

HIGH SPEED UK : J03

**Journey Time/Connectivity Comparisons
between HSUK/Network North and official
proposals for Northern rail network**

J03A Modelling of Northern network

J03B Assessment Methodology and Results

J03C Comparison of Direct Connectivity

J03D1 Improvement of Intercity Journey Times

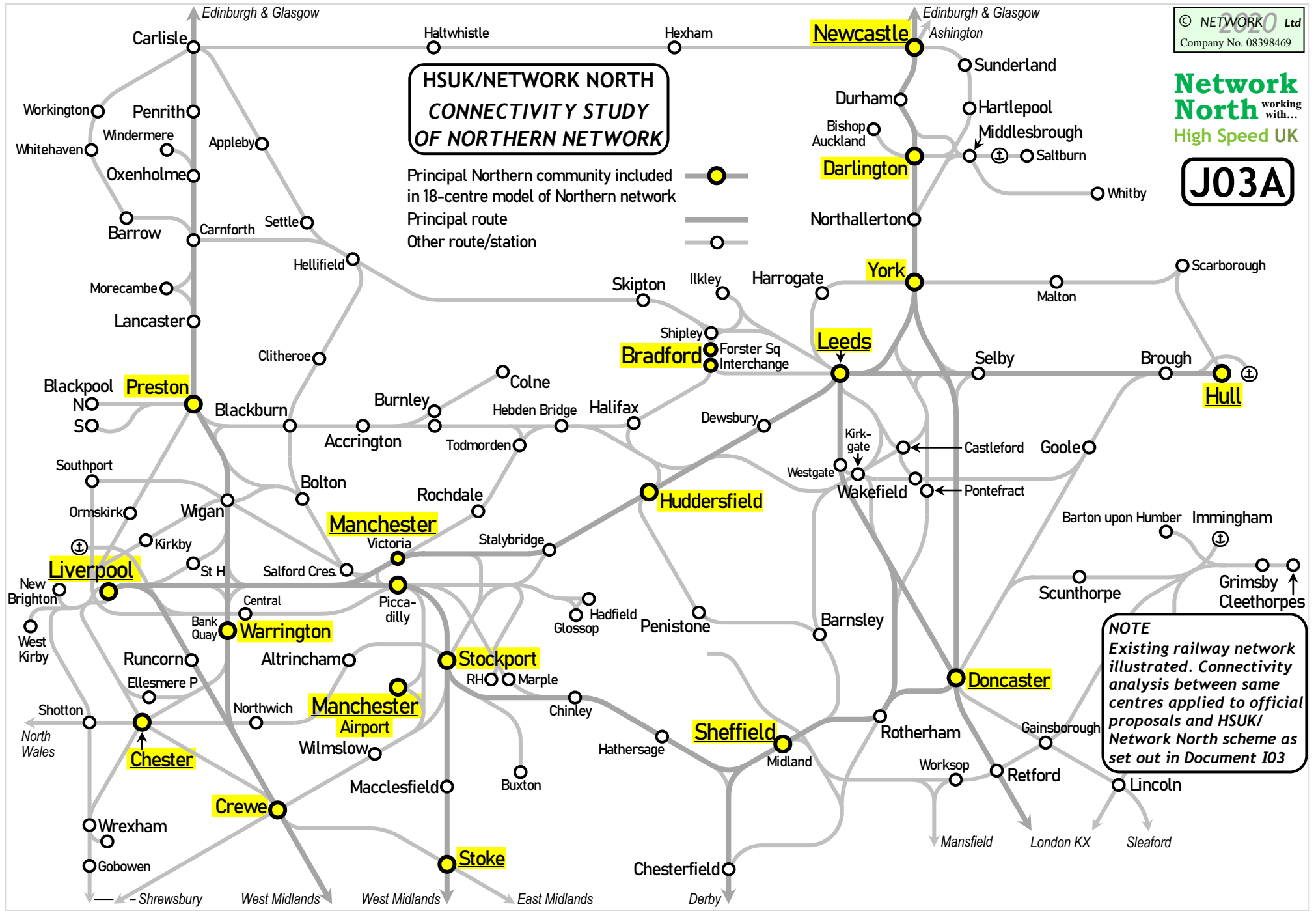
J03D2 Compliance with TfN Journey Time Spec

J03E Comparison with Journey Times by Road

April 2024 Update

**HSUK/NETWORK NORTH
CONNECTIVITY STUDY
OF NORTHERN NETWORK**

Principal Northern community included in 18-centre model of Northern network
Principal route
Other route/station



NOTE
Existing railway network illustrated. Connectivity analysis between same centres applied to official proposals and HSUK/Network North scheme as set out in Document I03

Methodology for Assessment of Connectivity

J03B

Connectivity is assessed according to 3 fundamental criteria:

1. Availability of direct, no change of trains, links between key cities;
2. Achievement of major journey time reductions across network;
3. Achievement of journey times similar to or superior to equivalent road journey.

Direct Links between Key Cities - see Figure J03C

For the existing network, and for the proposed HS2 and HSUK interventions (and all subsidiary projects), all possible journeys (153 journeys for an 18-centre network) are categorised by the number of changes required, and are scored as follows:

- 3 points for a direct journey - either existing or through the proposed intervention;
- 1 point for a journey requiring a single change of trains;
- 0 points for a journey requiring 2 or more changes.

Journey Times between Key Cities - see Figures J03D1 & J03D2

Journey times are derived as follows:

- For existing journeys: from national rail website (www.nationalrail.co.uk);
- For HS2 and subsidiary projects (i.e. Northern Powerhouse Rail & Midlands Rail Hub): either from official publicity or from HSUK assessment of proposed HS2 (et al) routes;
- For HSUK and subsidiary projects (i.e. TartanTrax, Network North & Midland Ring): from HSUK assessments of proposed HSUK routes, using bespoke software validated against HS2 proposed routes and claimed journey times.

Journey times are adjusted to allow for change of trains (20 minutes added for each change) and for frequency of service (30 minutes added for 2-hourly services, 1 hour for 3-hourly etc).

Comparison with Equivalent Road Journey - see Figure J03E

Journey times by road are obtained from Google Maps which automatically selects the quickest available route. These are measured between central railway stations in the origin and destination cities.

Results of Connectivity Assessment

Criteria	Case	North	Midlands	UK-wide	Scotland
Direct Connectivity (Figure J03C)	Existing Network	321 o/o 459 (70%)	67%	72%	48%
	HS2/NPR	347 o/o 459 (76%)	70%	73%	48%
	HSUK/Network North	431 o/o 459 (94%)	100%	95%	88%
Journey Time Reductions (Figure J03D1 & J03D2)	HS2/NPR	17% ave. JTR	9%	6%	0%
	NPR Compliance with TfN journey time targets	3 out of 14			
	HSUK/Network North	44% ave. JTR	58%	43%	43%
	NN Compliance with TfN journey time targets	12 out of 14			
Road Journey Comparisons (Figure J03E)	Existing Network	14 mins SLOWER	21 mins	11 mins	55 mins
	HS2/NPR	2 mins FASTER	16 mins	16 mins	55 mins
	HSUK/Network North	28 mins FASTER	20 mins	74 mins	1 min

Existing	ST	CW	CH	SK	MAN	MA	WA	PR	LI	DN	SH	HD	BD	LS	HU	YO	DL	NE			
Stoke	ST																				
Crewe		CW																			
Chester			CH																		
Stockport				SK																	
MAN Airport					MAN																
Manchester						MA															
Warrington							WA														
Preston								PR													
Liverpool									LI												
Doncaster										DN											
Sheffield											SH										
Huddersfield												HD									
Bradford													BD								
Leeds														LS							
Hull															HU						
York																YO					
Darlington																	DL				
Newcastle																		NE			

Direct existing journeys	85	3	255	ST
1 change required	66	1	66	CW
2 changes required	2	0	0	CH
Aggregate Connectivity Score				321
Max possible				459
%age				70%

Existing Connectivity Score : 321 out of 459 possible = 70%

HS2/NPR	ST	CW	CH	SK	MAN	MA	WA	PR	LI	DN	SH	HD	BD	LS	HU	YO	DL	NE			
Stoke	ST																				
Crewe		CW																			
Chester			CH																		
Stockport				SK																	
MAN Airport					MAN																
Manchester						MA															
Warrington							WA														
Preston								PR													
Liverpool									LI												
Doncaster										DN											
Sheffield											SH										
Huddersfield												HD									
Bradford													BD								
Leeds														LS							
Hull															HU						
York																YO					
Darlington																	DL				
Newcastle																		NE			

Direct HS2/NPR journeys	50	3	150	ST
Direct existing journeys	47	3	141	CW
1 change required	56	1	56	CH
2 changes required	0	0	0	SK
Aggregate Connectivity Score				347
Max possible				459
%age				76%

HS2/NPR/MRH Connectivity : 347 out of 459 possible = 76%

HSUK/NN	ST	CW	CH	SK	MAN	MA	WA	PR	LI	DN	SH	HD	BD	LS	HU	YO	DL	NE			
Stoke	ST																				
Crewe		CW																			
Chester			CH																		
Stockport				SK																	
MAN Airport					MAN																
Manchester						MA															
Warrington							WA														
Preston								PR													
Liverpool									LI												
Doncaster										DN											
Sheffield											SH										
Huddersfield												HD									
Bradford													BD								
Leeds														LS							
Hull															HU						
York																YO					
Darlington																	DL				
Newcastle																		NE			

Direct HSUK/NN journeys	128	3	384	ST
Direct existing journeys	11	3	33	CW
1 change required	14	1	14	CH
2 changes required	0	0	0	SK
Aggregate Connectivity Score				431
Max possible				459
%age				94%

HSUK/NN/MR Connectivity : 431 out of 459 possible = 94%

HS2/NPR	ST	CW	CH	SK	MAN	MA	WA	PR	LI	DN	SH	HD	BD	LS	HU	YO	DL	NE	
Stoke	ST	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.16	1.10	1.00	1.92	1.25	1.27	1.23	1.36	1.31	ST
Crewe	1.00	CW	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.24	1.13	1.00	2.00	1.22	1.37	1.21	1.38	1.31	CW
Chester	1.00	1.00	CH	1.00	1.00	1.00	1.00	1.00	1.00	1.14	1.05	1.00	1.00	1.00	1.27	1.00	1.00	1.00	CH
Stockport	1.00	1.00	1.00	SK	1.00	1.00	1.00	1.00	1.00	1.21	1.28	1.00	1.68	1.31	1.27	1.32	1.32	1.27	SK
MAN Airport	1.00	1.00	1.00	1.00	MAN	1.00	1.26	1.00	1.08	1.00	1.00	1.00	1.00	1.00	1.37	1.00	1.20	1.31	MAN
Manchester	1.00	1.00	1.00	1.00	1.00	MA	1.44	1.00	1.00	1.16	1.19	1.00	2.81	1.70	1.41	1.51	1.41	1.32	MA
Warrington	1.00	1.00	1.00	1.00	1.26	1.44	WA	1.00	1.53	1.06	1.00	1.00	2.21	2.27	1.95	2.17	1.91	1.75	WA
Preston	1.00	1.00	1.00	1.00	1.00	1.00	1.00	PR	1.00	1.09	1.09	1.00	1.00	1.00	1.18	1.14	1.32	1.07	PR
Liverpool	1.00	1.00	1.00	1.00	1.08	1.00	1.53	1.00	LI	1.16	1.00	1.00	2.25	1.23	1.58	1.24	1.24	1.22	LI
Doncaster	1.16	1.24	1.14	1.21	1.00	1.16	1.06	1.09	1.16	DN	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	DN
Sheffield	1.10	1.13	1.05	1.28	1.00	1.19	1.00	1.09	1.00	1.00	SH	1.00	1.19	1.03	1.00	1.00	1.00	1.00	SH
Huddersfield	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	HD	1.00	1.00	1.00	1.00	1.00	1.00	HD
Bradford	1.92	2.00	1.00	1.68	1.00	2.81	2.21	1.00	2.25	1.00	1.19	1.00	BD	2.71	1.95	2.00	1.86	1.57	BD
Leeds	1.25	1.22	1.00	1.31	1.00	1.70	2.27	1.00	1.23	1.00	1.03	1.00	2.71	LS	1.15	1.21	1.11	1.08	LS
Hull	1.27	1.37	1.27	1.27	1.37	1.41	1.95	1.18	1.58	1.00	1.00	1.00	1.95	1.15	HU	1.00	1.00	1.00	HU
York	1.23	1.21	1.00	1.32	1.00	1.51	2.17	1.14	1.24	1.00	1.00	1.00	2.00	1.21	1.00	YO	1.00	1.00	YO
Darlington	1.36	1.38	1.00	1.32	1.20	1.41	1.91	1.32	1.24	1.00	1.00	1.00	1.86	1.11	1.00	1.00	DL	1.00	DL
Newcastle	1.31	1.31	1.00	1.27	1.31	1.32	1.75	1.07	1.22	1.00	1.00	1.00	1.57	1.08	1.00	1.00	1.00	NE	NE
Global Average	1.20	1.15	1.17	1.03	1.16	1.07	1.29	1.44	1.05	1.21	1.07	1.06	1.00	1.71	1.31	1.28	1.24	1.24	1.19

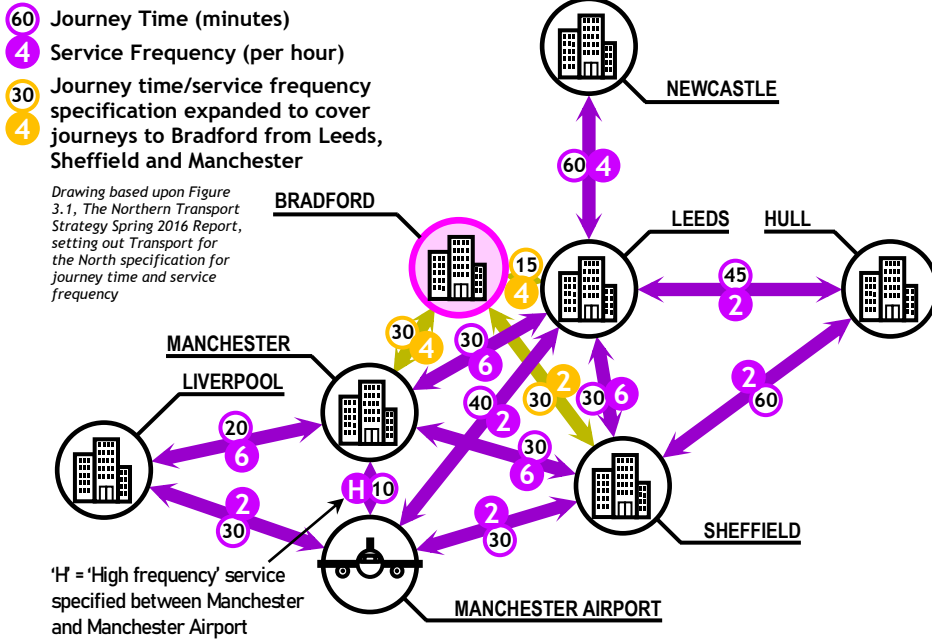
HS2/NPR Average Acceleration Factor = 1.21
Equivalent to Average Journey Time Reduction = 17%

HSUK/NN	ST	CW	CH	SK	MAN	MA	WA	PR	LI	DN	SH	HD	BD	LS	HU	YO	DL	NE	
Stoke	ST	2.67	2.84	1.16	2.78	1.25	4.01	2.36	2.48	1.34	1.87	1.18	1.90	1.96	1.56	1.87	1.90	1.89	ST
Crewe	2.67	CW	1.03	1.20	1.80	1.30	1.16	1.10	1.21	1.43	1.23	1.19	3.05	1.63	1.92	1.59	1.71	1.69	CW
Chester	2.84	1.03	CH	1.91	2.40	2.36	2.02	1.00	1.00	1.56	2.16	1.54	1.19	2.49	1.71	2.49	2.13	1.93	CH
Stockport	1.16	1.20	1.91	SK	4.87	1.05	1.28	1.89	1.89	1.59	1.58	2.44	2.15	3.23	2.24	2.62	2.14	2.05	SK
MAN Airport	2.78	1.80	2.40	4.87	MAN	1.00	3.16	1.88	2.61	1.91	2.18	1.23	2.22	1.83	2.18	1.71	1.78	1.97	MAN
Manchester	1.25	1.30	2.36	1.05	1.00	MA	2.05	1.38	1.81	1.95	2.25	1.00	1.99	1.98	1.72	1.76	1.56	1.63	MA
Warrington	4.01	1.16	2.02	1.28	3.16	2.05	WA	1.12	2.00	1.26	1.44	1.65	2.23	2.97	2.03	2.76	2.28	2.01	WA
Preston	2.36	1.10	1.00	1.89	1.88	1.38	1.12	PR	1.00	2.41	2.30	1.41	1.00	1.49	1.78	1.66	1.79	1.48	PR
Liverpool	2.48	1.21	1.00	1.89	2.61	1.81	2.00	1.00	LI	2.03	2.52	1.00	2.68	1.87	2.21	1.77	1.62	1.68	LI
Doncaster	1.34	1.43	1.56	1.59	1.91	1.95	1.26	2.41	2.03	DN	1.37	1.04	1.00	1.00	1.28	1.07	1.28	1.44	DN
Sheffield	1.87	1.23	2.16	1.58	2.18	2.25	1.44	2.30	2.52	1.37	SH	2.98	3.60	2.13	1.43	1.34	1.25	1.37	SH
Huddersfield	1.18	1.19	1.54	2.44	1.23	1.00	1.65	1.41	1.00	1.04	2.98	HD	1.00	1.00	1.00	1.00	1.00	1.02	HD
Bradford	1.90	3.05	1.19	2.15	2.22	1.99	2.23	1.00	2.68	1.00	3.60	1.00	BD	1.23	1.86	1.73	1.74	1.71	BD
Leeds	1.96	1.63	2.49	3.23	1.83	1.98	2.97	1.49	1.87	1.00	2.13	1.00	1.23	LS	1.45	1.49	1.21	1.39	LS
Hull	1.56	1.92	1.71	2.24	2.18	1.72	2.03	1.78	2.21	1.28	1.43	1.00	1.86	1.45	HU	1.75	2.18	2.16	HU
York	1.87	1.59	2.49	2.62	1.71	1.76	2.76	1.66	1.77	1.07	1.34	1.00	1.73	1.49	1.75	YO	1.02	1.32	YO
Darlington	1.90	1.71	2.13	2.14	1.78	1.56	2.28	1.79	1.62	1.28	1.25	1.00	1.74	1.21	2.18	1.02	DL	1.87	DL
Newcastle	1.89	1.69	1.93	2.05	1.97	1.63	2.01	1.48	1.68	1.44	1.37	1.02	1.71	1.39	2.16	1.32	1.87	NE	NE
Global Average	1.79	2.06	1.58	1.87	2.07	2.21	1.65	2.08	1.59	1.85	1.47	1.94	1.33	1.90	1.79	1.79	1.70	1.67	1.68

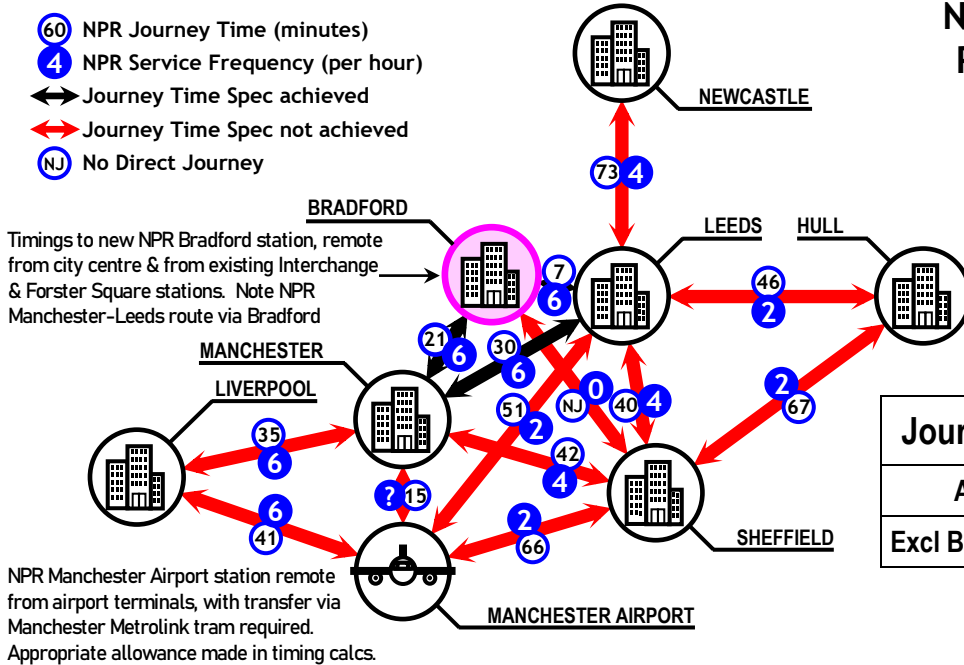
HSUK/NN/MR Average Acceleration Factor = 1.79
Equivalent to Average Journey Time Reduction = 44%

Transport for the North Specification for Intercity Journey Time & Service Frequency (March 2016)

J03D2

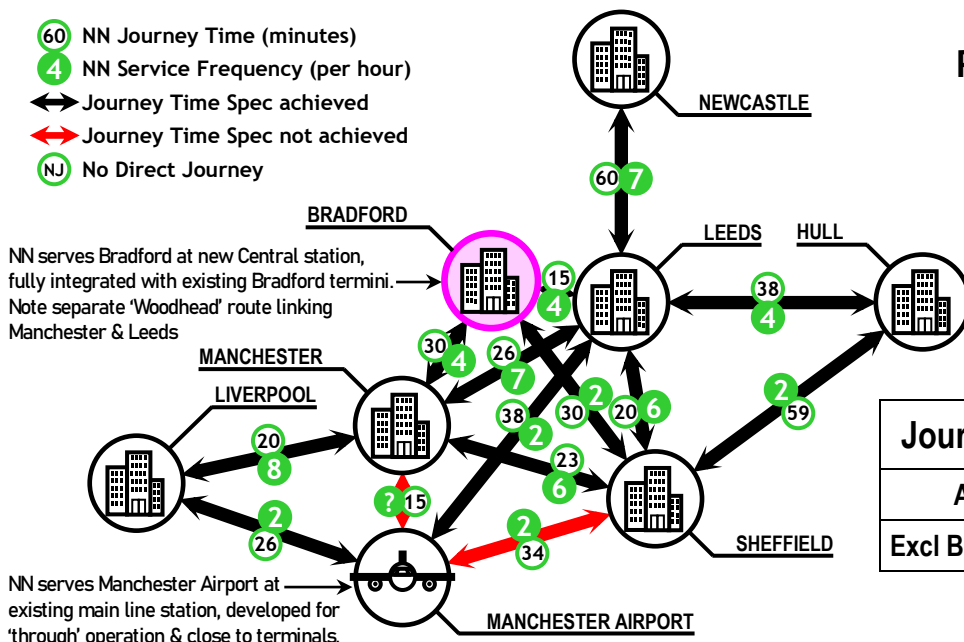


Northern Powerhouse Rail Performance against TfN Journey Time / Service Specification (April 2024)



Journeys	Meeting JT spec	Failing JT spec	Total
All	3	11	14
Excl Bradford	1	10	11

Network North (NN) Performance against TfN Journey Time / Service Specification (April 2024)



Journeys	Meeting JT spec	Failing JT spec	Total
All	12	2	14
Excl Bradford	9	2	11

Existing	ST	CW	CH	SK	MAN	MA	WA	PR	LI	DN	SH	HD	BD	LS	HU	YO	DL	NE	
Stoke	ST	-2	-28	30	-31	25	-55	-37	-34	-40	-12	-16	-80	-23	-49	-22	-40	-31	ST
Crewe	-2	CW	21	25	9	17	18	27	21	-24	3	-23	-93	-31	-72	-28	-50	-39	CW
Chester	-28	21	CH	-31	-38	-12	0	-10	-6	-72	-40	-59	-30	-48	-70	-61	-58	-52	CH
Stockport	30	25	-31	SK	-18	13	2	-23	-13	18	28	-28	-88	-31	-36	-33	-23	-23	SK
MAN Airport	-31	9	-38	-18	MAN	7	-27	-4	-18	-13	2	3	-70	-5	-49	-2	-17	-28	MAN
Manchester	25	17	-12	13	7	MA	6	6	12	3	17	16	-7	8	2	7	14	22	MA
Warrington	-55	18	0	2	-27	6	WA	21	6	-33	16	-48	-22	-44	-70	-54	-56	-52	WA
Preston	-37	27	-10	-23	-4	6	21	PR	-5	-49	-12	-40	-2	-20	-55	-22	-78	-31	PR
Liverpool	-34	21	-6	-13	-18	12	6	-5	LI	-48	4	1	-61	-5	-52	0	0	7	LI
Doncaster	-40	-24	-72	18	-13	3	-33	-49	-48	DN	7	-26	-37	23	8	38	36	48	DN
Sheffield	-12	3	-40	28	2	17	16	-12	4	7	SH	-28	-37	5	-11	24	32	40	SH
Huddersfield	-16	-23	-59	-28	3	16	-48	-40	1	-26	-28	HD	-16	14	7	15	17	21	HD
Bradford	-80	-93	-30	-88	-70	-7	-22	-2	-61	-37	-37	-16	BD	3	-34	-4	-19	-7	BD
Leeds	-23	-31	-48	-31	-5	8	-44	-20	-5	23	5	14	3	LS	12	16	20	31	LS
Hull	-49	-72	-70	-36	-49	2	-70	-55	-52	8	-11	7	-34	12	HU	-6	-22	-15	HU
York	-22	-28	-61	-33	-2	7	-54	-22	0	38	24	15	-4	16	-6	YO	39	46	YO
Darlington	-40	-50	-58	-33	-17	14	-56	-78	0	36	32	17	-19	20	-22	39	DL	23	DL
Newcastle	-31	-39	-52	-23	-28	22	-52	-31	7	48	40	21	-7	31	-15	46	23	NE	NE
	ST	CW	CH	SK	MAN	MA	WA	PR	LI	DN	SH	HD	BD	LS	HU	YO	DL	NE	
-14.2	-26	-13	-35	-14	-18	9	-23	-20	-11	-9	2	-11	-36	-4	-30	-3	-11	-2	

Global Average Average JOURNEY TIME DIFFERENTIALS (MINUTES) Average

Existing Average Rail Journey Time 14min slower than by road

HS2/NPR	ST	CW	CH	SK	MAN	MA	WA	PR	LI	DN	SH	HD	BD	LS	HU	YO	DL	NE	
Stoke	ST	-2	-28	30	-31	25	-55	-37	-34	-22	-3	-16	3	2	-8	7	15	26	ST
Crewe	-2	CW	21	25	9	17	18	27	21	4	15	-23	-4	-9	-13	-3	7	18	CW
Chester	-28	21	CH	-31	-38	-12	0	-10	-6	-49	-34	-59	-30	-48	-25	-61	-58	-52	CH
Stockport	30	25	-31	SK	-18	13	2	-23	-13	30	37	-28	-28	-9	-3	-4	5	17	SK
MAN Airport	-31	9	-38	-18	MAN	7	-17	-4	-14	-13	2	3	-70	-5	-4	-2	8	20	MAN
Manchester	25	17	-12	13	7	MA	13	6	12	14	25	16	31	29	35	33	46	57	MA
Warrington	-55	18	0	2	-17	13	WA	21	15	-25	16	-48	29	21	26	30	35	45	WA
Preston	-37	27	-10	-23	-4	6	21	PR	-5	-36	-2	-40	-2	-20	-26	-5	-29	-19	PR
Liverpool	-34	21	-6	-13	-14	12	15	-5	LI	-26	4	1	15	11	18	22	29	40	LI
Doncaster	-22	4	-49	30	-13	14	-25	-36	-26	DN	7	-26	-37	23	8	38	36	48	DN
Sheffield	-3	15	-34	37	2	25	16	-2	4	7	SH	-28	-22	6	-11	24	32	40	SH
Huddersfield	-16	-23	-59	-28	3	16	-48	-40	1	-26	-28	HD	-16	14	7	15	17	21	HD
Bradford	3	-4	-30	-28	-70	31	29	-2	15	-37	-22	-16	BD	15	20	24	29	42	BD
Leeds	2	-9	-48	-9	-5	29	21	-20	11	23	6	14	15	LS	19	20	25	37	LS
Hull	-8	-13	-25	-3	-4	35	26	-26	18	8	-11	7	20	19	HU	-6	-22	-15	HU
York	7	-3	-61	-4	-2	33	30	-5	22	38	24	15	24	20	-6	YO	39	46	YO
Darlington	15	7	-58	5	8	46	35	-29	29	36	32	17	29	25	-22	39	DL	23	DL
Newcastle	26	18	-52	17	20	57	45	-19	40	48	40	21	42	37	-15	46	23	NE	NE
	ST	CW	CH	SK	MAN	MA	WA	PR	LI	DN	SH	HD	BD	LS	HU	YO	DL	NE	
1.9	-8	7	-31	0	-10	22	7	-12	5	-1	6	-11	0	8	0	13	14	23	

Global Average Average JOURNEY TIME DIFFERENTIALS (MINUTES) Average

HS2/NPR Average Rail Journey Time 2min faster than by road

HSUK/NN	ST	CW	CH	SK	MAN	MA	WA	PR	LI	DN	SH	HD	BD	LS	HU	YO	DL	NE	
Stoke	ST	12	26	33	22	32	20	29	25	-6	35	0	2	38	20	48	57	81	ST
Crewe	12	CW	22	29	25	25	20	31	27	18	22	-7	27	15	32	26	36	58	CW
Chester	26	22	CH	6	7	25	14	-10	-6	-3	40	-12	-12	34	19	47	55	67	CH
Stockport	33	29	6	SK	8	13	9	12	17	43	43	16	-9	33	49	42	51	74	SK
MAN Airport	22	25	7	8	MAN	7	8	23	22	35	41	12	1	26	42	37	48	70	MAN
Manchester	32	25	25	13	7	MA	18	17	27	41	45	16	22	33	49	40	54	78	MA
Warrington	20	20	14	9	8	18	WA	24	19	-5	39	-8	29	33	30	46	51	62	WA
Preston	29	31	-10	12	23	17	24	PR	-5	45	59	-9	-2	14	30	36	12	33	PR
Liverpool	25	27	-6	17	22	27	19	-5	LI	33	69	1	25	35	52	49	57	81	LI
Doncaster	-6	18	-3	43	35	41	-5	45	33	DN	13	-23	-37	23	19	39	48	74	DN
Sheffield	35	22	40	43	41	45	39	59	69	13	SH	25	32	27	15	36	48	70	SH
Huddersfield	0	-7	-12	16	12	16	-8	-9	1	-23	25	HD	-16	14	7	15	17	24	HD
Bradford	2	27	-12	-9	1	22	29	-2	25	-37	32	-16	BD	6	17	20	25	49	BD
Leeds	38	15	34	33	26	33	33	14	35	23	27	14	6	LS	29	24	29	54	LS
Hull	20	32	19	49	42	49	30	30	52	19	15	7	17	29	HU	22	55	78	HU
York	48	26	47	42	37	40	46	36	49	39	36	15	20	24	22	YO	40	60	YO
Darlington	57	36	55	51	48	54	51	12	57	48	48	17	25	29	55	40	DL	36	DL
Newcastle	81	58	67	74	70	78	62	33	81	74	70	24	49	54	78	60	36	NE	NE
	ST	CW	CH	SK	MAN	MA	WA	PR	LI	DN	SH	HD	BD	LS	HU	YO	DL	NE	
28.2	28	25	19	28	26	32	24	20	31	21	39	4	11	28	33	37	42	62	

Global Average Average JOURNEY TIME DIFFERENTIALS (MINUTES) Average

HSUK/NN Average Rail Journey Time 28min faster than by road