Item 6 – TRU Update - Appendix

Trans-Pennine Route Upgrade (TRU): West Yorkshire's Ambition

Technical note

0. Summary

This note is concerned with identifying what the optimal balance of rail services should be on the post-TRU York/Selby – Leeds – Huddersfield – Manchester line. It analyses the nature of the population and employment patterns on the TRU corridor as it passes through West Yorkshire, and the travel-to-work patterns to which they give rise, as well as giving an overview of the socio-economic nature of the stations' catchments and of future developments likely to influence travel patterns. It also considers existing policy and the empirical evidence on which that is based, plus evidence from industry-standard rail market analysis and demand forecasting as to what service patterns are likely to be successful in terms of providing an attractive service to the markets identified. The main findings are that, from West Yorkshire's point of view:

(a) There need to be "true" local services provided, stopping at all stations and operating on a regular clockface of at least 2tph, with additional capacity provided in the peaks and greatly improved levels of reliability over the present standards; there is a case to move towards 4tph on local services in the longer term, to provide the S-Bahn-style (i.e. metro) walk-up-and-go frequencies that unlock the highest levels of connectivity and opportunity.

(b) The markets for local services are already significant but are poorly served, with some stations only having one train per hour and some local journeys being practically impossible by rail, in particular since the May 2018 timetable changes. As such, demand is being suppressed. Skip-stopping, "tidal" or other compromised service patterns will not be suitable for these flows.

(c) These local markets are expected to see significant growth driven by exogenous factors such as housing growth clustering around stations in locations such as Ravensthorpe, East Garforth and Brighouse (amongst others), and continued employment growth concentrated on the centres of Leeds, Huddersfield and to an extent Dewsbury, in locations that will disproportionately attract rail-borne commuting, as well as around the new stations at Thorpe Park and White Rose.

(d) Balanced against this, there clearly needs to be high-quality, fast, reliable and high-capacity intercity connectivity between Leeds and Manchester, serving Huddersfield and extending to the main centres to the east and west, and with a balance between the Manchester destinations. However, from an interurban connectivity point of view, it is not clear that there is a strong case for more than four such trains per standard hour; or rather, if, as appears likely, providing more than this in an affordable manner would lead to sacrifices in local connectivity (where frequency is all-important), then it appears likely that priority should be given to the local services as against exceeding 4tph for intercity services.

Initial analysis carried out by WYCA suggests that, while the above service pattern differs from that which was assumed by Network Rail in its timetable development work for TRU, it appears likely that a similar level and type of infrastructure to that assumed by NR in that work would also be capable of delivering WYCA's preferred service outcome. While further work needs to be carried out to verify this, it leads towards the conclusion that the level and type of TRU infrastructure intervention which we understand to be favoured by TfN would also be appropriate to deliver a service concept compatible with WYCA's priorities. This leads WYCA to agree with the broad infrastructure configuration for TRU that we understand to be proposed by TfN, and therefore to support its development through the business case process.

Overview

0.1. The purpose of this analysis is to consider, by going back to first principles and considering the available evidence, what West Yorkshire's requirements should be in terms of the balance of different types of passenger train service on the TRU route. In broad terms, the different types of passenger train services that are in scope fall into the following categories:

- Express intercity services;
- Local stopping services; and
- Other trains that use part of the route.

By following this approach, it should help to answer, from a WYCA point of view, the question: "What does success on TRU look like?" While freight requirements have not been analysed in the same degree of detail, its critical importance is fully recognised (see section 2.2 below).

0.2. In support of this, several types of analysis have been undertaken:

- Socio-economic profiles of the catchments of stations on the route
- Travel to work patterns, with regard to future expected population changes, to identify the relative strengths of future flows
- Spatial planning: district-level overviews
- Impacts of new stations
- Existing policies and evidence base
- Evidence of future peak train capacity requirements
- Transport planning evidence (PDFH)

0.3. While detailed reporting on timetable analysis is beyond the scope of this note, we have also begun to consider the extent to which it would appear feasible to operate a service pattern that achieves the right balance of services over the route from WYCA's standpoint, without implying significantly infrastructure interventions under TRU that are significantly different in scope, extent or nature from that assumed by Network Rail's timetable development work so far and by TfN's vision of TRU. We summarise our findings so far.

0.4. This note sets out the approach taken within the analysis and sets out the headline findings to support the wider considerations.

1. Scope

1.1. The geographic scope of TRU itself forms the background to this note; that is: Manchester (both Piccadilly and Victoria for our purposes) through Stalybridge, Huddersfield and Leeds to York and Selby. The scope of this note is therefore all train services that normally use any of this route and are directly relevant to West Yorkshire (but not those that do not touch the county, such as Stalybridge – Manchester – Liverpool stoppers – these may be of indirect relevance and interest to the West Yorkshire, but are likely to be adequately addressed by work done by TfGM, Merseytravel and other colleagues). We therefore focus on the following present or future services:

- **Express intercity** services travelling over the route. Is it to be expected that these will run to Liverpool, Manchester Airport, Hull, Newcastle and Teesside. They may also directly serve Scarborough or Edinburgh.
- **Local stopping** services wholly or largely running within the core TRU geography, including York/[Hull –] Selby to Leeds, Leeds to Huddersfield, Huddersfield to Manchester stations (and Salford) – which may or may not run through across Leeds, Huddersfield and Manchester.

1.2. While **freight** is not analysed in detail in this note, WYCA firmly recognises the economic and environmental case for railfreight, with supporting evidence in the Yorkshire Rail Network Study, the Long-Term Rail Strategy, and trans-Pennine connectivity studies. It is therefore essential that TRU make adequate provision for freight paths across the Pennines. These paths need to be commercially attractive to operators in terms of speed and time of day, sufficient in number to accommodate future economic needs and modal shift from M62, and over routes able to accommodate trains of the weight/axle-weight, length and loading-gauge required. While the TRU route itself is not necessarily the only or the complete solution, we consider it highly likely that a viable hourly path over a W12-cleared Diggle line will be an essential part of that future provision. We note also the synergy between the activities required for gauge-clearance and electrification.

1.3. The importance of the following other passenger services, which use the TRU route and stations for part of their journeys, is also recognised and cannot be ignored by TRU planning, though they do not form the main focus of this note:
- Huddersfield – Penistone – Sheffield
- Huddersfield – Brighouse – Halifax – Bradford – Leeds
- Huddersfield to Wakefield and the Five Towns
- Huddersfield – Leeds – London
- Huddersfield – Brighouse – Upper Calder Valley
- Leeds – Dewsbury – Brighouse – Upper Calder Valley – Manchester (and beyond)
- Calder Valley – Bradford – Leeds – York (and beyond)

1.4. Accordingly, the following stations have been considered in scope for these purpose:

Table 1: Stations in scope along the route:

Manchester Piccadilly	Deighton	Cross Gates
Manchester Victoria	Brighouse	Garforth
Ashton-under-Lyne	Mirfield	East Garforth
Stalybridge	Ravensthorpe	Micklefield
Mossley	Dewsbury	South Milford
Greenfield	Batley	Selby
Slaithwaite	Morley	Church Fenton
Marsden	Cottingley	Ulleskelf
Huddersfield	Leeds	York

1.5. This note attempts to set out what balance of services should be the aim for the TRU specification, and why. It does not go into detail on the “how”, such as:

- Detailed pattern of the timetables: while we recognise the very strong case for timetable structures which optimise travel opportunities by easing interchange through timetable and infrastructure design, and wish to see it guiding TRU particularly at obvious interchange nodes like Huddersfield, detailed timetable planning is beyond the scope of this note.
- Electrification: While there is a very strong body of evidence to support the contention that attempting to operate a busy mixed-traffic railway across the Pennines without electrification would be inefficient, unreliable, uneconomical and unsustainable, the specific case for electrification is again beyond the present scope of this note.
- Infrastructure specification: Devising specific solutions to provide what is identified in this note is clearly beyond its scope.

1.6. Finally, a detailed analysis of **performance** (punctuality and reliability) and its importance to the socio-economic successful of rail is not in scope, but we emphasise that addressing the deep-seated issues affecting the route at present must be a priority for TRU – but this cannot be at the cost of getting the right balance on connectivity and service outputs.

2. Socio-economic headlines

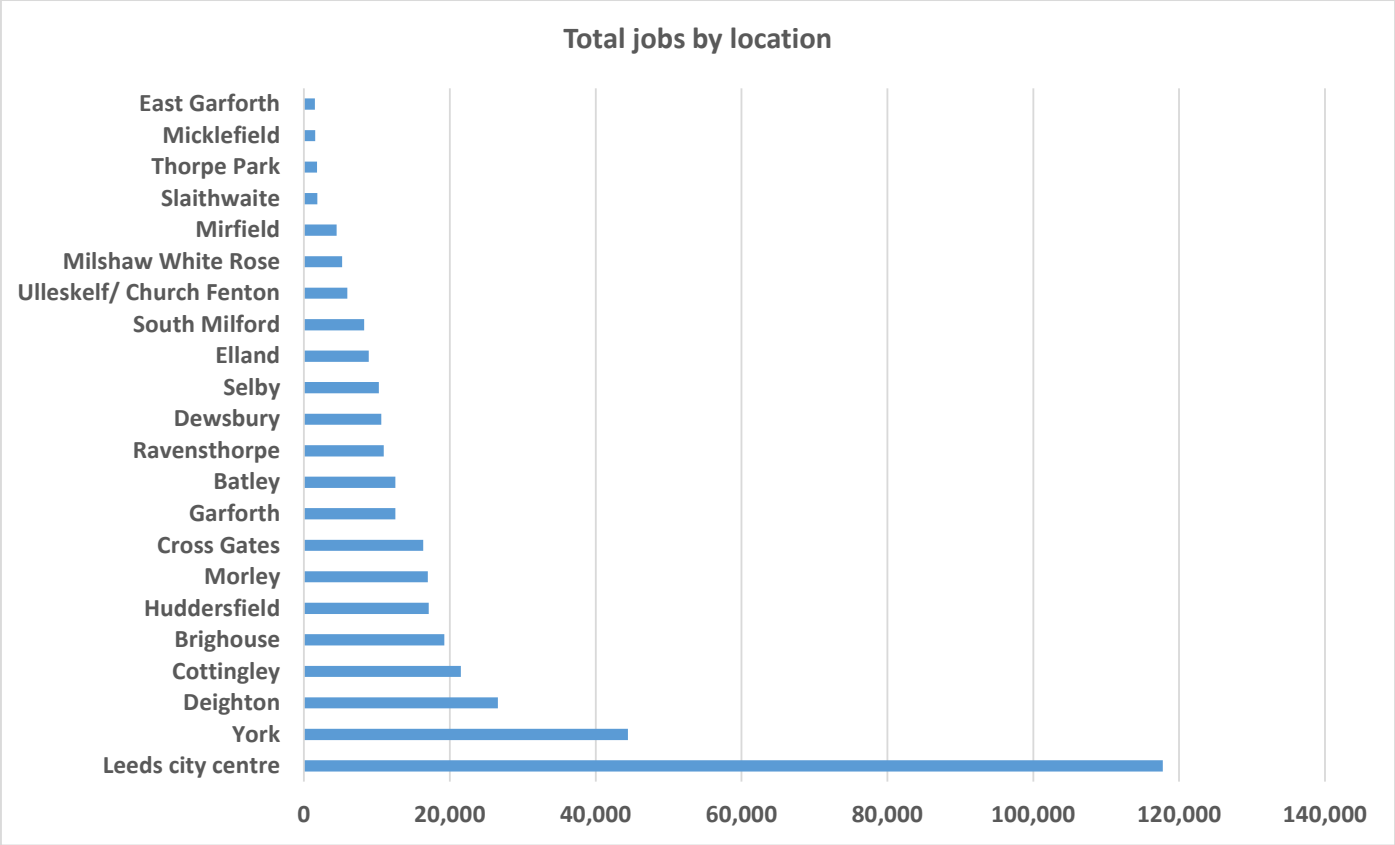
2.1. This section profiles the selected placement catchments:

- As local employment centres
- Resident based characteristics
- Travel to work (by rail)

(a) Local economies: jobs and businesses

2.2. The analysis shows that the towns and areas (without Leeds and York city centres) surrounding local stations on route of the TRU contain 215,000 jobs and 17,000 businesses. Therefore it is critical that these areas are adequately served by appropriate transport links. Principal employment centres include Deighton, Cottingley, Brighouse and Morley, as well as central Huddersfield. However, all areas have local economies that need to be both protected and ideally enhanced.

Figure 1: Total jobs in station catchments



2.3. The range of sectors varies on the route, and includes some principal manufacturing centres, as well as areas whose focus is both office jobs, and other sectors such as primary industries, retail, wholesale and logistics.

(b) Labour markets and deprivation

2.4. There are approximately 400,000 people living within these station catchment areas, again excluding York and Leeds themselves. While local residents live in a variety of socio-economic contexts along the route, the route includes a number of the most deprived and lowest-income areas in the country. 2015 IMD data includes the following (several stations appear more than once, because each relevant neighbourhood[1] is shown separately):

[1] Attribution of each neighbourhood to station catchments has been carried out based on our modelling assumptions.

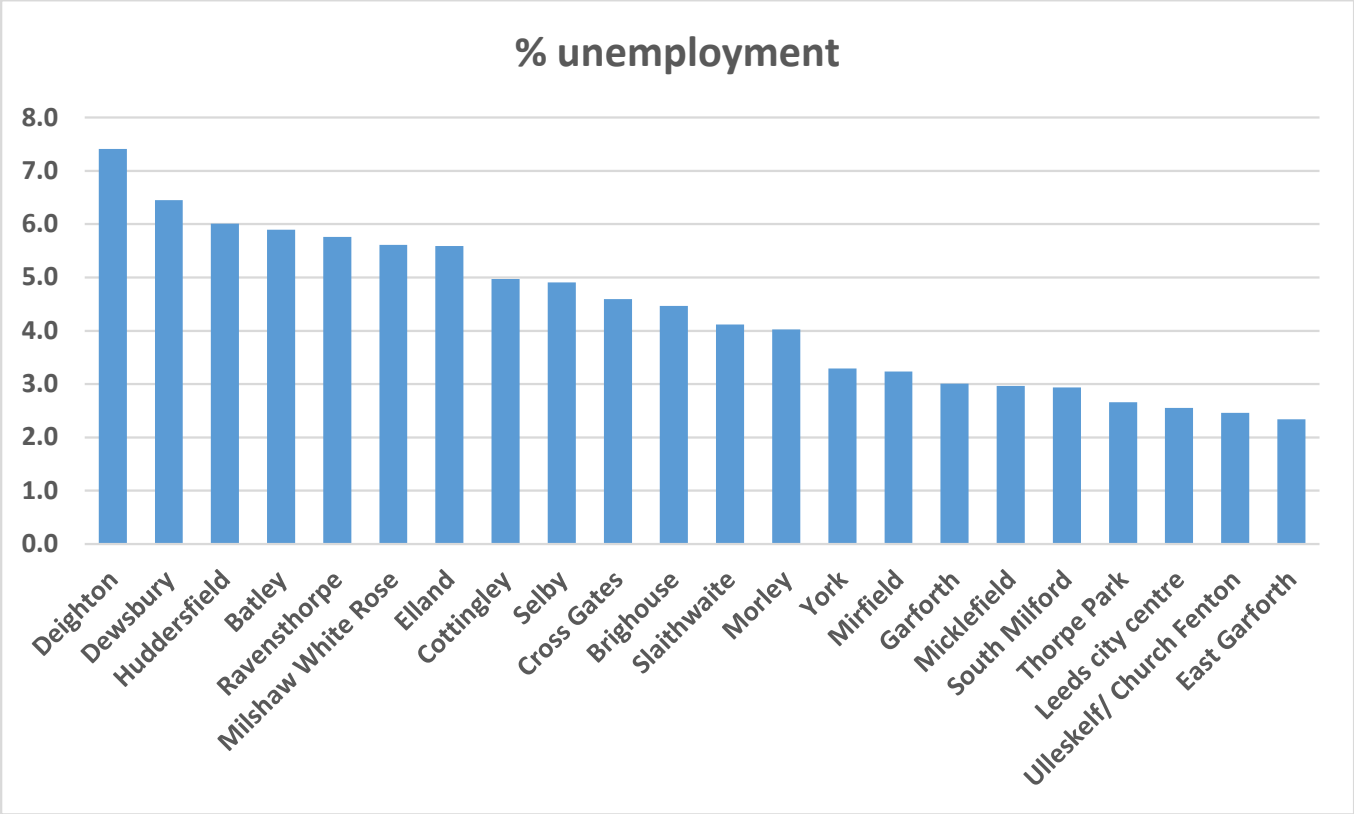
Table 2: High-deprivation neighbourhoods in TRU station catchments:

Station	District	IMD
Cross Gates	Leeds	Top 1%
Cottingley	Leeds	Top 5%
Cross Gates	Leeds	Top 5%
Cross Gates	Leeds	Top 5%
Batley	Kirklees	Top 5%
Deighton	Kirklees	Top 5%
Huddersfield	Kirklees	Top 5%
Deighton	Kirklees	Top 5%
Dewsbury	Kirklees	Top 5%
Dewsbury	Kirklees	Top 5%
Dewsbury	Kirklees	Top 5%
Dewsbury	Kirklees	Top 5%
Cottingley	Leeds	Top 10%
Cottingley	Leeds	Top 10%
Cross Gates	Leeds	Top 10%
Cottingley	Leeds	Top 10%
Brighouse	Calderdale	Top 10%
Batley	Kirklees	Top 10%
Huddersfield	Kirklees	Top 10%
Huddersfield	Kirklees	Top 10%
Deighton	Kirklees	Top 10%
Deighton	Kirklees	Top 10%
Deighton	Kirklees	Top 10%
Ravensthorpe	Kirklees	Top 10%
Ravensthorpe	Kirklees	Top 10%
Ravensthorpe	Kirklees	Top 10%
Ravensthorpe	Kirklees	Top 10%

2.5. This underlines that parts of Cross Gates, Cottingley, Batley, Dewsbury and Ravensthorpe in particular are amongst the most deprived areas in the country. At present, Cottingley Ravensthorpe, and to an extent Batley, have relatively poor rail services in terms of frequency and quality, and WYCA considers addressing this contributor to poor access to opportunity, and so to perpetuating deprivation, to be a priority.

2.6. Many of these areas also suffer from relatively high levels of unemployment and economic inactivity – as shown below

Figure 2: Unemployment rates in station catchments



(c) Summary

The high-level analysis above[2] underlines that there is significant employment not only in the main centres served by intercity trains, with clear potential for rail to perform better in commuting, if local services were more attractive in terms of frequency, regularity and reliability. This would not only yield modal-shift benefits, but would also link deprived communities with low levels of car ownership to further job opportunities – in turn expanding the pool of labour available to the businesses concerned. The high levels of unemployment around locations such as Batley and Ravensthorpe underline the importance of this priority.

3. Travel to work analysis

3.1. This analysis seeks to understand travel to work patterns along the route (both current and future) to help, in part, to identify the mix of passenger service types that best suits the needs of the region.

(a) Methodology

3.2. Data on current travel to work flows was sourced from the 2011 Census. Data used was for origin-destination flows, disaggregated by mode, at MSOA level, and extracted for the catchments of stations considered in scope along the TRU route (see **Table 1** above).

3.3. Flows selected for analysis were those where the population-weighted centroid of both origin and destination MSOAs fall within 3km of one of the stations in scope. MSOAs allocated to the nearest station where catchments overlap.

[2] More detailed data is available and analysis can be provided.

3.4. A small number of practical adjustments have been made to improve the quality of the analysis, including:

- Manchester stations combined into one catchment – referred to in this analysis as 'XMC';
- Garforth stations combined into one catchment – referred to in this analysis as 'XGF';
- Reallocation of one MSOA in Huddersfield town centre which fell marginally to Deighton due to use of population weighted centroids;
- Reallocation of one MSOA to Micklefield from being out of scope; and
- Ulleskelf catchment merged into Church Fenton catchment due to very low catchment population.

3.5. The specification outlined above was used to produce matrices of origin-destination commuting flows between station pairs.

3.6. The high-level methodology developed here is appropriate considering the nature of the task in hand and the timescales available. There are, however, a number of limitations that should be kept in mind, including:

- Analysis based on Census travel to work data which does not identify the specific origin and destination stations used by rail commuters – this is instead inferred using simple catchment analysis (even so, this analysis has the advantage that it does not suffer the difficulties that Moira data does in assigning zonal Metro ticketing to specific journeys);
- Data from the 2011 Census is somewhat out-dated at present – although it is still widely applied and represents a comprehensive picture of commuting trips;
- Travel to work flows clearly do not capture wider journey purposes such as travel for leisure, business, or education – this could have important implications for the route being considered;
- The simple catchment analysis does not attempt to capture wider catchment impacts – for example longer distance park and ride access at stations such as Garforth;
- The assessment does not attempt to consider the impacts of new stations on the route – namely Thorpe Park, White Rose, and Elland;
- The assessment of expected future changes captures the impact of proposed employment and housing development at a high-level – but does not attempt to capture the impact of wider background growth on the rail network.

(b) Findings – current patterns

3.7. This section draws out the headline findings from the analysis of current travel to work patterns along the TRU route. The findings here are supported by a range of matrix outputs included on the following pages.

Travel to work flows – current – rail (Census 2011)

3.8. For rail, headline findings have been drawn from the travel to work matrix presented within **Figure 3**[3].

Figure 3: Travel to work flows – current – rail (Census 2011)

O / D	XMC	SWT	MSN	HUD	DHN	BGH	MIR	RVN	DEW	BTL	MLY	COT	LDS	CRG	XGF	MIK	SOM	SBY	CHF	YRK	Total
XMC	-	0	1	24	2	0	1	0	0	0	1	2	67	0	1	0	0	0	0	2	101
SWT	24	-	6	85	6	0	1	3	5	0	2	3	97	1	1	0	0	0	0	2	236
MSN	53	7	-	78	5	2	0	2	6	0	0	2	48	0	2	0	1	0	0	1	207
HUD	110	9	3	-	9	3	7	7	68	21	9	29	624	4	5	1	0	1	0	11	921
DHN	20	0	0	29	-	1	2	0	7	2	2	1	104	2	0	0	0	0	0	0	170
BGH	13	0	0	11	1	-	1	0	6	2	3	3	104	1	0	0	0	0	0	5	150
MIR	10	2	1	38	1	3	-	3	12	12	9	4	189	1	0	0	0	0	0	2	287
RVN	2	0	1	28	1	1	1	-	6	8	3	10	136	0	0	0	0	0	0	3	200
DEW	14	0	1	69	2	0	2	4	-	2	0	4	233	1	1	0	0	0	0	10	343
BTL	8	0	0	53	3	4	3	11	11	-	3	11	237	4	2	0	0	0	0	4	354
MLY	11	0	0	14	0	0	2	1	13	7	-	1	203	1	1	0	0	1	0	10	265
COT	5	0	0	10	1	1	0	3	3	2	1	-	91	2	5	0	0	0	0	13	137
LDS	68	4	0	79	0	2	1	7	26	11	19	17	-	17	12	4	0	3	2	110	382
CRG	10	1	1	16	1	0	0	3	4	5	4	7	348	-	14	2	1	2	1	20	440
XGF	5	0	0	9	0	0	0	0	1	1	9	15	738	39	-	1	2	3	0	27	850
MIK	2	0	0	1	0	0	0	0	1	0	0	4	58	0	4	-	0	0	0	5	75
SOM	2	0	0	1	0	0	0	0	1	0	0	1	144	1	0	0	-	3	2	34	189
SBY	6	0	0	0	1	0	0	0	0	0	1	3	167	2	1	0	1	-	1	59	242
CHF	4	0	0	1	1	0	0	1	0	0	0	1	77	0	0	0	5	3	-	43	136
YRK	23	0	1	27	0	0	0	3	6	0	6	9	711	5	5	1	1	8	4	-	810
Total	390	23	15	573	34	17	21	48	176	73	72	127	4,376	81	54	9	11	24	10	361	**6,495**

3.9. Summary of significant destinations:

- Flows into Leeds as the most significant destination by some margin;
- Substantial flows into centres of Huddersfield, York, and Manchester; and
- Notable flows into Dewsbury, Cottingley (covering areas south of Leeds), and Cross Gates (covering areas east of Leeds).

3.10. Summary of significant origins:

- Origins naturally more evenly spread for travel to work compared with destinations;
- Notably higher flows out of Huddersfield, Garforth, and York; and
- Significant rail commuting flows out of the majority of station catchments along the route.

3.11. For presentational purposes, **Figure 4** shows a simplified view of the same matrix with flows classified as 'Low' / 'Medium' / 'High' / 'Very high'.

[3] In the case of all of these figures, the locations in the leftmost column are origins and those in the topmost row are destinations.

Figure 4: Travel to work flows – current – rail (categorised)

O / D	XMC	SWT	MSN	HUD	DHN	BGH	MIR	RVN	DEW	BTL	MLY	COT	LDS	CRG	XGF	MIK	SOM	SBY	CHF	YRK
XMC	-	-	-	Medium	-	-	-	-	-	-	-	-	Medium	-	-	-	-	-	-	-
SWT	Medium	-	Low	Medium	Low	-	-	-	Low	-	-	-	Medium	-	-	-	-	-	-	-
MSN	Medium	Low	-	Medium	Low	-	-	-	Low	-	-	-	Medium	-	-	-	-	-	-	-
HUD	High	Low	-	-	Low	-	Low	Low	Medium	Medium	Low	Medium	V. high	-	Low	-	-	-	-	Low
DHN	Medium	-	-	Medium	-	-	-	-	Low	-	-	-	High	-	-	-	-	-	-	-
BGH	Low	-	-	Low	-	-	-	-	Low	-	-	-	High	-	-	-	-	-	-	Low
MIR	Low	-	-	Medium	-	-	-	-	Low	Low	Low	-	High	-	-	-	-	-	-	-
RVN	-	-	-	Medium	-	-	-	-	Low	Low	-	Low	High	-	-	-	-	-	-	-
DEW	Low	-	-	Medium	-	-	-	-	-	-	-	-	V. high	-	-	-	-	-	-	Low
BTL	Low	-	-	Medium	-	-	-	Low	Low	-	-	Low	V. high	-	-	-	-	-	-	-
MLY	Low	-	-	Low	-	-	-	-	Low	Low	-	-	V. high	-	-	-	-	-	-	Low
COT	Low	-	-	Low	-	-	-	-	-	-	-	-	Medium	-	Low	-	-	-	-	Low
LDS	Medium	-	-	Medium	-	-	-	Low	Medium	Low	Low	Low	-	Low	Low	-	-	-	-	High
CRG	Low	-	-	Low	-	-	-	-	-	Low	-	Low	V. high	-	Low	-	-	-	-	Medium
XGF	Low	-	-	Low	-	-	-	-	-	-	Low	Low	V. high	Medium	-	-	-	-	-	Medium
MIK	-	-	-	-	-	-	-	-	-	-	-	-	Medium	-	-	-	-	-	-	Low
SOM	-	-	-	-	-	-	-	-	-	-	-	-	High	-	-	-	-	-	-	Medium
SBY	Low	-	-	-	-	-	-	-	-	-	-	-	High	-	-	-	-	-	-	Medium
CHF	-	-	-	-	-	-	-	-	-	-	-	-	Medium	-	-	-	Low	-	-	Medium
YRK	Medium	-	-	Medium	-	-	-	-	Low	-	Low	Low	V. high	Low	Low	-	-	Low	-	-

3.12. To enhance the analysis of rail travel to work flows, additional classifications can be used to dissect the findings further:

- **Figure 5** demonstrates which origin – destination flows are served by express intercity services at present, and therefore which flows are served by local stopping services; and
- **Figure 6** shows which flows involve a large centre at either end of the flow, and therefore which flows are made between pairs of local, intermediate stations along the route.

Figure 5 Station origin-destination pairs served by express intercity services

O / D	XMC	SWT	MSN	HUD	DHN	BGH	MIR	RVN	DEW	BTL	MLY	COT	LDS	CRG	XGF	MIK	SOM	SBY	CHF	YRK
XMC	-	-	-	Fast	-	-	-	-	Fast	-	-	-	Fast	-	Fast	-	-	Fast	-	Fast
SWT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MSN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HUD	Fast	-	-	-	-	-	-	-	Fast	-	-	-	Fast	-	Fast	-	-	Fast	-	Fast
DHN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BGH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MIR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RVN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEW	Fast	-	-	Fast	-	-	-	-	-	-	-	-	Fast	-	Fast	-	-	Fast	-	Fast
BTL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MLY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDS	Fast	-	-	Fast	-	-	-	-	Fast	-	-	-	-	-	Fast	-	-	Fast	-	Fast
CRG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
XGF	Fast	-	-	Fast	-	-	-	-	Fast	-	-	-	Fast	-	-	-	-	Fast	-	Fast
MIK	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SOM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SBY	Fast	-	-	Fast	-	-	-	-	Fast	-	-	-	Fast	-	Fast	-	-	-	-	-
CHF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
YRK	Fast	-	-	Fast	-	-	-	-	Fast	-	-	-	Fast	-	Fast	-	-	-	-	-

Figure 6: Station origin-destination pairs involving larger centres as either origin or destination (or both)

O / D	XMC	SWT	MSN	HUD	DHN	BGH	MIR	RVN	DEW	BTL	MLY	COT	LDS	CRG	XGF	MIK	SOM	SBY	CHF	YRK
XMC	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major
SWT	Major	-	-	Major	-	-	-	-	Major	-	-	-	Major	-	-	-	-	-	-	Major
MSN	Major	-	-	Major	-	-	-	-	Major	-	-	-	Major	-	-	-	-	-	-	Major
HUD	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major
DHN	Major	-	-	Major	-	-	-	-	Major	-	-	-	Major	-	-	-	-	-	-	Major
BGH	Major	-	-	Major	-	-	-	-	Major	-	-	-	Major	-	-	-	-	-	-	Major
MIR	Major	-	-	Major	-	-	-	-	Major	-	-	-	Major	-	-	-	-	-	-	Major
RVN	Major	-	-	Major	-	-	-	-	Major	-	-	-	Major	-	-	-	-	-	-	Major
DEW	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major
BTL	Major	-	-	Major	-	-	-	-	Major	-	-	-	Major	-	-	-	-	-	-	Major
MLY	Major	-	-	Major	-	-	-	-	Major	-	-	-	Major	-	-	-	-	-	-	Major
COT	Major	-	-	Major	-	-	-	-	Major	-	-	-	Major	-	-	-	-	-	-	Major
LDS	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major
CRG	Major	-	-	Major	-	-	-	-	Major	-	-	-	Major	-	-	-	-	-	-	Major
XGF	Major	-	-	Major	-	-	-	-	Major	-	-	-	Major	-	-	-	-	-	-	Major
MIK	Major	-	-	Major	-	-	-	-	Major	-	-	-	Major	-	-	-	-	-	-	Major
SOM	Major	-	-	Major	-	-	-	-	Major	-	-	-	Major	-	-	-	-	-	-	Major
SBY	Major	-	-	Major	-	-	-	-	Major	-	-	-	Major	-	-	-	-	-	-	Major
CHF	Major	-	-	Major	-	-	-	-	Major	-	-	-	Major	-	-	-	-	-	-	Major
YRK	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major

3.13. The analysis considering express / stopping services shows that a significant proportion of current rail journeys along the route fall within the concern of local stopping services. **Table 3** presents a summary of the split for each of the stations in scope along the route.

Table 3: Split of travel to work flows on express / stopping services

TRU route	Trips as origin		Trips as destination	
Station	**Express**	**Stopping**	**Express**	**Stopping**
XMC	94	7	226	164
SWT	0	236	0	23
MSN	0	207	0	15
HUD	819	102	208	365
DHN	0	170	0	34
BGH	0	150	0	17
MIR	0	287	0	21
RVN	0	200	0	48
DEW	327	16	101	75
BTL	0	354	0	73
MLY	0	265	0	72
COT	0	137	0	127
LDS	298	84	2,540	1,836
CRG	0	440	0	81
XGF	783	67	25	29
MIK	0	75	0	9
SOM	0	189	0	11
SBY	174	68	7	17
CHF	0	136	0	10
YRK	772	38	160	201
Total	**3,267**	**3,228**	**3,267**	**3,228**

3.14. Looking at current trip origins, it is clear to see that express intercity services account for the majority of trips from the main centres of Leeds, Manchester, Huddersfield, York, and Dewsbury. However, there are clearly a significant number of trips from a wide range of intermediate stations that are reliant on the local stopping services. The overall picture shows that, within the TRU route, local stopping services serve 50% of total rail travel to work trips.

3.15. Trips with destinations in the larger centres, such as Leeds, Manchester, Huddersfield, York and Dewsbury, include many from origin communities that are not well served (or served at all) by express intercity services: this reflects the nature of these centres as attractors of commuting journeys from a wide range of intermediate stations.

3.16. In terms of specific origin-destination flows, it can be seen in **Figure 7** that there are significant flows that are not currently served by express intercity services, including:

- Trips to Leeds from: Marsden, Slaithwaite, Deighton, Brighouse, Mirfield, Ravensthorpe, Batley, Morley, Cottingley, Cross Gates, South Milford and Church Fenton;
- Trips to Huddersfield from: Marsden, Slaithwaite, Deighton, Batley and Mirfield;
- Trips to Manchester from: Marsden, Slaithwaite and Deighton; and

- Trips to York from: Cross Gates, Church Fenton.

Figure 7: Travel to work flows – current – rail (categorised) *–OD pairs served by express intercity services shown dark grey*

O / D	XMC	SWT	MSN	HUD	DHN	BGH	MIR	RVN	DEW	BTL	MLY	COT	LDS	CRG	XGF	MIK	SOM	SBY	CHF	YRK
XMC	-	-	-	Medium	-	-	-	-	-	-	-	-	Medium	-	-	-	-	-	-	-
SWT	Medium	-	Low	Medium	Low	-	-	-	Low	-	-	-	Medium	-	-	-	-	-	-	-
MSN	Medium	Low	-	Medium	Low	-	-	-	Low	-	-	-	Medium	-	-	-	-	-	-	-
HUD	High	Low	-	-	Low	-	Low	Low	Medium	Medium	Low	Medium	V. high	-	Low	-	-	-	-	Low
DHN	Medium	-	-	Medium	-	-	-	-	Low	-	-	-	High	-	-	-	-	-	-	-
BGH	Low	-	-	Low	-	-	-	-	Low	-	-	-	High	-	-	-	-	-	-	Low
MIR	Low	-	-	Medium	-	-	-	-	Low	Low	Low	-	High	-	-	-	-	-	-	-
RVN	-	-	-	Medium	-	-	-	-	Low	Low	-	Low	High	-	-	-	-	-	-	-
DEW	Low	-	-	Medium	-	-	-	-	-	-	-	-	V. high	-	-	-	-	-	-	Low
BTL	Low	-	-	Medium	-	-	-	Low	Low	-	-	Low	V. high	-	-	-	-	-	-	-
MLY	Low	-	-	Low	-	-	-	-	Low	Low	-	-	V. high	-	-	-	-	-	-	Low
COT	Low	-	-	Low	-	-	-	-	-	-	-	-	Medium	-	Low	-	-	-	-	Low
LDS	Medium	-	-	Medium	-	-	-	Low	Medium	Low	Low	Low	-	Low	Low	-	-	-	-	High
CRG	Low	-	-	Low	-	-	-	-	-	Low	-	Low	V. high	-	Low	-	-	-	-	Medium
XGF	Low	-	-	Low	-	-	-	-	-	-	Low	Low	V. high	Medium	-	-	-	-	-	Medium
MIK	-	-	-	-	-	-	-	-	-	-	-	-	Medium	-	-	-	-	-	-	Low
SOM	-	-	-	-	-	-	-	-	-	-	-	-	High	-	-	-	-	-	-	Medium
SBY	Low	-	-	-	-	-	-	-	-	-	-	-	High	-	-	-	-	-	-	Medium
CHF	-	-	-	-	-	-	-	-	-	-	-	-	Medium	-	-	-	Low	-	-	Medium
YRK	Medium	-	-	Medium	-	-	-	-	Low	-	Low	Low	V. high	Low	Low	-	-	Low	-	-

3.17. Based on the classification of trips in **Figure 6**, the analysis shows that around 5% of journeys do not involve a large centre at either end of the journey. Whilst not a substantial percentage of overall trips, not only are these trips not served by express intercity services, they are also in several cases not well served by current local stopping services. Some such locations are also the subject of proposed skip-stopping arrangements and/or would require interchange which has not been optimised: in some cases, such arrangements could render such journeys impossible by rail in practical terms.

3.18. The data also demonstrates from locations around Deighton and further west as far as Marsden, there are significant commuter flows towards Manchester as well as towards Leeds, underlining that stations such as Marsden and Slaithwaite could not be effectively served by a "tidal" service pattern which would only provide 2tph in one direction (possibly varying by time of day): these stations, as with the others along the Leeds – Manchester axis, require a regular 2tph stopping service all day.

Travel to work flows – current – all modes excluding rail (Census 2011)

3.19. For all other modes excluding rail, headline findings have been drawn from the travel to work matrix presented within **Figure 8**.

Figure 8: Travel to work flows – current – all modes excluding rail (Census 2011)

O / D	XMC	SWT	MSN	HUD	DHN	BGH	MIR	RVN	DEW	BTL	MLY	COT	LDS	CRG	XGF	MIK	SOM	SBY	CHF	YRK	Total
XMC	-	1	4	63	9	6	2	0	3	2	12	7	161	2	3	0	1	3	0	14	293
SWT	66	-	108	1,870	171	117	43	50	45	45	18	37	231	4	1	0	2	0	0	6	2,814
MSN	105	206	-	651	60	29	15	17	27	9	12	9	91	4	4	0	2	0	0	1	1,242
HUD	250	494	138	-	1,671	766	288	320	460	315	187	229	1,381	51	17	6	0	7	1	33	6,614
DHN	55	83	27	3,503	-	376	187	136	190	114	59	92	429	25	8	2	1	0	0	12	5,299
BGH	64	24	6	1,043	259	-	73	57	109	91	103	129	644	26	5	6	1	2	0	25	2,667
MIR	29	24	7	891	207	158	-	425	717	323	157	178	665	31	15	3	3	3	1	12	3,849
RVN	12	19	7	393	81	56	217	-	1,171	550	126	197	552	16	5	3	5	0	0	9	3,419
DEW	27	14	5	450	96	50	168	1,022	-	1,072	293	302	868	52	12	3	5	3	0	21	4,463
BTL	23	17	7	604	135	76	146	846	1,700	-	734	564	1,313	85	13	3	7	11	0	20	6,304
MLY	29	2	0	104	23	31	25	77	177	262	-	1,653	4,842	241	59	14	33	11	2	52	7,637
COT	25	2	0	66	12	23	13	32	79	83	1,060	-	7,339	364	75	16	30	6	4	59	9,288
LDS	180	5	1	190	26	43	16	49	117	91	833	2,757	-	1,542	239	76	110	25	20	290	6,610
CRG	49	1	1	56	15	21	7	23	47	51	443	937	9,991	-	370	115	107	21	11	151	12,417
XGF	17	2	0	22	9	7	5	20	27	31	210	368	3,522	915	-	108	173	25	14	137	5,612
MIK	5	1	0	5	2	1	0	4	10	7	41	88	746	201	116	-	25	6	4	40	1,302
SOM	5	0	0	6	2	7	2	3	8	2	23	65	664	115	76	28	-	181	113	208	1,508
SBY	10	0	0	9	3	2	2	5	5	9	35	48	541	56	28	6	452	-	115	970	2,296
CHF	11	0	0	8	4	2	1	3	5	3	19	28	424	70	32	14	155	269	-	451	1,499
YRK	47	0	4	48	7	11	3	7	11	10	64	120	1,756	197	56	21	128	228	115	-	2,833
Total	1,009	895	315	9,982	2,792	1,782	1,213	3,096	4,908	3,070	4,429	7,808	36,160	3,997	1,134	424	1,240	801	400	2,511	**87,966**

3.20. Summary of notable findings:

- As widely understood, there are substantially more trips by other modes compared to rail , and with a much more varied range of origins and destinations;
- Largest individual origin-destination flows appear to be very short distance, and many flows likely to be out of scope for rail given the simple catchment analysis approach;
- However, there is almost certainly a large number of travel to work trips which are within scope of rail, and with a significant amount that would fall within the markets of local stopping services – if they were attractive enough.

(c) Future growth

3.21. An attempt has been made to capture the spatial impact of current land use planning – in terms of proposed housing and employment sites – on future travel to work patterns along the TRU route.

3.22. Housing land allocations have been sourced from the various Local Plan documents covering the areas along the route[4]. Allocations within 3km of the stations in scope along the route have been converted in to potential commuting trips based on the existing ratio of households to commuting trips across the whole region.

3.23. Future employment growth inputs have been sourced directly from the Regional Econometric Model (REM) as numbers of net jobs at MSOA level and then allocated to the MSOAs identified specifically for each station within the catchment analysis.

3.24. Both the housing and employment inputs have been converted into potential additional travel to work trips –both rail and non-rail – by applying existing mode shares and origin / destination splits from the Census analysis.

3.25. It is acknowledged that there is potential for double-counting in that a proportion of the trips generated from proposed housing and employment sites would be paired together as single flows. However, to counteract this, it is reasonable to expect that future land use planning could be positioned in such a way that could realistically result in higher rail mode shares than have been inferred based on existing land use patterns. In any event, it will be recalled that the purpose of this exercise is not to attempt to forecast absolute future levels of train occupation, but to show the locations, and therefore the likely flows, that are to be expected to see significant growth in commuting rail travel in the context of TRU and the need for there to be an appropriate balance of train services along the route.

3.26. In the absence of specific land use allocation inputs for areas outside the West Yorkshire region, growth in Manchester has been assumed to be equivalent to Leeds, which is considered to be a reasonable proxy.

[4] The assumed timescales for the site allocations vary by authority but relate to the late 2020s to early 2030s and therefore represent a timescale which can be considered suitable for the TRU context.

(d) Findings – future patterns

3.27. For rail, headline findings have been drawn from the travel to work matrix presented within **Figure 9**. This builds upon the current rail travel to work matrix presented in **Figure 3** and layers the additional future trips on top.

Figure 9: Travel to work flows – with future growth – rail

O / D	XMC	SWT	MSN	HUD	DHN	BGH	MIR	RVN	DEW	BTL	MLY	COT	LDS	CRG	XGF	MIK	SOM	SBY	CHF	YRK	Total
XMC	-	0	2	62	4	0	2	0	1	0	3	4	216	1	2	0	0	0	0	10	309
SWT	29	-	8	119	7	0	2	4	6	0	2	4	174	2	1	0	0	0	0	2	360
MSN	98	9	-	97	5	2	0	4	8	0	0	2	50	3	2	0	1	0	0	10	292
HUD	139	10	3	-	10	3	8	8	72	24	10	31	725	5	5	1	0	1	0	17	1,073
DHN	34	0	0	38	-	1	2	0	8	3	2	2	114	3	0	0	0	0	0	0	208
BGH	26	0	0	26	2	-	2	0	12	6	6	7	227	2	0	0	0	0	0	10	326
MIR	27	3	1	66	2	5	-	5	18	19	15	6	289	1	0	0	0	0	0	3	459
RVN	2	0	1	37	1	1	1	-	8	12	4	13	198	1	0	0	0	0	0	7	288
DEW	17	0	1	111	3	0	3	6	-	4	3	6	371	2	1	0	0	0	0	16	545
BTL	9	0	0	69	4	5	4	14	13	-	5	13	310	6	2	0	0	0	0	5	458
MLY	20	0	0	25	0	0	3	2	19	11	-	2	377	3	2	0	0	2	0	20	486
COT	13	0	0	24	1	1	0	5	4	4	1	-	166	4	7	0	0	0	0	22	253
LDS	91	5	0	105	0	3	1	9	33	15	25	22	-	24	17	5	1	4	3	152	514
CRG	16	2	2	27	2	0	0	5	6	9	7	12	616	-	26	3	2	3	2	36	774
XGF	20	0	0	22	0	0	0	0	2	3	15	30	1,346	77	-	2	3	5	0	57	1,583
MIK	2	0	0	6	0	0	0	0	1	0	0	4	225	7	5	-	0	0	0	14	264
SOM	3	0	0	1	0	0	0	0	1	0	0	1	181	2	1	0	-	4	3	45	242
SBY	9	0	0	1	1	0	0	0	0	0	2	4	261	4	2	0	2	-	2	97	384
CHF	4	0	0	1	1	0	0	1	0	0	0	1	142	2	0	0	8	4	-	70	234
YRK	29	0	1	32	0	0	0	3	7	0	8	12	1,004	9	7	1	4	11	5	-	1,135
Total	588	28	20	870	46	22	29	66	220	107	109	177	6,990	160	81	13	21	34	14	593	**10,188**

3.28. **Figure 10** presents the net difference between the current and future trips.

Figure 10: Travel to work flows – indicative future growth over current flows

O / D	XMC	SWT	MSN	HUD	DHN	BGH	MIR	RVN	DEW	BTL	MLY	COT	LDS	CRG	XGF	MIK	SOM	SBY	CHF	YRK	Total
XMC	-	0	1	38	2	0	1	0	1	0	2	2	149	1	1	0	0	0	0	8	208
SWT	5	-	2	34	1	0	1	1	1	0	0	1	77	1	0	0	0	0	0	0	124
MSN	45	2	-	19	0	0	0	2	2	0	0	0	2	3	0	0	0	0	0	9	85
HUD	29	1	0	-	1	0	1	1	4	3	1	2	101	1	0	0	0	0	0	6	152
DHN	14	0	0	9	-	0	0	0	1	1	0	1	10	1	0	0	0	0	0	0	38
BGH	13	0	0	15	1	-	1	0	6	4	3	4	123	1	0	0	0	0	0	5	176
MIR	17	1	0	28	1	2	-	2	6	7	6	2	100	0	0	0	0	0	0	1	172
RVN	0	0	0	9	0	0	0	-	2	4	1	3	62	1	0	0	0	0	0	4	88
DEW	3	0	0	42	1	0	1	2	-	2	3	2	138	1	0	0	0	0	0	6	202
BTL	1	0	0	16	1	1	1	3	2	-	2	2	73	2	0	0	0	0	0	1	104
MLY	9	0	0	11	0	0	1	1	6	4	-	1	174	2	1	0	0	1	0	10	221
COT	8	0	0	14	0	0	0	2	1	2	0	-	75	2	2	0	0	0	0	9	116
LDS	23	1	0	26	0	1	0	2	7	4	6	5	-	7	5	1	1	1	1	42	132
CRG	6	1	1	11	1	0	0	2	2	4	3	5	268	-	12	1	1	1	1	16	334
XGF	15	0	0	13	0	0	0	0	1	2	6	15	608	38	-	1	1	2	0	30	733
MIK	0	0	0	5	0	0	0	0	0	0	0	0	167	7	1	-	0	0	0	9	189
SOM	1	0	0	0	0	0	0	0	0	0	0	0	37	1	1	0	-	1	1	11	53
SBY	3	0	0	1	0	0	0	0	0	0	1	1	94	2	1	0	1	-	1	38	142
CHF	0	0	0	0	0	0	0	0	0	0	0	0	65	2	0	0	3	1	-	27	98
YRK	6	0	0	5	0	0	0	0	1	0	2	3	293	4	2	0	3	3	1	-	325
Total	198	5	5	297	12	5	8	18	44	34	37	50	2,614	79	27	4	10	10	4	232	**3,693**

3.29. **Figures 11** and **12**, which show the same information but simplified into bands, illustrate the large number of trips served by stopping trains that can be expected to see significant growth over the timescales in question.

Figure 11: Rail travel to work flows, with future growth (categorised)

O / D	XMC	SWT	MSN	HUD	DHN	BGH	MIR	RVN	DEW	BTL	MLY	COT	LDS	CRG	XGF	MIK	SOM	SBY	CHF	YRK
XMC	-	-	-	Medium	-	-	-	-	-	-	-	-	V. high	-	-	-	-	-	-	Low
SWT	Medium	-	Low	High	Low	-	-	-	Low	-	-	-	High	-	-	-	-	-	-	-
MSN	Medium	Low	-	Medium	Low	-	-	-	Low	-	-	-	Medium	-	-	-	-	-	-	Low
HUD	High	Low	-	-	Low	-	Low	Low	Medium	Medium	Low	Medium	V. high	Low	Low	-	-	-	-	Low
DHN	Medium	-	-	Medium	-	-	-	-	Low	-	-	-	High	-	-	-	-	-	-	-
BGH	Medium	-	-	Medium	-	-	-	-	Low	Low	Low	Low	V. high	-	-	-	-	-	-	Low
MIR	Medium	-	-	Medium	-	-	-	-	Low	Low	Low	Low	V. high	-	-	-	-	-	-	-
RVN	-	-	-	Medium	-	-	-	-	Low	Low	-	Low	High	-	-	-	-	-	-	Low
DEW	Low	-	-	High	-	-	-	Low	-	-	-	Low	V. high	-	-	-	-	-	-	Low
BTL	Low	-	-	Medium	-	-	-	Low	Low	-	Low	Low	V. high	Low	-	-	-	-	-	-
MLY	Medium	-	-	Medium	-	-	-	-	Low	Low	-	-	V. high	-	-	-	-	-	-	Low
COT	Low	-	-	Medium	-	-	-	-	-	-	-	-	High	-	Low	-	-	-	-	Medium
LDS	Medium	-	-	High	-	-	-	Low	Medium	Low	Medium	Medium	-	Medium	Low	-	-	-	-	High
CRG	Low	-	-	Medium	-	-	-	-	Low	Low	Low	Low	V. high	-	Medium	-	-	-	-	Medium
XGF	Medium	-	-	Medium	-	-	-	-	-	-	Low	Medium	V. high	Medium	-	-	-	Low	-	Medium
MIK	-	-	-	Low	-	-	-	-	-	-	-	-	V. high	Low	Low	-	-	-	-	Low
SOM	-	-	-	-	-	-	-	-	-	-	-	-	High	-	-	-	-	-	-	Medium
SBY	Low	-	-	-	-	-	-	-	-	-	-	-	V. high	-	-	-	-	-	-	Medium
CHF	-	-	-	-	-	-	-	-	-	-	-	-	High	-	-	-	Low	-	-	Medium
YRK	Medium	-	-	Medium	-	-	-	-	Low	-	Low	Low	V. high	Low	Low	-	-	Low	-	-

Figure 12: Rail travel to work flows, with future growth (categorised)–*OD pairs served by express intercity services shown dark grey*

O / D	XMC	SWT	MSN	HUD	DHN	BGH	MIR	RVN	DEW	BTL	MLY	COT	LDS	CRG	XGF	MIK	SOM	SBY	CHF	YRK
XMC	-	-	-	Medium	-	-	-	-	-	-	-	-	V. high	-	-	-	-	-	-	Low
SWT	Medium	-	Low	High	Low	-	-	-	Low	-	-	-	High	-	-	-	-	-	-	-
MSN	Medium	Low	-	Medium	Low	-	-	-	Low	-	-	-	Medium	-	-	-	-	-	-	Low
HUD	High	Low	-	-	Low	-	Low	Low	Medium	Medium	Low	Medium	V. high	Low	Low	-	-	-	-	Low
DHN	Medium	-	-	Medium	-	-	-	-	Low	-	-	-	High	-	-	-	-	-	-	-
BGH	Medium	-	-	Medium	-	-	-	-	Low	Low	Low	Low	V. high	-	-	-	-	-	-	Low
MIR	Medium	-	-	Medium	-	-	-	-	Low	Low	Low	Low	V. high	-	-	-	-	-	-	-
RVN	-	-	-	Medium	-	-	-	-	Low	Low	-	Low	High	-	-	-	-	-	-	Low
DEW	Low	-	-	High	-	-	-	Low	-	-	-	Low	V. high	-	-	-	-	-	-	Low
BTL	Low	-	-	Medium	-	-	-	Low	Low	-	Low	Low	V. high	Low	-	-	-	-	-	-
MLY	Medium	-	-	Medium	-	-	-	-	Low	Low	-	-	V. high	-	-	-	-	-	-	Low
COT	Low	-	-	Medium	-	-	-	-	-	-	-	-	High	-	Low	-	-	-	-	Medium
LDS	Medium	-	-	High	-	-	-	Low	Medium	Low	Medium	Medium	-	Medium	Low	-	-	-	-	High
CRG	Low	-	-	Medium	-	-	-	-	Low	Low	Low	Low	V. high	-	Medium	-	-	-	-	Medium
XGF	Medium	-	-	Medium	-	-	-	-	-	-	Low	Medium	V. high	Medium	-	-	-	Low	-	Medium
MIK	-	-	-	Low	-	-	-	-	-	-	-	-	V. high	Low	Low	-	-	-	-	Low
SOM	-	-	-	-	-	-	-	-	-	-	-	-	High	-	-	-	-	-	-	Medium
SBY	Low	-	-	-	-	-	-	-	-	-	-	-	V. high	-	-	-	-	-	-	Medium
CHF	-	-	-	-	-	-	-	-	-	-	-	-	High	-	-	-	Low	-	-	Medium
YRK	Medium	-	-	Medium	-	-	-	-	Low	-	Low	Low	V. high	Low	Low	-	-	Low	-	-

3.30. Equivalent future values have not been presented for non-rail trips due to the likely large impact of double-counting (as discussed above), particularly considering the high proportion of shorter distance trips.

3.31. Summary of significant increases in rail travel to work trips:

- Trips to Leeds from all stations, notably Manchester stations, Huddersfield, Brighouse, Mirfield, Dewsbury, Morley, Cross Gates, Garforth stations, Micklefield and York;
- Trips generally to Huddersfield, Manchester, and York
- While by definition smaller in magnitude, "elsewhere to elsewhere" trips, which are dependent on regular all-stations services (as opposed to skip-stopping or similar) will also see significant growth – provided that the rail services provided allow this to happen.

4. Spatial planning: district-level overview

(a) Kirklees

General growth and spatial context

4.1. Kirklees has a projected population of approximately 440,000 people in 2018, with the population projected to grow to approximately 461,000 by 2031. The district has plans for

significant growth, with over 31,000 homes and 23,000 new jobs planned for the district by 2031. To underline that point, the objectively assessed need figures for housing, recently published by DCLG, show that Kirklees will be the second-largest housing provider over the next 15 years in the Leeds City Region, and the fourth largest local authority housing provider in the north of England outside of Manchester, Leeds and Sheffield. The council's strategy for delivering these major growth plans is focussed on the largest towns of Huddersfield and Dewsbury, in areas with transport connections to Manchester to the west and Leeds and Humber to the east.

Spatial context for the stations listed in the TRU Service Outcomes

Batley

4.2. Batley town centre falls within a Leeds City Region Strategic Priority Area and is part of the council's major regeneration programme – the North Kirklees Growth Zone. The area contains a number of sub-regionally important retail, cultural and leisure destinations, with strong local and sub-regional employment opportunities; however recognised challenges to growth are traffic congestion along main routes and junctions, restricted local rail services, and bus journeys which take longer to larger towns and cities. Pockets of high unemployment, deprivation and poor health remain difficult challenges due in part to accessibility issues.

Dewsbury

4.3. Dewsbury town centre falls within a Leeds City Region Strategic Priority Area and is part of the council's major regeneration programme – the North Kirklees Growth Zone. The town is the focus of at least 5,000 new homes by 2031, with a further 2,000 homes already planned for following years. It is a council priority to transform Dewsbury, building on its strategic location and driven by integrated housing and economic development in the town. Dewsbury is an important public transport hub, with bus services linking to other parts of North Kirklees and to Leeds, Bradford and Wakefield, but experiences traffic congestion on key routes, poor air quality in some areas, and higher than average retail vacancies. Pockets of high unemployment, deprivation and poor health remain difficult challenges due in part to accessibility issues. Dewsbury is now also emerging as a key further educational centre with the recent completion of the Dewsbury Learning Quarter and further plans for students at Kirklees College to be based in the town.

Ravensthorpe and Mirfield

4.4. Ravensthorpe falls within a Leeds City Region Strategic Priority Area and is part of the council's major regeneration programme – the North Kirklees Growth Zone. This area is planned for major transformation, focussed around Ravensthorpe station, as this is the heart of the 4,000-home Dewsbury Riverside urban extension. The area is already a key location for a significant number of local, regional, national and international businesses, largely located in older industrial areas around the station area. Railway stations at Ravensthorpe and Mirfield currently have a lack of facilities, with poorer air quality in some locations of the towns, and there are significant traffic congestion issues on this key route between Leeds/Dewsbury and Huddersfield. Mirfield station currently plays an important role as the district's only direct rail link to London.

Deighton

4.5. Deighton station is located close to the district's largest established strategic economic development zone, on Leeds Road in Huddersfield, providing approximately 5,000 jobs taking into account existing and proposed economic development proposals. The current position of the station, together with frequency and the routing of current public transport services, means that much of this development is served by the private car, exacerbating traffic congestion problems on this key route between Huddersfield to Junction 25 of the M62 and routes to Dewsbury and Leeds. Rail's attractiveness could be significantly improved by a relocation of Deighton station to an alternative location.

Huddersfield

4.6. The town is the focus of at least 6,000 new homes by 2031, with a further 1,000 homes already planned for following years. It is a council priority to transform Huddersfield into an attractive place to live and work, and to tackle its increasing retail vacancy levels, building on its strategic location and driven by integrated housing and economic development in the town. The town is now also recognised as major student town, focussed on the increasingly prominent institutional role of the University of Huddersfield (18,000 students and growing). The town centre is the district's main cultural and leisure hub, as well as being pivotal to connectivity, with links to the Premier/Super League football/rugby stadium. Huddersfield is an important public transport hub, with train services to major cities across the north of England, as well as services to other towns in the region. Frequent bus networks connect Huddersfield town centre to outlying areas of the town and to other areas in Kirklees and elsewhere in West Yorkshire, but the town experiences traffic congestion on key routes, poor air quality in some areas, and higher than average retail vacancies. Pockets of high unemployment, deprivation and poor health remain difficult challenges due in part to accessibility issues.

Slaithwaite and Marsden

4.7. There is growth around Slaithwaite and Marsden that is quite unique, and a growing commuter population that relies on links to Huddersfield, Manchester and Leeds. Former textile buildings and land are being reclaimed for new housing growth and small-scale, but high-value, digital and creative industries with strong links to the University of Huddersfield.

(b) Leeds

The Leeds city economy

4.8. Leeds is the UK's fastest growing city and is the main driver of a city region with a £64.6 billion economy, a combined population of 3 million and a workforce of 1.37 million. Over the next ten years, the Leeds economy is forecast to grow by 21%, with financial and business services set to generate over half of the GVA growth over that period. Financial and business services account for 38% of total output at present. Other key sectors include retail, leisure and the visitor economy, construction, manufacturing and the creative and digital industries.

4.9. Leeds city centre is an economic powerhouse for the North, with over 50% of the jobs in Knowledge-Intensive Business Services (compared to 25% across the city region as a whole). Leeds is the third-largest shopping destination in the UK outside London, and with over 300 bars and restaurants is a premium leisure destination. Office take-up in the city centre passed the 1m sq ft mark in 2017, more than double the amount registered in 2016, and 88% ahead

of the 10-year annual average for the city. Immediately to the south of Leeds City station, and including the site of the planned HS2 station, South Bank Leeds offers a unique opportunity to increase the physical and economic impact of the city centre. At 253ha, it is one of Europe's largest city centre regeneration opportunities, creating 35,000 new jobs and over 8,000 new homes. Leeds West End forms a natural expansion of the traditional office core and includes the new Government Hub (due for completion at the end of 2019, to accommodate 6,000 civil service workers). Proposals for a new Innovation District aim to make Leeds city centre a 21st century science park, centred on the universities and the Leeds General Infirmary in the northern part of the city centre.

4.10. These knowledge-intensive digital / creative and service sectors, as well as retail / leisure activities, are disproportionately located in the catchment of Leeds City Station, and they are therefore critically dependent on rail-borne connectivity from throughout the city region for their supply of labour, and on long-distance business-to-business and leisure connectivity. With increasing constraints on road-space and car parking, this dependence will only grow with increases in such economic activity.

Thorpe Park and White Rose

4.11. Outside the city centre, Thorpe Park represents one of the key economic centres in the District, with some 56,000 sqm of existing office development, and outline planning permission for a further 83,000 sqm, alongside a significant (22,000 sqm) retail and leisure element, currently under construction. Progression of the proposed Thorpe Park parkway station will provide a direct link to this major site. As described elsewhere, Thorpe Park is also expected to provide a significant park-and-ride / parkway access point to the local and wider strategic rail network.

4.12. West of the city, a new station proposal is under development at White Rose. Approximately 230,000 customers per week visit the Retail Centre, and 10,000 people are employed across the shopping centre, office park and industrial estate. If White Rose office masterplan is fully implemented in accordance to the aspiration of Munroe K (the developer), there will be 10,000 people working in the office park (currently there are about 4,000 people working there). In total, the number employed is expected to rise from 10,000 at present to 16,000.

4.13. The scale of the population and employment numbers, and the strategic locations, of Thorpe Park and White Rose underline the significant importance attached by the city to providing these locations with a good local service. This is, as noted elsewhere, a particular issue at White Rose, where the existing local service at the two adjacent stations of Cottingley and Morley is of poor quality and low frequency. At Thorpe Park the provision of a good service level and timetable is an essential component of supporting the approved and planned development. That this should not prejudice services at the adjoining local stations is considered important by the City, as is the retention of service levels at the existing Garforth and East Garforth stations which match the demand and connectivity needed by a potentially significantly expanded community.

Population and housing distribution

4.14. It is anticipated that the population of Leeds will rise from 784,500 in 2017 to 856,800 in 2033, an increase of 9%. The adopted Core Strategy (2014) contains plans for a net

additional 70,000 dwellings to be delivered between 2012 and 2028 and, although the Council has recently submitted a Core Strategy Selective Review based on a lower net increase of 52,000 households between 2017 and 2033, this nevertheless represents a major increase on the existing situation.

4.15. The planned distributional growth in households across Leeds is defined in the Core Strategy, with significant elements planned for the areas around and adjacent to the TRU route: Morley, Leeds city centre, east Leeds, Garforth and Micklefield. This accounts for half of all the housing growth for the District. Of particular note, almost 12,000 dwellings are planned for the city centre, alongside 6,000 in East Leeds Extension and adjacent sites (in the vicinity of Cross Gates and the planned Thorpe Park stations); up to 2,100 in the vicinity of Garforth (including the proposed Parlington development); and a further 650 in Micklefield. In the locality of Morley and the proposed White Rose station some 1,200 houses are planned.

5. Impacts of new stations in West Yorkshire

5.1. WYCA is committed to delivering new rail stations in four locations around the county, of which two, Thorpe Park and White Rose[5], are situated on the TRU route and one, Elland, is of relevance due to its intended services using the route.

(a) Thorpe Park

5.2. Situated to the west of Garforth, Thorpe Park is intended to serve three main markets:

- Park-and-ride: to allow a swathe of population to the east of Leeds access to the rail network for short-distance journeys, especially commuting into the city, and provide an attractive alternative to car use;
- Parkway: to provide access to the longer-distance interregional rail network without the need to travel into a congested city centre for access to a station; and
- Inbound travel: Thorpe Park will be a significant centre of employment, attracting travel from neighbouring districts and further afield, above all for commuting purposes.

It follows from this that the network needs to be capable of allowing Thorpe Park to be served both by local services but also interregional trains serving main centres other than Leeds. While some of the park-and-ride and parkway market is expected to be abstracted from Garforth, reducing pressure on its parking, it should be emphasised that all existing stations are well used and should not suffer reductions in their services in consequence of Thorpe Park opening.

(b) White Rose

5.3. This station is to be located to the south-west of the existing Cottingley station, towards Morley. Intended primarily to serve the White Rose employment centre[6], it will undoubtedly also attract some usage for the neighbouring White Rose Centre (which itself also contains a bus interchange). While not intended to be a park-and-ride facility, White Rose may well replace the existing Cottingley station, with whose walk-up catchment the new station will overlap. It should however be emphasised that no decision has yet been taken to close Cottingley, though for the purposes (solely) of the timetable analysis discussed later in this paper, the assumption has been made that local trains would stop at White Rose instead of

[5] Formerly known as Millshaw White Rose.
[6] Including the site formerly known as Millshaw.

Cottingley, with no net impact on their running times, or the wider impacts on line capacity, from doing so. However, one significant issue emerging from our analysis of Network Rail's timetabling work is that NR appear to have assumed only one train per hour stopping at Cottingley, and have not acknowledged that White Rose will require 2tph in common with the other stations on the line. Future TRU planning needs to be cognisant of White Rose and to assume 2tph stopping, not 1tph.

(c) Elland

5.4. Elland station will be located to the west of the TRU geography, between Brighouse and Greetland Junction on the line west from Heaton Lodge Junction. It is intended that Elland, whose markets include a substantial town and whose proposed location makes it attractive for park-and-ride use, will be served by the same services as the existing Brighouse station, namely those from Huddersfield to Bradford and Leeds via Halifax, and from Manchester via the Upper Calder Valley to Dewsbury and Leeds. It is possible that London services provided at present by Grand Central will also gain an Elland stop. Any service calling at Elland will therefore use the TRU route. While the two Northern services currently operate on a 1tph basis, TRU work should be cognisant that in the medium term there is a strong evidence base (see for example the documents referred to in the next section) for 2tph to be provided; this could take the form of uplifts to existing service patterns, or of alternatives; we are for example aware of stakeholder lobbying for a service from Huddersfield via Brighouse to the Upper Calder Valley. While it may not be appropriate for TRU to make direct provision for such service uplifts which may be considered beyond its remit, it should not produce infrastructure solutions that would make it significantly more difficult to deliver such increments.

6. Existing policies and evidence base

(a) Yorkshire Rail Network Study (YRNS)

6.1. 2012's YRNS identified that, of £10.5bn to £12.2bn of benefits over a 60-year period that improvements in rail connectivity in Yorkshire could yield, over a quarter would be associated with enhancing existing connections on four main corridors, of which two are the two trans-Pennine mainlines from Leeds to Manchester. In addition, however, it found that further journey-time enhancements and frequency increases in the trans-Pennine corridors could deliver an additional £1.8bn to £2.1bn of benefit. It emphasised that, in order to unlock the full scale of benefits, a rail transport strategy needs to support enhanced connectivity for each of the four groups of movement types it identified: between regional centres; from sub-regional centres to the regional centres: journeys within the city region; and between sub-regional centres.

6.2. The YRNS Conditional Outputs Statement specifically states the principle that:

> *To ensure that city regions across the North enjoy economic growth a balanced approach that enhances links within city regions and between city regions is required.*

6.3. It also notes that traditional transport appraisal, which has historically tended to favour longer-distance travel, is likely to understate significantly the value of intra-regional connectivity, where it helps to catalyse structural changes in the economy such as the move to high-value white-collar employment in Leeds city centre:

Emerging evidence suggests that transport investments that are anticipated to have a structural impact on the economy can have an impact far greater than conventional transport cost benefit analysis would suggest.

6.4. Amongst the headline conditional outputs identified by the YRNS, the first two are particularly relevant:

Conditional Output		Current Constraint
1.Connectivity	Rail journey times that are quicker than off peak car journeys A minimum frequency of two trains per hour (up to six trains per hour in some corridors) all day operating on a clockface timetable with additional peak services as required to meet demand.	Capability of the network and provision of sufficient and appropriate rolling stock to operate faster services Network capacity and availability of rolling stock to deliver increased frequency
2. Capacity	Sufficient capacity, by providing longer or more frequent trains, to accommodate forecast demand growth to 2027	Seating capacity currently exceeded on peak and inter-regional off peak services. Limited availability of rolling stock and infrastructure capability (track capacity, depot capacity and platform length) prevents longer or more frequent services

6.5. The YRNS connectivity conditional output therefore forms part of the basis on which WYCA continues to argue for a minimum frequency of 2tph all day at all local stations, including all of those on the TRU route – some will require more than this:

Local services[7] within Leeds and Sheffield City Regions serving Leeds and Sheffield should have a minimum all-day service frequency of two trains per hour operating on a clockface timetable with additional services in the peak as the capacity output requires. Improving journey times between Bradford, Leeds, Sheffield and Manchester as well as between these regional centres and the sub-regional centres will also offer the opportunity to improve journey times within the two city regions. Meeting other outputs (such as those

[7] A footnote reads: *Typically stopping at all stations on the route in which they operate, for example Ilkley to Leeds.*

related to capacity and rolling stock) will also provide further opportunity to deliver benefits by reducing travel times within the journey to work catchment.

6.6. The question of capacity will also help inform the service strategy, in particular in the peaks, when in any event trains operating any lower frequencies would not provide sufficient capacity, with consists of any plausible lengths. This is discussed in more detail below in the context of GHD's demand modelling.

6.7. The YRNS Conditional Outputs Statement also assigns monetary economic values to improvements in connectivity. These improvements are measured in terms of Generalised Journey Time (GJT, discussed further below in the context of rail industry PDFH modelling), and their valuation has regard to the strength of the flow on each of the corridors in the scope of the study (because clearly 1 minute's improvement enjoyed by 200 passengers per train is prima facie worth more than the same enjoyed by only 50). These benefits include increase rail revenues (a lower cost to society in providing the service); journey-time reduction itself (value of time of existing and new rail users); non-user benefits (resulting from modal shift to rail); and wider economic benefits (such as agglomeration, labour market improvements, and improving competition and therefore economic efficiency). Their analysis:

… makes very clear the importance of commuting flows to the regional and sub-regional centres from the local (corridor) stations.

6.8. Specifically[8], the YRNS finds that the value of 1 minute's saving of GJT is:

- £25.1m for journeys originating from local stations on the North Trans-Pennine corridor (i.e. the Leeds – Huddersfield – Manchester line)
- £19.1m for journeys from local stations on the York route
- £20.8m for journeys from local Leeds CR stations on the Selby – Hull line

6.9. These values do not include those accruing for journeys originating at regional-centre stations such as Manchester stations, York or Leeds, nor those from sub-regional centres including Huddersfield (for whose journeys the value is £56.2m).

6.10. In addition, YRNS recognises the critical nature of reliability to the operation of a successful railway, clearly a major problem at present on the Diggle route. This priority is reflected in the Conditional Outputs statement:

4. Performance	Reduce the variation in performance on different corridors by improving performance of the relatively poor performing corridors. Any enhancements to meet these Conditional Outputs should not worsen performance	Variability in performance of services in different corridors caused by track capacity, rolling stock reliability and delivery of planned capacity

[8] Appendix B to *Conditional Outputs Statement*, Table B12. Values given are present values using 2002 prices and do not include any de-crowding benefits that may also arise.

(b) WYCA (Metro) Rail Plan 7

6.11. The conditional outputs identified by the YRNS were refined incorporated into the specific West Yorkshire context by Rail Plan 7, part of the region's third Local Transport Plan. Specifically, with regard to frequency, Rail Plan 7 states:

> *Local services to the regional centres of Leeds and Bradford and the other sub-regional centres should have a minimum all-day service frequency of two trains per hour operating on an even interval timetable with additional services in the peak periods as the demand for increased capacity requires.*

6.12. In so stating, it recognises that this will imply increases in frequencies on certain services, explicitly including those at local stations west of Huddersfield, and also at Brighouse, Cottingley and Ravensthorpe, plus on the services from Huddersfield towards both Bradford and Wakefield.

(c) Rail North Long-Term Rail Strategy (LTRS)

6.13. The LTRS, both the original version published in 2015 and the consultation draft of the updated 2018 version, also acknowledge the importance of frequent local services, using an evidence base comparable with that underpinning YRNS and Rail Plan 7, and also confirming that 2tph, operating at regular intervals, should be the minimum service level at local stations. The benefit of moving to such a minimum service level across the North is valued at £5.4bn (present value).

6.14. In addition, the 2015 LTRS advocates consistent service patterns and standards:

> *The adoption of a categorised service specification (e.g. high speed, inter-regional express, urban commuter, community railways etc.) each with specific service and rolling stock standards.*

6.15. The LTRS also underlines the need for passenger-centred timetable structures that maximise the opportunities for convenient interchange.

(d) Political priorities

6.16. Reflecting its critical strategic importance to West Yorkshire as a whole, the TRU project is considered to be a priority at political level. This has been reflected in statements from the leaders of Leeds and Kirklees councils (Councillors Judith Blake and Shabir Pandor respectively), as well as that of the Combined Authority itself, Councillor Susan Hinchcliffe. This political comment makes clear that:

- As a city without a dedicated rapid transit system, Leeds is dependent on good, frequent and reliable local rail services, to help people live their lives, get to work, and access education and other services. Leeds needs the new stations at White Rose and Thorpe Park to be able to be served by a good train service offer, and the infrastructure requirements need to reflect those services.
- Kirklees needs its residents, particularly in the more deprived areas of north Kirklees, to have usable and reliable access to jobs in the major employment centres – including not only Leeds, Dewsbury, Huddersfield and Manchester but also to jobs accessible from the new station at White Rose.

- At Combined Authority level, the focus is on socially inclusive and sustainable growth, and this drives a need for connectivity, including by rail, that will enable all members of society to benefit from economic and wider opportunities while enhancing their quality of life.

6.17. At a more local level, the need to provide more consistent, reliable and attractive services to the Upper Colne Valley (Slaithwaite and Marsden) continues to attract a high level of Councillor attention.

7. Future peak train capacity requirements: Evidence from GHD demand forecasts

7.1. GHD's industry-compliant forecasting model suite, developed for WYCA, confirms that on the Huddersfield – Dewsbury – Leeds and York / Selby – Leeds corridors, by the 2023/24 rail year all peak local stopping services will be operating in excess of seated capacity, with most in the high peaks being in excess of total capacity. This is despite committed capacity enhancements and after subtracting demand from those "crowded off" rail travel. This crowding affects the services into Leeds from the west (broadly 2tph, but only 1tph from Slaithwaite and Marsden – whose services are particularly crowded by the time they approach Leeds) as well as from the east, and is despite many (though not all) services being assumed strengthened to the maximum degree assumed permitted by platform lengths.

7.2. Extrapolating demand growth beyond 2024 to a notional 2039/40 year, and assuming no further enhancements to rail services (only exogenous growth) beyond 2024, the model verifies that in practice there is little further capacity for growth, and large amounts of demand are "crowded off" on these corridors. This translates into a lack of rail capacity acting as a significant brake on the economy of West Yorkshire.

7.3. It should be noted that GHD's model, concentrating as it does primarily on peak flows into/out of the main West Yorkshire centres, will not pick up as clearly the growth forecast to take place from Kirklees westwards towards Greater Manchester. It is also acknowledged that the current calibration and inputs used in the GHD model will lead to it tending to understate forecast demand growth.

7.4. It can be reasonably concluded that providing anything less than a minimum of 2tph at all local stations on the TRU route would not be realistic over these timescales, even purely from a capacity point of view, at least in the peaks.

8. Transport Planning: Passenger Demand Forecasting Handbook (PDFH)

8.1. PDFH contains guidance on the how service frequencies interact with other components of a passenger's journey, such as time spent travelling on the train itself, access to and egress from the railway network, and the effect of any need to change trains. These enable the effects of changing one or more of these criteria on passenger behaviour (and so on the success of the service in demand terms) to be predicted. This is called Generalised Journey Time calculation (GJT)[9].

8.2. In general, GJT comparisons tend to confirm the view that, for a shorter train journey such as a daily commute, the frequency of the service is more important than its speed, because the

[9] Note that the PDFH forecasting models do not include access and egress (if they were included, the elasticity values would need to be higher). For this simple example, this does not matter, as it is considering the effects on a given set of passengers, so access and egress would not change anyway.

waiting-time, which is perceived as more of an inconvenience than the actual travelling time, makes up a greater proportion of the total journey time. This is why typically buses can compete with rail for short suburban journeys. As the journey gets longer, so the importance of the travel time (speed) becomes greater as against other components of GJT. Similarly, the GJT of a service does not get better in proportion to an increase in frequency – beyond a certain level, providing an extra service does not lead to as great an increase in demand. That point is reached sooner for longer journeys than for short ones.

8.3. While somewhat simplified, the following examples illustrate the relative impacts of changing different aspects of the service (particularly train frequency and journey-time) for journeys that might be considered typical of the types of travel undertaken on the trans-Pennine mainline.

8.4. In every case, trains are assumed to be direct, so there is no "interchange penalty" applicable.

(a) Typical city-region commuting journey

8.5. With passengers assumed to be using season tickets or equivalent[10], for a typical journey of about 10 miles, one can use PDFH elasticity methods to compare the relative importance of a good service frequency as against a lower frequency but a faster journey-time:

Table 4: GJT and demand impact comparison: short-distance commuting example

	1tph	2tph	4tph	1tph, fast
Waiting	39	26	15	39
Travelling	20	20	20	15
Total GJT	59	46	35	54
Demand vs base	**100%**	**131%**	**178%**	**110%**

8.6. Assuming the service to run in our "base scenario" once per hour and to take 20 minutes, it can be seen that increasing the service (without making the train itself any faster) to 2tph would result in a demand increase of almost a third; a further increase to a metro-style 4tph (as on, for example, Merseyrail Electrics) would result in an even greater increase in demand – a full 78% more use than for an hourly service, reflecting the attractiveness of a walk-up-and-go service level. In contrast, if instead investment were concentrated on making the 1tph service faster, even increasing the train's average speed from 30mph to 40mph would only increase demand by 10%.

8.7. This underlines the priority which it is appropriate to place on local services running at attractive frequencies, even if these frequent trains stop many times and their average actual speed is not particularly high.

(b) Leeds – Manchester business journey

8.8. In this example, passengers are assumed to be using full-fare tickets. It should be emphasised that this case represents a particular simplification, as the effect of Manchester having two (for some purposes three) relevant stations is not modelled. Nonetheless, for the

[10] Using values from Table B4.5 in PDFH v.6.0, the relevant elasticity to change is -1.1 for season and full-fare tickets, and -1.2 for reduced-fare travel.

purposes of showing the relative importance of speed versus frequency, we consider it to have validity.

Table 5: GJT and demand impact comparison: middle-distance business example

	4+2tph	true 6tph	4tph	2tph	4tph fast
Waiting	13	10	15	26	15
Travelling	42	40	40	40	35
Total GJT	55	50	55	66	50
Demand vs base	**100%**	**112%**	**100%**	**80%**	**112%**

8.9. The scenarios here are as follows:

- "4+2tph": This is intended to be a representation of something akin to the service pattern proposed in ITSS v.1.1: there are 4tph from Manchester to Leeds taking 40 minutes and 15 minutes apart, plus two others 30 minutes apart which take 49 minutes. The relevant waiting and travelling times are not simple averages, because there will be a preference amongst passengers for the faster trains, so the waiting time is slightly higher, and the travelling time slightly lower, than a simple arithmetical mean – the values are however estimates interpolated between the values for a 6tph and a 4tph service. This scenario is taken as the base.
- "true 6tph": This is a notional scenario where there are six fast trains, all of which take 40 minutes, and they are perfectly spaced 10 minutes apart. It can be seen that this ambitious service level would generate 12% extra demand.
- "4tph": This scenario removes the 2tph from Manchester to Leeds taking 49 minutes, but leaves the 40-minute fast services unchanged, operating at even 15-minute intervals. Such a scenario might be chosen if, for example, it were decided to operate better local services on a given network specification, and/or more freight. What it shows is that the GJT is in fact no different from the base scenario. In other words, ***for journeys between Leeds and Manchester themselves*** (as opposed to intermediate locations), the additional 2tph do not bring any benefits in pure GJT terms, and the 4tph service is all that is required in passenger attractiveness terms.
- "2tph": While a 2tph fast service is not considered to be a serious proposal in the context of TRU and would not be supported by WYCA, this scenario is included for comparison with example (a) above, to show that in fact the demand effect of even a lower frequency would not be as marked as the that of different frequency levels for local stopping services. This notional 2tph service would in fact carry only 20% fewer passengers, all other things being equal, than either a 4tph service or indeed the 4+2tph service proposed under ITSS v.1.1.
- "4tph fast": This is a variant on the "4tph" scenario, but with an increase in the fast trains' speed such that they take only 35 minutes to complete their journey. This achieves a 12% increase in demand as against either the base scenario or the "4tph" – the same in GJT terms as if the trains ran every 10 minutes.

8.10. This example demonstrates that for journeys between Leeds and Manchester, and ignoring the effects of the choice of origin/destination stations in Manchester, there is no additional benefit in GJT terms to having the 2tph "semi-fast" trains proposed under ITSS v.1.1 as against a simple 4tph regular-interval service. This is not to say that there is no case for those semi-fast trains – they might be justified in terms of serving alternative locations in Manchester, serving intermediate locations between Manchester and Huddersfield and/or

Huddersfield and Leeds, or serving stations beyond the core TRU network that might not otherwise be served. However, it suggests that it is reasonable to look at other uses for the network capacity that might become available if those trains did not run, such as enhanced local services on the core TRU route (some or all of which may themselves run through from Leeds to Manchester), and/or freight paths.

8.11. Conversely, the simple analysis underlines that for longer journeys such as this, where business travel is likely to be significant, station-to-station journey time is important: it can be seen that a move from a 4tph service with trains taking 40 minutes to one where the same trains take only 35 minutes would, all other things being equal, increase end-to-end demand by 12%. Notably, this 5-minute speed enhancement taken as an example only represents half of the further journey benefit expected from the longer-term Northern Powerhouse Rail programme, which has set a sub-30-minute target for Leeds – Manchester. This evidence underlines that these journey times are worthwhile, even before ancillary advantages such as better interchange are considered.

(c) Longer-distance example: Leeds – Newcastle leisure journey

8.12. This last example is intended to illustrate how the components of GJT interact for a typical longer-distance leisure journey likely to be covered by TRU service – for example, a student travelling home for a weekend on a reduced-fare journey. It is assumed in the "base scenario" that TRU enables a train to travel from Leeds to Newcastle in 80 minutes, and that two trains achieve this per hour, plus a third train taking around 85 minutes (comparable to a current Cross-Country service).

Table 6: GJT and demand impact comparison: longer-distance leisure example

	3tph uneven	3tph even	2tph	2tph fast
Waiting	19	17	21	21
Travelling	82	80	80	75
Total GJT	101	97	101	96
Demand vs base	**100%**	**105%**	**100%**	**106%**

8.13. Once again, the base scenario attempts in simplified terms to represent what is understood to be proposed under ITSS v.1.1. Because the slightly slower XC train is assumed to be slightly less attractive than the two TRU services and the trains would be unlikely to operate 3tph on even 20-minute intervals, the waiting time is slightly greater than for an even 3tph service, and the journey time is slightly more than the 80-minute value.

8.14. The alternative scenarios then show that:

- if there were three trains exactly 20 minutes apart and all taking only 80 minutes to get to Newcastle, demand would increase by 5%;
- if there were only two trains per hour but they both took 80 minutes and were exactly 30 minutes apart, this would be just as attractive as the base scenario; and
- if there were only 2tph, again evenly spaced, and they were made 5 minutes faster on their journeys, this would generate 6% extra demand, more than if it were possible to move to a "perfect 3tph" service pattern.

8.15. This demonstrates that, for this origin-destination pair, from a passenger attractiveness point of view, a service of two trains per hour evenly spaced, and achieving the best journey time reasonably feasible, would appear to be a sensible target. Over this longer journey, the value of increases in end-to-end train speed are even greater – again pointing the way towards NPR.

(d) Conclusions from simple GJT analysis

8.16. The above examples, using standard industry techniques, can be taken to support the following conclusions:

- There is a strong case to ensure that local stations are provided with regular-interval services at a minimum level of 2tph, with a longer-term ambition (such as under an NPR scenario) of 4tph being clearly legitimate if the region wishes to move towards a Metro (S-Bahn) style of operations in order to provide the most attractive local train services possible, driving inclusive and sustainable economic growth and maximising quality of life. These local trains can stop at all stations, as the benefits in terms of service frequency, even intervals and simplicity of service offer outweigh the journey-time penalty for such journeys.
- From a connectivity point of view, 4tph appears to be the optimum level of fast service between Leeds and Manchester, and there is little need in GJT terms for 6tph. Anything beyond 4tph is only likely to be justifiable if it provides additional connectivity (such as by serving different areas of Manchester, intermediate stops, or locations beyond the core TRU network), or capacity that is needed end-to-end beyond that which could be delivered by 8-car sets running at 4tph. The case for such additional Leeds – Manchester trains should be balanced against alternative uses of the network, other ways of providing passenger capacity on the corridors in question, and other options to deliver connectivity for intermediate locations and those beyond the core TRU network. It is therefore legitimate to consider such alternatives rather than regarding the “6tph fast” model as sacrosanct.
- Longer-distance intercity connectivity will in general not require more than 2tph from a GJT point of view, but wider connectivity requirements might in some cases drive one to higher service levels on certain corridors; however, where tough choices need to be made on network capacity, such as on the ECML north of York, there may be a case for considering alternative solutions such as reliable, timetabled/ticketed and guaranteed cross-platform interchange.
- Conversely, the value of train speed increases (end-to-end journey times) on the longer-distance services is underlined: verifying much of the narrative behind NPR, which seeks to do this without compromising regional and local connectivity.

8.17. It is worth noting that, in broad terms, levels of economic benefit as between the scenarios for each origin-destination pair considered can be assumed to be roughly in proportion with demand, in relative terms. However, it will be recalled that all of the above analysis is simply in relative terms, and does not consider absolute demand levels – for example, the flow from Manchester to Leeds and vice versa is considerably greater than that between Marsden and Stalybridge, and the flows between Huddersfield and Leeds are greater still. It follows that the economic value of one minute saving of GJT will be greater on those heavier flows.

8.18. We would also comment that while we have not attempted to model reliability, we are aware that the value (or disbenefit) of one *unscheduled* minute, whether it be on a delayed train or waiting on a platform, is significantly more than one minute travelling on a punctual train, meaning that a punctual railway brings disproportionately strong GJT (and therefore

demand and wider economic) benefits. Once again this underlines the need for TRU to produce a genuinely reliable railway.

8.19. It is important to repeat that the above observations are based solely on GJT analysis and on the specific origin-destination pairs named. Other considerations might legitimately drive one to differing conclusions as to what service patterns are optimal; such factors could include:

- other origin-destination pairs along the same routes, which might give slightly different results (although the above examples are believed to show a fair spread of typical journeys using the TRU line);
- timetabling considerations, including the need for certain places to have a given number of direct connections to other locations (for example, if the view is that Manchester should have 2tph to Newcastle, then Leeds – Newcastle would have to be at least 3tph assuming that a service on the Cross-Country route is still required);
- train capacity: if absolute demand levels were, for example, such that even with 8-car trains, there were not enough passenger capacity to accommodate loadings between Manchester and Leeds, then the case for operating six trains per hour would become stronger (although note that if the additional two were slower, their impact on de-crowding the four fast trains would be limited).

9. Timetable analysis

9.1. We have had sight of Network Rail's paper Timetable & Performance Analysis Report [11], which, on the basis of Strategic Development Option 1 (SDO1) reproduces a number of model standard-hour timetables that to differing extents translate the Indicative Train Service Specification (ITSS) v.1.1 into specific service pattern, including some sensitivity-tests of alternative options for use in performance analysis and infrastructure planning.

9.2. While we do not have any detailed information setting out the infrastructure assumptions on which this timetable development work was based, the timetables themselves, and the underlying paper, allow certain conclusions to be drawn about the capability and capacity that the infrastructure is assumed to deliver. Based on these, and retaining NR's wider assumptions on matters such as sectional running and dwell times, we have begun carrying out analysis of the extent to which those model standard-hour timetables could be varied to allow a service pattern to operate that more closely reflects the WYCA priorities evidenced in this paper – without altering the assumed infrastructure interventions.

9.3. While the conclusions emerging from our analysis are preliminary and subject to significant caveats, it would appear that the assumed network capability and capacity delivered by SDO1 as represented in NR's analysis would indeed be compatible with delivering the alternative service pattern assumptions used in our work. In particular, it is notable that:

- Removing the 2tph semi-fast Manchester Piccadilly – Hull services (and providing the relevant connectivity and on-train capacity using other services) frees up line capacity
- This allows a 2tph Leeds – Huddersfield – Manchester stopping service to operate, serving all stations on a straightforward and balanced clockface; notably, this includes Cottingley /

[11] Transpennine Route Upgrade: ITSS Version 1.1 Timetable & Performance Analysis Report, 14th May 2018 (NR ProjectWise Ref: 151671-NWR-00-TRU-REP-K-OP-000051)

White Rose (which under some NR scenarios would only have 1tph), and the Upper Colne Valley

- There remain 4tph fast services between Leeds and Manchester, with 2tph having slightly longer journey times (45 minutes vice 39 minutes) while serving Dewsbury and Stalybridge
- It also provides the opportunity for locations such as Hull to have a better range of direct connectivity, and for connections in some locations to be made more logical, such as for cross-Huddersfield interchange journeys
- The reconfiguration could potentially deliver a more robust (and therefore punctual) railway overall on the same infrastructure, in that it reduces the pressure at some critical locations such as Stalybridge

9.4. This leads one towards the conclusion that SDO1, which we understand to be broadly similar to the variant of TRU infrastructure configuration favoured by TfN[12], appears to remain the "right answer" even if this alternative view from TfN's or Network Rail's is taken as to the optimal mix of services that should operate on the route post-TRU. This leads to the conclusion that, though WYCA's view as to that service configuration may indeed be different from TfN's, WYCA should support TfN's view as to the *infrastructure* configuration that TRU should deliver. This appears to be an important conclusion from the point of view of progressing TRU as a whole through its Strategic Outline Business Case and beyond.

9.5. Certain caveats need, however, to be emphasised at this stage;

(a) We have so far received only very limited information as to the infrastructure assumptions behind NR's timetable development work on SDO1 and believed to reflect TfN's view of the appropriate configuration for TRU (these are believed to be the same). We have therefore had to rely on deduction and analogy.

(b) Our timetable analysis and development work itself has been carried out in-house and not subjected to any external checking, validation, demand forecasting / crowding analysis, performance modelling or similar – nor consideration of interactions with the wider network beyond TRU boundaries. It is at an early stage and could change or even contain errors.

(c) There could well be detail areas in which the infrastructure requirements of the WYCA timetable model do differ from those implied by the NR timetables, for example the turnback specifications where NR assumes that stopping services from Leeds and Manchester would terminate in Huddersfield, or the platform lengths required by WYCA's assumption that fast services are likely to need to be longer if operating at 4tph.

(d) Further work also needs to be carried out to consider the impact of the proposed new station at Thorpe Park[13], that of assuming freight to be electrically hauled rather than diesel, that of any differences in services that may be necessary in the peaks, and potentially also options for other service configurations for local services such as those west of Huddersfield and/or on the routes through Brighouse and Elland.

[12] We understand that TfN are referring to their proposed variant as SDO2A. However, it is understood that SDO2A would be similar to SDO1 in terms of the network capacity it would enable. Nonetheless, WYCA has not had sight of specifics about either strategic development option, and this needs further consideration to identify any material differences.

[13] Note that for the purposes of this exercise it is being assumed that White Rose simply replaces Cottingley with no net changes in trains' running times nor net line capacity implications.

9.6. There may be instances where, while WYCA's service concept leads to the same general conclusions regarding the infrastructure configuration to be delivered by TRU and certainly to the same view as to the overall order of magnitude, scope and nature of the scheme, more than one option or sub-option is under consideration at a given location. In such cases, if a given option is compatible with both TfN's service concept and WYCA's, and an alternative option is only compatible with TfN's and would exclude WYCA's, we would urge that TRU be "future-proofed" by choosing the former. Purely by way of example, this might emerge in terms of the optimal configuration of Huddersfield station, where we understand several options to be available.

9.7. In light of these emerging conclusions, we are keen to share our timetable analysis with TfN colleagues and would ask them to make available fuller information on the specific infrastructure interventions making up their vision of TRU's physical configuration. There is clearly much scope for joint working between WYCA and TfN technical officers in developing TRU further and jointly supporting the development of the project through SOBC stage.

10. General conclusions

10.1. The York/Selby – Leeds – Manchester corridor is one of the most important rail routes serving West Yorkshire, and ensuring that TRU provides for the optimal combination of fast interurban and stopping regional services is essential if the region's businesses are to have access to the labour on which they depend, and if the region is to develop in a manner that is sustainable and inclusive, while maintaining and enhancing quality of life.

10.2. The analysis in this note shows strong evidence that:

(a) There need to be "true" local services provided, stopping at all stations and operating on a regular clockface of at least 2tph, with additional capacity provided in the peaks and greatly improved levels of reliability over the present standards; there is a case to move towards 4tph on local services in the longer term, to provide the S-Bahn-style (i.e. metro) walk-up-and-go frequencies that unlock the highest levels of connectivity and opportunity.

(b) The markets for local services are already significant but are poorly served, with some stations only having one train per hour and some local journeys being practically impossible by rail, in particular since the May 2018 timetable changes. As such, demand is being suppressed. Skip-stopping, "tidal" or other compromised service patterns will not be suitable for these flows.

(c) These local markets are expected to see significant growth driven by exogenous factors such as housing growth clustering around stations in locations such as Ravensthorpe, East Garforth and Brighouse (amongst others), and continued employment growth concentrated on the centres of Leeds, Huddersfield and to an extent Dewsbury, in locations that will disproportionately attract rail-borne commuting, as well as around the new stations at Thorpe Park and White Rose.

(d) Balanced against this, there clearly needs to be high-quality, fast, reliable and high-capacity intercity connectivity between Leeds and Manchester, serving Huddersfield and extending to the main centres to the east and west, and with a balance between the Manchester destinations. However, from an interurban connectivity point of view, it is not clear that there is a strong case for more than four such trains per standard hour; or rather,

if, as appears likely, providing more than this in an affordable manner would lead to sacrifices in local connectivity (where frequency is all-important), then it appears likely that priority should be given to the local services as against exceeding 4tph for intercity services.

10.3. This analysis has not attempted to consider all factors that are potentially relevant in considering the appropriate post-TRU balance of services on the route. For example, pure revenue considerations may suggest different conclusions as regards priorities – but the railway, it should be recalled, is not primarily a commercial entity but exists rather as a critical piece of infrastructure to ensure the proper functioning of the regions it serves: a railway that is successful in narrow revenue / opcost terms would be a failure if it did not deliver the workers into the city centres on which the economy depends. Similarly, operating considerations could also drive differing approaches to service provision – but while this might extend to the selection of which locations are linked with which others by through services, it should not dictate the overall levels of service provision. It might also be suggested that the nature of the infrastructure will be a factor determining the overall service proposition – but this should not be the deciding factor: while deliverability and affordability of infrastructure will always be a constraint on the ultimate levels of service that can be provided, the design of infrastructure needs to *follow* service provision, and not vice versa. Subject to such real-world constraints, the timetable should be written first, and the infrastructure designed around that – as is normal practice in most other European countries.

10.4. Initial analysis carried out by WYCA suggests that, while the service patterns that our priorities imply are likely to differ from those assumed by Network Rail in its timetable development work for TRU, it appears likely that a similar level and type of infrastructure to that assumed by NR in that work would also be suitable to deliver WYCA's preferred service outcome. While further work needs to be carried out to verify this, it leads towards the conclusion that the level and type of TRU infrastructure intervention which we understand to be favoured by TfN would also be capable of delivering a service concept compatible with WYCA's priorities. This leads WYCA to agree with the broad infrastructure configuration for TRU that we understand to be proposed by TfN, and therefore to support its development through the business case process.

10.5. It follows that work should continue to design a timetable concept (standard-hour off-peak and peaks) that reflects the priorities outlined in this paper, plus the areas noted as out of scope, alongside, of course, similar inputs setting out neighbouring authorities' and other stakeholders' priority outputs for TRU. The existing infrastructure design work (and the Strategic Development Options) can then be sense-tested against such timetable concept(s), and any detail modifications necessary carried out, subject to value-for-money, deliverability and other standard criteria.

West Yorkshire Combined Authority, August 2018