

Note: Ranking based on total delay and takes no account of traffic levels. Combined ranking double counts peak hour delays to give more emphasis to these time periods.

14. Table 2 lists the sites ranked from 31 to 70. Six junctions fall outside the combined top 30 although they rank within it on the basis of either peak hour or 12 hour delays. This list contains all the remaining sites where 12 hour delays exceed 8 minutes on at least one approach, however, there are two sites where peak hour delays exceed 2 minutes that are ranked outside the top 70: A658 / A659 (E), Pool-in-Wharfedale and Domestic Rd / Domestic St in the city centre.
15. Overall 24 out of the previous top 30 junctions in 2011-12 remain within the top 30, while 64 out of the top 70 also remain within that group. Nonetheless, there have been some significant movements with 35 junctions rising or falling by more than 10 places and 12 rising or falling by more than 20.

16. Across all 96 junctions, peak hour delays have risen by 24% and all day (12 hour) delays by 18%.
17. Figure 1 shows the locations of all the evaluated sites.
18. A number of the junctions in this evaluation have improvement schemes that are either currently being implemented or are planned. The vast majority, however, are constrained so that significant improvements would require third party land and or property demolition. Tables 3-5 provide comments for each site covering these points, with further detail being available in Appendix A.

Table 2 – Leeds Congestion Hotspots 31-70 (2015-16)

Combined rank	Junction	Peak delay (mins)	12 hour delay (mins)	Peak rank	12 hour rank	Peak delays >2 mins	12 hr delays >8 mins	Change in Rank from 2011-12
31	A65 / Kirkstall La	7.3	16.8	33	34	1	0	17
32	A6110 / A58 Whitehall Rd, Ringways	7.4	16.6	31	37	2	0	27
33	A62 / B6126 Asquith Ave, Gildersome	8.0	15.5	26	42	0	0	-5
34	M62 (J28) / A653 / A650, Tingley	7.3	16.0	32	38	0	0	18
35	A6120 / King La	6.6	16.7	41	35	1	0	18
36	A650 / A643 Bruntcliffe La, Morley	7.5	15.6	28	39	0	0	-21
37	A647 / Richardshaw La, Pudsey	6.4	16.6	44	36	1	0	-4
38	Harrogate Rd / B6159 Harehills La	4.8	18.0	57	28	0	0	-17
39	A61 / Harrogate Rd	6.8	15.6	36	40	1	1	24
40	Harrogate Rd / Street La	4.6	17.8	62	31	0	0	-10
41	A6120 / A64 Barwick Rd	6.6	15.6	38	41	2	0	13
42	A6029 / A650 / B6127 Bridge St, Morley	7.2	14.9	34	44	1	0	-2
43	M621 (J7) / A61 / A639, Stourton	6.7	14.4	37	46	2	1	0
44	B6155 Lidget Hill / B6154 Church La, Pudsey	3.3	17.8	76	30	0	0	-9
45	A6120 / A64 York Rd	6.0	15.1	48	43	1	1	5
46	M621 (J2) / A643, Islington	6.5	14.5	42	45	1	0	30
47	Station Rd / Long Row, Horsforth	6.6	13.9	40	48	1	0	-11
48	A58 / A659 Wattle Syke, Collingham	7.4	12.5	29	59	1	0	41
49	A6120 / A61 Harrogate Rd, Moortown	6.5	13.2	43	51	1	0	0
50	A6120 / A660 Otley Rd, Lawnswood	6.4	12.9	45	55	0	0	-5
51	A6110 / A643 Elland Rd (S)	6.1	13.1	47	53	1	1	14
52	A61 / Alwoodley La	5.5	13.6	49	49	0	0	-20
53	B6126 Brunswick St / B6127 Chapel Hill, Morley	4.7	13.9	61	47	0	0	7
54	A658 / B6152 Mickelfield La, Rawdon	7.4	11.0	30	69	2	0	17
55	A642 / B6137 Main St, Garforth	5.2	13.2	51	52	0	0	-13
56	A58 / A659 Harewood Rd, Collingham	5.4	12.5	50	58	1	0	25
57	B6159 / Primrose La, Halton	4.8	13.1	59	54	1	0	0
58	A63 / B6137 Lidgett La, Garforth	4.9	12.8	54	56	0	0	-21
59	A650 / Thorpe La, Tingley	5.0	12.6	53	57	0	0	-18
60	A64 / B6159 Selby Rd, Halton Dial	3.6	13.5	73	50	0	0	6
61	A65 / A658 Green La, Rawdon	4.8	11.9	56	62	0	0	-3
62	A61 / A654 Leadwell La, Robin Hood	4.8	11.9	60	61	0	0	6
63	A6120 / Roundhay Park La	5.1	11.4	52	67	1	0	14
64	A639 / B6481 Pontefract Rd	4.3	12.1	66	60	0	0	0
65	A61 / Wood La, Rothwell	4.5	11.8	64	63	0	0	-14
66	A6110 / Millshaw Rd / White Rose (N)	4.3	11.8	67	64	0	0	-5
67	M1 (J44) / A639 Leeds Rd, Rothwell	4.9	10.4	55	72	0	0	-48
68	A6120 / Coal Rd	3.5	11.5	74	66	0	0	5
69	Shadwell La / Wike Ridge La, Shadwell	3.8	11.0	69	68	0	0	-14
70	A642 / Bullerthorpe La, Woodlesford	3.8	10.8	70	70	1	1	0

Note: Ranking based on total delay and takes no account of traffic levels. Combined ranking double counts peak hour delays to give more emphasis to these time periods.

Figure 1 – Leeds Congestion Hotspot Junctions (2015-16)

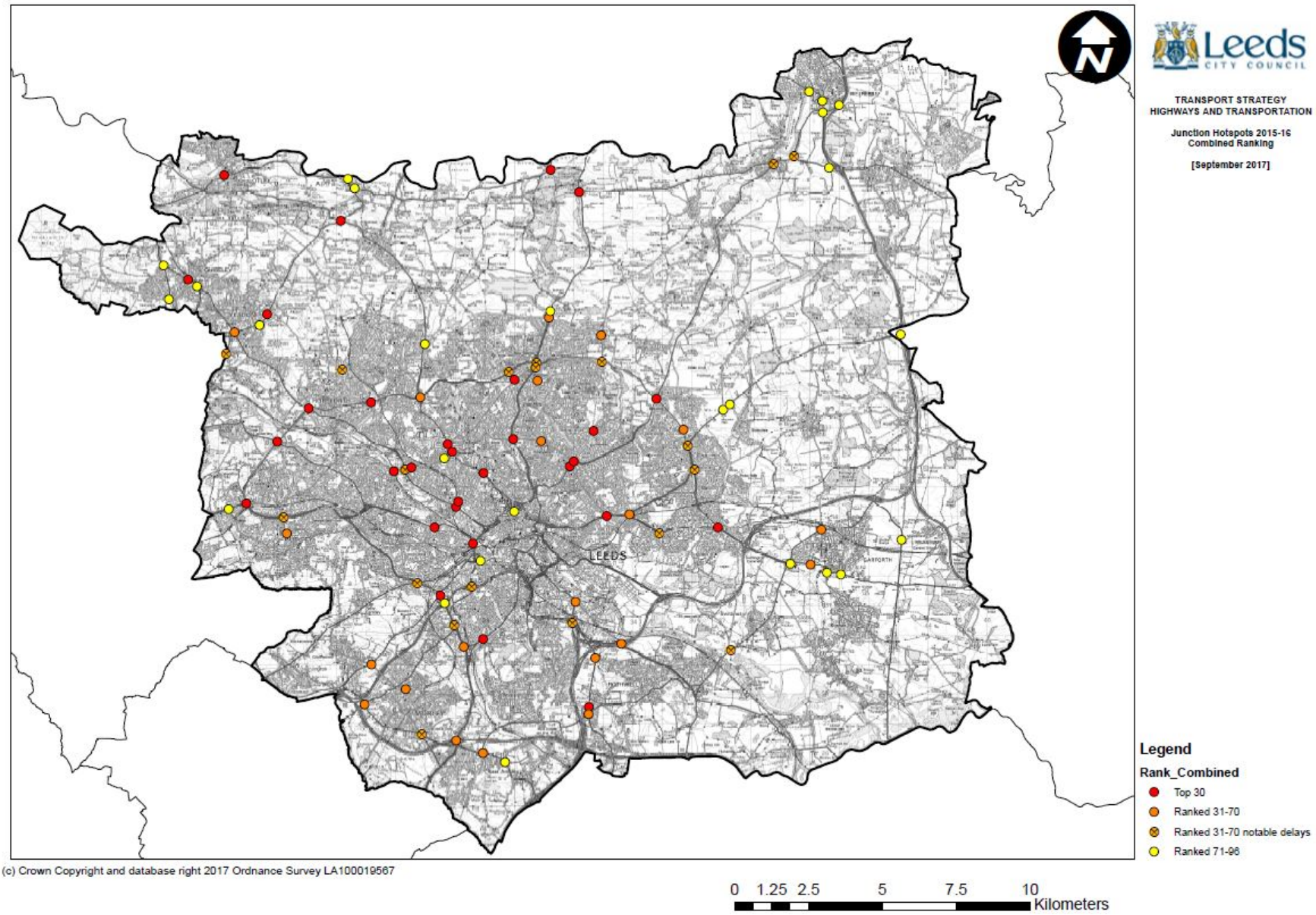


Table 3 – Interventions and Constraints (Sites 1-25)

Combined rank	Junction	Description	Schemes
1	A6110 / A62 Gelderd Rd, Wheatsheaf	Signalled junction. Very Constrained site	A6110 (WYPTF)
2	Armley Gyratory	Signalled gyratory. Very Constrained site	City Centre Package (WYPTF)
3	B6157 Leeds & Bradford Rd / Wyther La	Signalled junction. Very Constrained site	Feasibility study planned
4	A647 / Ledgard Way	Signalled junction. Very Constrained site	Potential CIP/LPTIP scheme
5	A660 / B6157 North La	Signalled junction. Severely Constrained site	Potential CIP/LPTIP scheme
6	Burley Rd / Cardigan Rd	Signalled junction. Very Constrained site	
7	A6120 / A65 Rawdon Rd, Horsforth	Signalled roundabout. Constrained site	Developer/potential WYPTF scheme
8	A659 / B6451 Clapgate, Otley	Signalled junction. Severely Constrained site	Otley Relief Rd
9	B6157 Kirkstall La / Morris La	Signalled junction. Constrained site	
10	Wetherby Rd / Princes Ave, Oakwood	Signalled junction. Very Constrained site	
11	B6157 Stonegate Rd / King La	Roundabout. Constrained site	ELOR/ORR improvement (WYPTF)
12	A6120 / A647, Dawsons Corner	Signalled roundabout. Constrained site	CIP phase 1 scheme (WYPTF)
13	A660 / Hyde Park Rd	Signalled junction. Severely Constrained site	Potential CIP/LPTIP scheme
14	A653 / Ring Rd Beeston Park	Signalled junction. Very Constrained site	Potential CIP/LPTIP scheme
15	A6120 / A657 Rodley La	Signalled roundabout. Unconstrained site	Potential WYPTF scheme
16	A660 / B6157 Shaw La	Signalled junction. Very Constrained site	Potential CIP/LPTIP scheme
17	A58 / B6159 Harehills La, Fforde Green	Signalled junction. Very Constrained site	Potential CIP/LPTIP scheme
18	A58 / Harehills Rd	Signalled junction. Severely Constrained site	Potential CIP/LPTIP scheme
19	A6120 / A58 Wetherby Rd	Roundabout. Unconstrained site	ELOR (WYPTF)
20	A61 / A659 (E), Harewood	Signalled junction. Very Constrained site	Potential LPTIP scheme
21	A660 / A658, Dyneley Arms	Signalled junction. Unconstrained site	CIP phase 1 scheme (WYPTF)
22	A65 / Willow Rd	Signalled junction. Very Constrained site	Potential CIP/LPTIP/developer scheme
23	A6120 / B6159 Selby Rd, Colton	Roundabout. Constrained site	ELOR (WYPTF)
24	A61 / B6159 Potternewton La	Roundabout. Constrained site	Potential CIP/LPTIP scheme
25	A64 / B6159 Harehills La	Signalled junction. Very Constrained site	

Table 4 – Interventions and Constraints (Sites 26-50)

26	A65 / Oxford Rd, Guiseley	Signalled junction. Severely Constrained site	Potential CIP scheme
27	A658 / Bayton La, Yeadon	Signalled junction. Constrained site	Potential A65-Airport-A658 Link scheme (WYPTF)
28	A6120 / Low La, Horsforth	Roundabout. Constrained site	Potential CIP scheme
29	A61 / Sharp La, Robin Hood	Signalled junction. Constrained site	Potential CIP/LPTIP scheme
30	A61 / A659 (W), Harewood	Priority junction. Unconstrained site	Potential LPTIP scheme
31	A65 / Kirkstall La	Signalled junction. Very Constrained site	Potential CIP/developer scheme
32	A6110 / A58 Whitehall Rd, Ringways	Roundabout. Constrained site	A6110 (WYPTF)
33	A62 / B6126 Asquith Ave, Gildersome	Signalled junction. Constrained site	Potential CIP/developer scheme
34	M62 (J28) / A653 / A650, Tingley	Signalled gyratory. Constrained site	Potential CIP/developer scheme
35	A6120 / King La	Roundabout, part-signalled. Constrained site	ELOR/ORR improvement (WYPTF)
36	A650 / A643 Bruntcliffe La, Morley	Signalled junction. Constrained site	MOVA
37	A647 / Richardshaw La, Pudsey	Signalled junction. Very Constrained site	
38	Harrogate Rd / B6159 Harehills La	Signalled junction. Very Constrained site	Potential CIP/LPTIP scheme
39	A61 / Harrogate Rd	Roundabout. Very Constrained site	ELOR/ORR improvement (WYPTF)
40	Harrogate Rd / Street La	Signalled junction. Very Constrained site	Potential CIP/LPTIP scheme
41	A6120 / A64 Barwick Rd	Roundabout. Constrained site	ELOR (WYPTF)
42	A6029 / A650 / B6127 Bridge St, Morley	Signalled gyratory. Very Constrained site	Potential CIP/developer scheme
43	M621 (J7) / A61 / A639, Stourton	Part-signalised roundabout-style junction. Constrained site	LPTIP scheme
44	B6155 Lidget Hill / B6154 Church La, Pudsey	Signalled junction. Severely Constrained site	
45	A6120 / A64 York Rd	Roundabout. Constrained site	ELOR (WYPTF)
46	M621 (J2) / A643, Islington	Signalled gyratory. Very Constrained site	City Centre Package (WYPTF)
47	Station Rd / Long Row, Horsforth	Roundabout. Very Constrained site	
48	A58 / A659 Wattle Syke, Collingham	Priority junction. Constrained site	
49	A6120 / A61 Harrogate Rd, Moortown	Roundabout. Constrained site	ELOR/ORR improvement (WYPTF)
50	A6120 / A660 Otley Rd, Lawnswood	Roundabout. Constrained site	Potential CIP/LPTIP scheme

Table 5 – Interventions and Constraints (Sites 51-70)

51	A6110 / A643 Elland Rd (S)	Roundabout. Constrained site	Potential A6110 scheme (WYPTF)
52	A61 / Alwoodley La	Signalled junction. Very Constrained site	Potential CIP/LPTIP/developer scheme
53	B6126 Brunswick St / B6127 Chapel Hill, Morley	Signalled junction. Severely Constrained site	
54	A658 / B6152 Micklefield La, Rawdon	Signalled junction. Very Constrained site	
55	A642 / B6137 Main St, Garforth	Signalled junction. Very Constrained site	
56	A58 / A659 Harewood Rd, Collingham	Priority junction. Constrained site	
57	B6159 / Primrose La, Halton	Signalled junction. Very Constrained site	
58	A63 / B6137 Lidgett La, Garforth	Signalled junction. Very Constrained site	Bypass feasibility ongoing
59	A650 / Thorpe La, Tingley	Signalled junction. Unconstrained site	Potential CIP/developer scheme
60	A64 / B6159 Selby Rd, Halton Dial	Signalled junction. Very Constrained site	Potential CIP scheme
61	A65 / A658 Green La, Rawdon	Roundabout. Constrained site	Potential CIP scheme
62	A61 / A654 Leadwell La, Robin Hood	Signalled junction. Constrained site	Potential CIP/LPTIP scheme
63	A6120 / Roundhay Park La	Signalled junction. Unconstrained site	ELOR/ORR improvement (WYPTF)
64	A639 / B6481 Pontefract Rd	Signalled junction. Constrained site	LPTIP scheme
65	A61 / Wood La, Rothwell	Signalled junction. Unconstrained site	Potential CIP/LPTIP/developer scheme
66	A6110 / Millshaw Rd / White Rose (N)	Roundabout. Constrained site	Potential A6110 scheme (WYPTF)
67	M1 (J44) / A639 Leeds Rd, Rothwell	Signalled gyratory. Unconstrained site	
68	A6120 / Coal Rd	Signalled junction. Unconstrained site	ELOR (WYPTF)
69	Shadwell La / Wike Ridge La, Shadwell	Signalled junction. Very Constrained site	
70	A642 / Bullerthorpe La, Woodlesford	Priority junction. Very Constrained site	

Appendix A - Interventions and Constraints

Definitions

This appendix attempts to classify congestion hotspots based on how constrained they may be by their location in terms of potential for unlocking capacity through widening, enlarging or relocating the junction. By nature, these definitions are subjective, but the following give an indication of the criteria considered.

Unconstrained:-

- There appears to be undeveloped land available (whether highway or otherwise) on most or all approaches to allow additional lanes to be added or the junction repositioned or enlarged.

Constrained:-

- There is retail or civic activity around the junction, high pedestrian flows and/or loading requirements, which could affect the potential for improvement.
- There is non-highway land adjacent to the junction and approaches which could be utilised, but the effect of the land take on the property is likely to be undesirable, e.g. removes car parking, landscape buffers etc.

Very constrained:

- There are buildings or engineering/ environmental constraints which make it quite uncertain whether an improvement is deliverable. Land take will be required.
- The junction has buildings in proximity to the junction or approaches, but they are set back and/or appear to be of lower intrinsic value to the function and quality of the local area, and hence there could be a medium to term long prospect of redevelopment (leading to a potential improvement line).

Severely constrained:

- The junction is surrounded by buildings which are an integral part of the character or function of the area and which presently seem very unlikely to be demolished.
- The junction in very close proximity to one or more structures or topographical features, such as railway lines, rivers or environmental features which would appear to prevent substantial modification to the junction.

Junction Assessment

1) A6110 / A62 Gelderd Road, Wheatsheaf (signalled junction)

Very constrained. There is some heavy electrical plant (substation?) to the southwest, which limits potential improvement lines to the adjacent M621 junction. New buildings to the east, including car showrooms on the northeast corner, limit the amount of widening which can be provided. To the west of the junction are low density industrial buildings with a degree of set back from the highway, which could offer some junction improvement potential. The proximity of the M621 junction 1 is an operational constraint which further constrains workable schemes.

2) Armley Gyratory (signalled gyratory)

Very constrained. Presence of railway viaducts to the north and southeast, and major gas plant within the gyratory mean that this otherwise large site has design limitations. The relocation of gas facilities would however help release opportunities. There is also some open space to the west, but the junction with the B6154 could constrain if this can be effectively used. The B6154 alignment, status etc could be reviewed.

3) B6157 Leeds & Bradford Road / Wyther Lane (signalled junction)

Very constrained. The junction is on a bridge straddling twin track railway lines and the River Aire which effectively prevents any widening on all three approaches. Wyther Lane is restricted to one lane each way unless some land is acquired and property demolished from the premises to the east of the Wyther Lane / Broad Lane junction. East of the River Aire there is scope to widen to the south side but this will impact on a tree belt between the road and playing fields. In the long term, capacity improvement is not out of the question, but there are significant obstacles requiring a significant investment.

4) A647 / Ledgard Way (signalled junction)

Very constrained. The north and east arms have some prospect for widening, although the latter would have a greater impact and may ultimately not be deliverable without demolition. The south arm is tightly constrained between property whilst the west arm has softer constraints (bowls club lawn and off-street car parking). There are pedestrian facilities, and pedestrian demand, which will constrain improvements.

5) A660 / B6157 North Lane (signalled junction)

Severely constrained. At the heart of the thriving Headingley Centre, with very high pedestrian footfalls and buildings at or close to the back of footway. Ideally footways would be wider, and better cycle facilities provided, meaning that there is already significant pressure on accommodating non-motorised users in the event that more space did become available.

6) Burley Road / Cardigan Road (signalled junction)

Very constrained. Although there is open space to the southeast, the railway bridge to the west and residential properties fronting the north arm effectively limit any potential improvement as they result in single lane approaches and exits on the west and north arms. Significant demolition or detrimental acquisition of private land would be required on the north arm. The small property on the southwest corner could potentially provide some scope for capacity improvements.

7) A6120 / A65 Rawdon Road, Horsforth (signalled roundabout)

Constrained. An initial feasibility design suggests that there is scope to enlarge the junction by utilising land to the west of the junction between the A65 north arm and the A6120 west arm. The skewed geometry of the approach roads and the location of housing and a petrol filling station on the A65 south arm constrain the design and mean that further capacity increases on the A65 south arm are unlikely.

8) A659 / B6451 Clapgate, Otley (signalled junction)

Severely constrained. The junction is surrounded by retail premises in the heart of Otley, with high pedestrian flows and narrow footways. Clapgate itself also has near right-angle bends in it, reducing the effective ability of the road to deliver higher flows through a signal junction. There is no scope for further capacity enhancement through road widening.

9) B6157 Kirkstall Lane / Morris Lane (signalled junction)

Constrained. Widening opportunities exist on the eastern side of Morris Lane at and south of the junction and on the southern side of Kirkstall Lane west of the junction, through land acquisition. However, widening opportunities are limited on the other two arms – the eastern arm possibly allowing a short flare although the impact on the houses north of the road could be too significant. These limitations mean that it appears unlikely, upon initial inspection, that a step-change improvement in capacity could be realised without acquiring property, unless pedestrian crossing islands can be accommodated to replace the 'all-red' stage with walk-with-traffic.

10) Wetherby Road / Princes Avenue, Oakwood (signalled junction)

Very constrained. Although, in theory, there is scope for widening on the northwestern (Princes Avenue) and northeastern (Wetherby Road) approaches, the impact on mature trees and good quality open space is likely to make any improvement line challenging to justify and difficult to deliver. The bustling local centre on Roundhay Road has high pedestrian demands, kerbside parking and loading and street activity and would make any further carriageway widening improbable, especially given that there are already three lanes at the stop line and the Gledhow Lane junction interferes with eastbound flow on Roundhay Road. Oakwood Lane is very constrained, with side turnings and premises on each side of the road.

11) B6157 Stonegate Road / King Lane (roundabout)

Constrained. The King Lane (north) approach has scope for significant widening, but the junction configuration to the south and east constrains options, as it is effectively a 5 arm junction. Residential and church properties and mature trees surround the junction, meaning that, environmentally, the footprint of any junction improvement scheme is likely to be restricted.

12) A6120 / A647, Dawsons Corner (signalled roundabout)

Constrained. There is open space to the southwest – where the dominant flow movements are – and some scope for acquiring land each side of the Ring Road. However, to the south there is the Bradford railway line which restricts widening on the northbound approach, plus property on the northwest and southeast corner.

13) A660 / Hyde Park Road (signalled junction)

Severely constrained. The junction is surrounded on three corners by retail premises, with generally narrow footways and moderately high pedestrian demands. Given the high cycle flows and lack of cycle lanes through the junction, it is already considered to be sub-optimal. The junction of Victoria Road to the northwest can impact on traffic progression through the junction. The former NGT scheme was proposing to improve the junction by banning turns and accommodating these using the adjacent junctions. This junction scheme, if subsequently progressed with modifications, could release capacity and enable a shorter cycle time and would realise benefits from realigning and signalising Victoria Road.

14) A653 / Ring Road Beeston Park “Tommy Wass” (signalled junction)

Very constrained. The junction was upgraded in 2011. Opportunities for further capacity enhancements appear limited given the location of the Tommy Wass public house right on the corner and requirement for private forecourts and gardens to achieve any improvement line.

15) A6120 / A657 Rodley Lane (signalled roundabout)

Unconstrained. A recent junction upgrade scheme has been completed, keeping the junction within the highway boundary. Further increases in capacity would need to be provided by using land outside of the highway. Although there is existing development to the south and east of the junction, there is enough room to upgrade the junction by realigning Rodley Lane (west arm) and the Ring Road (north) arm using predominantly agricultural land.

16) A660 / B6157 Shaw Lane (signalled junction)

Very constrained. High pedestrian and cycle flows. The former NGT scheme was planning a capacity improvement to the junction through minor localised widening to accommodate pedestrian crossing islands on the side roads and banning the right turn into St Anne's Road. A more substantial scheme would impact on the existing service access road for the shops on the northwest side, remove mature trees which are a key part of the streetscape, acquire front garden and could require demolition of retail property.

17) A58 / B6159 Harehills Lane, Fforde Green (signalled junction)

Very constrained. Adjacent to A58 / Harehills Road, this junction also has retail premises on all four corners of the junction. Some widening may be possible through the acquisition of private forecourts. Some widening on Harehills Lane (south) could be possible through land acquisition, but this will affect off-street parking for businesses and is not an easy option.

18) A58 / Harehills Road (signalled junction)

Severely constrained. At the heart of a busy local centre with high pedestrian flows, demand for loading and retail premises on all corners of the junction. The only prospect for widening appears to be land take of private forecourts on the northwest side of the A58, but this will have impacts on the amenity of the area and on the properties concerned. All other locations are severely constrained by properties at or close to the highway boundary.

19) A6120 / A58 Wetherby Road (roundabout)

Unconstrained. Although there is no room to widen on the A58 (North) arm without acquiring private gardens, with an impact on trees, there is scope to realign the whole junction southwestwards, and scope to widen and realign the other three approaches.

20) A61 / A659 (E), Harewood (Signalled junction)

Very constrained. The junction is surrounded by the old boundary walls to Harewood House and high quality residential boundaries of mature hedges and trees, at the current main entrance to Harewood House. Land take from gardens would be required to enhance the junction and it does not appear to be possible without a significant detrimental effect on the locality and residents.

21) A660 / A658, “Dyneley Arms” (signalled junction)

Unconstrained. There is open space to the east and south which could be used to realign the A658, if widening is unacceptable on the A660 west arm south of the Dyneley Arms, because of the mature trees present.

22) A65 / Willow Road (signalled junction)

Very constrained. Although there is some open space to the north/east of the junction, effective alignments are constrained by the Harrogate Line viaduct across the A65 immediately to the west and properties had up against the sides of Viaduct Road to the south. The latter constraints could in the medium to long term be overcome if redevelopment takes place.

23) A6120 / B6159 Selby Rd, Colton (roundabout)

Constrained. Although there is scope to widen both arms of the A6120 without property demolition, the two minor arms of B6159 Selby Road and Colton Lane – coupled with the property on the western corner – make significant capacity increases challenging (though not impossible). Widening of the eastern arm of the A6120 is likely to impact on mature trees in the bank of trees on the south side. It may be possible to reduce capacity of the minor arms and give it to the major arms (the B6159 was the A63 but has not been provided for by the East Leeds Link Road).

24) A61 / B6159 Potternewton Lane (roundabout)

Constrained. Potternewton Lane to the west cannot be widened without acquiring gardens. Widening on Scott Hall Road (north arm) may require removal of the guided busway and an impact on mature trees lining the street. To the east and south there is scope for widening into the open space.

25) A64 / B6159 Harehills Lane (signalled junction)

Very constrained. The junction already has banned turns and additional lanes on the approaches, and further improvement looks difficult to accommodate because of buildings on the southeast side of the junction. There is already a two-lane left turn out of Harehills Lane.

26) A65 / Oxford Road, Guiseley (signalled junction)

Severely constrained. There are properties close to the road on all corners of the junction in this local centre. Upon initial inspection there appears to be no realistic prospect for any enlargement of the junction.

27) A658 / Bayton Lane, Yeadon (signalled junction)

Constrained. The A658 south arm is constrained away from the junction by property on each side of the road, although widening at the junction entry may be practical (with private land take). On the remaining three arms, some road widening may be possible using private land (car parking, front gardens) with an impact on a row of mature trees on the A658 (north) arm.

28) A6120 / Low Lane, Horsforth (roundabout)

Constrained. The junction is loosely surrounded by development, but the A6120 can be widened on its approaches. A larger roundabout may be unrealistic without property acquisition and demolition, but a signalled junction may be practical with land take on the east sides of both minor arms.

29) A61 / Sharp Lane, Robin Hood (signalled junction)

Constrained. It appears possible to widen on all approaches without property demolition, although to do so will require land outside the highway boundary and (depending on the design) could affect mature trees, the edge of some allotments and on-street parking. There is a war memorial on the southwest corner which will need to be considered and it is too early to say whether this would be adversely affected.

30) A61 / A659 (W), Harewood (priority junction)

Unconstrained. Although there is a house immediately south of the junction, the remainder of the frontage is open farmland and there is scope for realignment and widening. There is a potential issue with the alignment of the A61, which is 'bendy' here, which could increase scheme costs and impacts.

31) A65 / Kirkstall Lane (signalled junction)

Very constrained. Property is very close or abuts three approaches to the junction, whilst the fourth (eastern) arm is on a gradient. The operation is restricted by the adjacent signals gaining access to Morrisons.

32) A6110 / A58 Whitehall Road, Ringways (roundabout)

Constrained. There is very little scope for widening without land take, but there are opportunities to enhance the junction through using car parking and other land around the junction.

33) A62 / B6126 Asquith Avenue, Gildersome (signalled junction)

Constrained. There is undeveloped land or commercial car parking which could be utilised to widen three of the four approaches, whilst the fourth approach (Branch End) is restricted particularly by a few terraced properties on the southwestern side.

34) M62 (J28) / A653 / A650, Tingley (signalled gyratory)

Constrained. Housing and development to the south of the junction constrains any widening or realignment of the A653 and A650 approaches and to some extent the A650 also. Any scheme which affects the motorway overbridges will also jeopardise feasibility.

35) A6120 / King Lane (roundabout, part-signalled)

Constrained. Housing and development to the south and west, places side road accesses, places some constraints on any improvement scheme, although there is some open space to the north/east.

36) A650 / A643 Bruntcliffe Lane, Morley (signalled junction)

Constrained. The three houses on the northwest corner could present a significant obstacle to enlarging the junction, but on each arm there appears to be some scope for widening either within the highway or by taking private land (typically car parking), but with no further demolition. There may be an opportunity to protect an improvement line at this junction.

37) A647 / Richardshaw Lane, Pudsey (signalled junction)

Very constrained. The junction is already grade separated. Properties on the south and north side of the junction, coupled with the width of the A647 overbridge, mean that the scope for improvement is limited.

38) Harrogate Road / B6159 Harehills Lane (signalled junction)

Very constrained. Although there are few properties hard up against the footway, the prospect for widening is limited as the buildings are in relatively close proximity to the highway on all arms except for Harehills Lane, and the impact of land take on the settings of the properties would appear to be significant. The junction operation is likely to be constrained by the adjacent junctions, meaning that the likelihood of significant operational gains is low.

39) A61 / Harrogate Road (roundabout)

Very constrained. The junction is surrounded by houses and is in close proximity to the A6120 / A61 junction, with retail businesses between the two junctions. Whilst there may be some options to explore, the scope for junction enlargement or road widening is limited.

40) Harrogate Road / Street Lane (signalled junction)

Very constrained. The junction is surrounded by retail and residential property, with reasonably high pedestrian flows and servicing requirements. In theory some widening of the approaches could be possible with land take from forecourts and front gardens, but in practice this seems unlikely to be tenable.

41) A6120 / A64 Barwick Road (roundabout)

Constrained. Although there is open space which could be used for a widening scheme, the housing and other development on Barwick Road and immediately south/east of the junction constrains potential alignment improvements. The ELOR scheme will remove traffic from this junction.

42) A6029 / A650 / B6127 Bridge Street, Morley (signalled gyratory)

Very constrained. Surrounded by property on all sides, although some of the buildings are set back. There is a potential improvement line if the property to the north of the A650 is redeveloped, notably to get a better two lane approach on the B6127 (north) arm.

43) M621 (J7) / A61 / A639, Stourton (part-signalised roundabout-style junction)

Constrained. Although there is open space around most of the roundabout, there are constraints created by the adjacent railway, the freight terminal access location and the retaining wall on the northbound on-slip. In addition, the M621 overbridges themselves create a constraint which would be very expensive to replace or modify. Highways England is proposing to widen the southeastbound M621 off slip entry into the junction which will improve capacity. Leeds City Council's current scheme to build a bus-based Park and Ride side at Stourton is also proposing amendments to the junction which will accommodate the extra traffic arising from the Park and Ride site.

44) B6155 Lidget Hill / B6154 Church Lane, Pudsey (signalled junction)

Severely constrained. Significant property surrounds the junction, close to the trafficked highway, on three corners, restricting any potential improvement to redevelopment of the western corner and the potential to realign the highway to create a staggered junction. It is in the middle of a retail area with moderately high footfall.

45) A6120 / A64 York Rd (roundabout)

Constrained. The York Road / North Parkway is close, and the two junctions' interaction will constrain capacity improvements. There are properties around the junction, although set back, meaning that improvement could be possible. The ELOR scheme will remove traffic from the junction.

46) M621 (J2) / A643, Islington (signalled gyratory)

Very constrained. An improvement here forms part of the Highways England RIS scheme for the M621. Although there are embankments and areas of tree planting which suggest that some capacity improvements can be provided, the main constraint is on the eastbound on-slip where there is a large retaining wall which is likely to limit the exit from the junction to the M621 to a single lane, given that the merge is already short. The M621 overbridges themselves also create a restriction. However, more radical changes could be possible, for example by redirecting Elland Road eastbound traffic to Junction 1, which would release capacity for other movements, or by introducing signals on the M621 mainline, which would require downgrading from motorway status.

47) Station Road / Long Row, Horsforth (roundabout)

Very constrained. A five arm roundabout in a suburban area with retail activity. Enlargement of the roundabout is restricted by adjacent buildings. The most likely opportunity for enhancing capacity could come from closing the two minor arms (St Margaret's Road and Brownberrie Avenue) and possibly signalling it.

48) A58 / A659 Wattle Syke, Collingham (priority junction)

Constrained. Junction improvements appear possible but these could require acquisition of land on one or both sides of Wattle Syke, though demolition should be avoidable; there are also mature trees fronting both sides of the A58 northeast of the junction which would probably be affected by a widening scheme. A more radical solution would be to realign the highway using the fields to the northwest, to avoid impact on dwellings, which would be likely to have enough scope to deliver whatever capacity enhancement is required.

49) A6120 / A61 Harrogate Rd, Moortown (roundabout)

Constrained. There is a churchyard on the northeastern corner and the Scott Hall Road / Harrogate Road junction is in close proximity. There are significant banks of mature trees and retail premises on the south arm close to the highway. There is scope for some highway widening.

50) A6120 / A660 Otley Road, Lawnswood (roundabout)

Constrained. With the cancellation of the NGT scheme, which was proposing to signalise the roundabout and amend its geometry, Leeds City Council is considering the case for a lower impact scheme at this junction which can be delivered within the highway boundary which will increase capacity potential. Further enlargement outside of the highway boundary is constrained on the northwest corner by housing, but enlargement on the remaining corners may be possible with land take, noting that the impact on mature trees and school grounds is likely to be unacceptable unless significant benefits can be demonstrated.

51) A6110 / A643 Elland Road (S) (roundabout)

Constrained. Although there is scope for widening and enlarging the junction, the alignment of the A643 is at a skew angle which will limit widening options.

52) A61 / Alwoodley Lane (signalled junction)

Very constrained. The A61(N) arm is flanked closely by property which makes any widening impossible without significant acquisition and demolition. The remaining arms can only be widened by encroaching into private gardens, with a significant impact on established boundaries including hedges and mature trees. The eastern arm looks tight for space which is also likely to impact on potential improvement schemes.

53) B6126 Brunswick St / B6127 Chapel Hill, Morley (signalled junction)

Severely constrained. The junction is surrounded by buildings against the back of footway and the highway alignment and topography further make future (long term) prospects very limited.

54) A658 / B6152 Micklefield La, Rawdon (signalled junction)

Very constrained. Micklefield Lane is fronted by houses whilst the A658 is also residential in nature, although on the west side the buildings are slightly set back. Widening on the A658 would require removal of mature trees fronting the route and acquisition of front gardens and other land, although demolition may be avoidable.

55) A642 / B6137 Main St, Garforth (signalled junction)

Very constrained. There is an opportunity to realign the A642 west of the junction and Barrowby Lane (north arm) to create a staggered junction, which could release capacity. However, the B6137 Main Street is tightly constrained between buildings, as is the eastern arm of the A642. These latter constraints will constrain the overall benefit of a significant junction improvement.

56) A58 / A659 Harewood Rd, Collingham (priority junction)

Constrained. There is property very close to the existing highway on both sides of Harewood Road. Although there is slightly more scope for widening on the A58, the proximity of buildings around the junction make this look challenging to deliver. A scheme utilising Mill Lane, to relocate turning some movements, could be explored but this is still likely to require land and affect trees.

57) B6159 / Primrose Lane, Halton (signalled junction)

Very constrained. There is development on all corners of the junction which prohibits a whole-scale upgrade, although some widening may be possible without building demolition through use of Lidl car parking and private land. The Selby Road east arm, however, can only be widened a short way because of the retail centre / buildings.

58) A63 / B6137 Lidgett Lane, Garforth (signalled junction)

Very constrained. There appears to be some scope for widening the A63 on the public highway, but the presence of property right on the northeast corner and south side opposite it effectively make it unlikely without acquiring residential property.

59) A650 / Thorpe Lane, Tingley (signalled junction)

Unconstrained. Although there is housing on the south side, the north side is open fields, with scope for enlarging the junction. The staggered side road Smithy Lane could also possibly be widened through land acquisition from the adjacent Primary School.

60) A64 / B6159 Selby Road, "Halton Dial" (signalled junction)

Very constrained. The railway line and bridge immediately to the south is already a restriction on junction performance and operation, whilst the busier western arm of the A64 is flanked by housing, where some loss of bus lane or on-street parking would be required to facilitate any more traffic lanes.

61) A65 / A658 Green Lane, Rawdon (roundabout)

Constrained. There is scope for widening and/or reconfiguring the junction, the main constraint seems to be a church building on the eastern corner. Land take would likely be required.

62) A61 / A654 Leadwell Lane, Robin Hood (signalled junction)

Constrained. The Old Halfway House is right on the eastern corner of the junction. The western arm has property close to both sides. The northern arm could possibly be widened within the highway boundary, but widening of the southern arm will have an impact on adjacent properties (though without needing demolition).

63) A6120 / Roundhay Park La (signalled junction)

Unconstrained. There is a current scheme to be delivered as part of the East Leeds Orbital Route to increase capacity at this junction by increasing the number of lanes at the outer ring road stop lines. Further capacity increases could be undertaken but this would likely require the dualling of this section of the outer ring road, which could be undertaken on the current alignment (noting impact on trees) or the outer ring road could be realigned northwards in this area to reduce the impact on trees and reduce noise.

64) A639 / B6481 Pontefract Road (signalled junction)

Constrained. There could be some opportunities for acquiring adjacent land to enlarge the junction, with no demolition.

65) A61 / Wood Lane, Rothwell (signalled junction)

Unconstrained. There are open fields to the west and south of the junction, meaning realignment and widening of both the A61 and Wood Lane is possible.

66) A6110 / Millshaw Rd / White Rose (N) (roundabout)

Constrained. This five arm roundabout is constrained by houses to the east, topography and (to a lesser extent) office development to the west.

67) M1 (J44) / A639 Leeds Rd, Rothwell (signalled gyratory)

Unconstrained. Although the Motorway and overbridge are a constraint, there appears to be enough open land around the junction to the north and south to facilitate capacity improvements over and above the Pinch Point signalisation scheme recently implemented by Highways England in 2015.

68) A6120 / Coal Rd (signalled junction)

Unconstrained. The East Leeds Orbital Route scheme will remove traffic from this junction and therefore improved performance should result with no further interventions. However, should this be required there is land available on a wide verge on the western side of the outer ring road and, with some land acquisition and impact on mature trees, it should be possible to also widen or realign Coal Road.

69) Shadwell Lane / Wike Ridge Lane, Shadwell (signalled junction)

Very constrained. Surrounded by housing and some retail, any enhancement to this junction looks like it would have a significant effect on surrounding property.

70) A642 / Bullerthorpe Lane, Woodlesford (priority junction)

Very constrained. The location of property around the junction and its placement next to the bridge over the River Aire means that the site is very constrained and forming multiple lanes on the A642 seems undeliverable. An extra lane on the minor arm could be achievable subject to visibility issues.