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Skipton and East Lancashire Rail Action Partnership (SELRAP)

Skipton – Colne Demand Forecasting Analysis

November 2020



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1 Introduction

Ove Arup and Partners Limited have been commissioned by the Skipton and East Lancashire Rail Action Partnership (SELRAP) to investigate demand benchmarks for the proposed station at Earby on the potentially reopened Skipton to Colne Line. This is an update to an initial benchmarking exercise carried out by Arup in 2013 and follows the submission of the Strategic Outline Business Case (SOBC) for the scheme which was produced by the consultants Steer in 2019.

Previous forecasts had been based upon comparisons with selected comparable stations within the local region. However, these new forecasts are based upon deriving trip rates (rail journeys per head of population per annum) from a range of stations on lines from a much wider geography around the country with good quality rail services that are deemed comparable to Earby's aspirations. These rates have been applied to the catchment population of Earby to help understand the level of demand that could be achieved upon opening if a similar quality of service is provided.

Accordingly, for this study, the forecasts have been based upon a detailed study of four rail lines which each provide higher quality and longer distance commuting services into a range of regional cities across the UK, namely Leeds, Manchester, Birmingham and Edinburgh (Borders Railway line):

- The Airedale and East Lancashire Line;
- Mid-Cheshire Line (Manchester Piccadilly - Chester via Knutsford);
- Birmingham - Worcester via Kidderminster – or via Droitwich Spa; and
- Borders Railway between Tweedbank and Edinburgh.

These specific lines were selected because, as with the future services using the Skipton to Colne link towards Leeds, they each provide a high quality and fast service to a major regional city centre and therefore deliver patronage levels that are higher than is found on other more local comparator lines which are of a lower-quality, slower and less frequent. Such an approach is considered reasonable to provide an improved and updated patronage figure for the new station at Earby, particularly given the aspiration to extend the high-quality Leeds to Skipton services onwards to serve the new station.

This additional, more detailed analysis is considered necessary given the large variance in patronage forecasts previously quoted for the new station at Earby; firstly from the Steer SOBC commissioned by the DfT (between 8,291 and 44,707 passengers per year) and secondly, the earlier forecasts produced by Arup on behalf of SELRAP (174,750 passengers per year). As the development work progresses to the next stage it is important that core assumptions around demand are continuously refined and, where necessary, challenged.

This note presents the results of this analysis along with a comparison with the past demand estimates, commentary on the strengths and weaknesses of the different approaches taken and a summary of potential additional demand generated beyond the new station in Earby.

1.1 Project Phasing

In early 2020 the DfT authorised the progression of the Skipton to Colne project through to the 'develop' stage of the Rail Network Enhancements Pipeline (RNEP). This precedes 'design' and puts the focus on developing a clear understanding of the relevant railway outputs to deliver the outcomes being sought. The scheme being put forward, which is referred to as Phase 1 by SELRAP, is for the delivery of a 12-mile long stretch of new railway between Skipton and Colne, mostly

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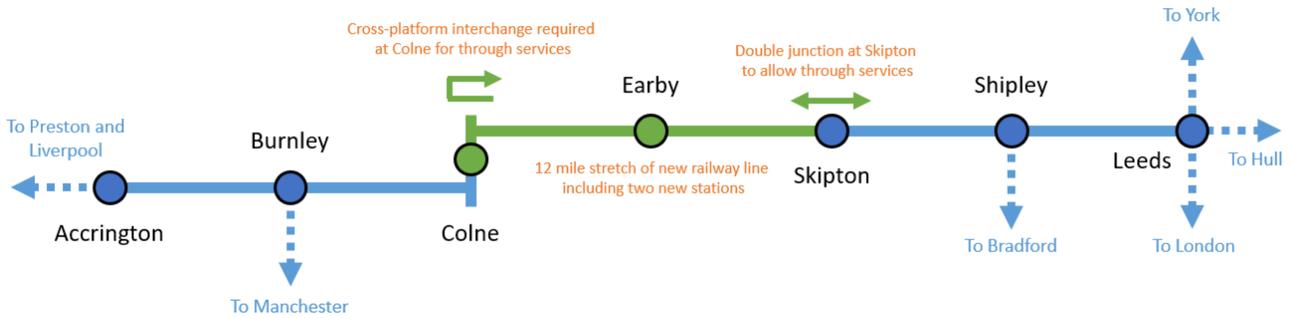
across greenfield, with one additional station on the route. This would include provision of a double junction at Skipton to allow Leeds – Skipton – Colne services to be introduced. This moves away from Option 1 in the *Strategic Outline Business Case* which only assumed the provision of a Skipton to Colne shuttle service.

The demand forecasts produced through this analysis are designed to align with Phase 1 of the project, as outlined above, with the primary drivers of demand being new direct trips from the two new stations at Earby and Colne to Leeds (with additional demand drivers outlined in a Chapter 8). However, it should be noted that the nature of this scheme lends itself to a number of incrementally delivered future phases. As described by SELRAP, these are:

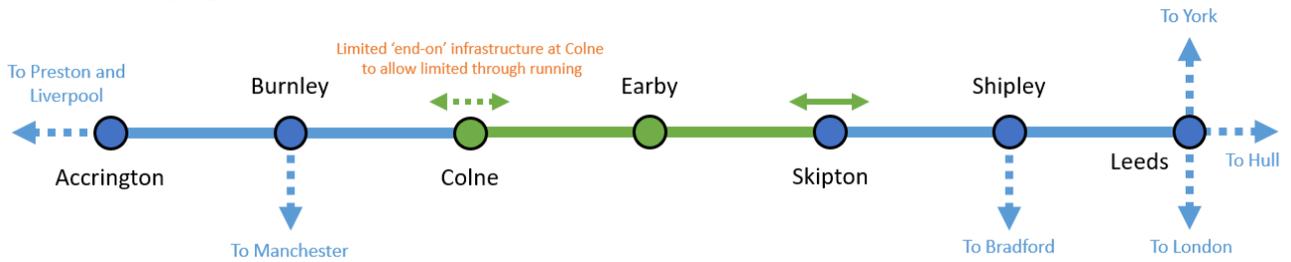
- Phase 1A – provision of a limited ‘end on’ infrastructure connection at Colne to allow some through running of passenger and freight services (likely no more than 1tph);
- Phase 2 – modernisation and doubling of the Colne to Gannow (Burnley Rose Grove) branch line, approximately 6 miles long to allow passenger services to be extended out to Accrington;
- Phase 3 – provide gauge clearance and capacity works at isolated locations on the strategic freight route from Liverpool to the Drax Power Station and the East Coast ports of Hull and Immingham.

These phases are presented diagrammatically below:

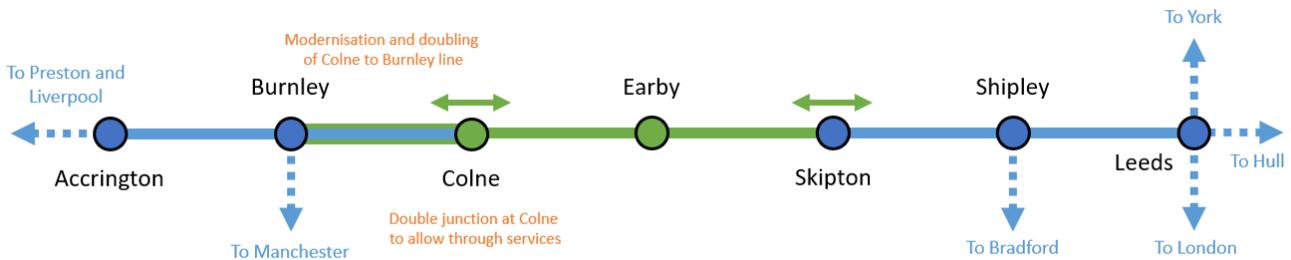
PHASE 1



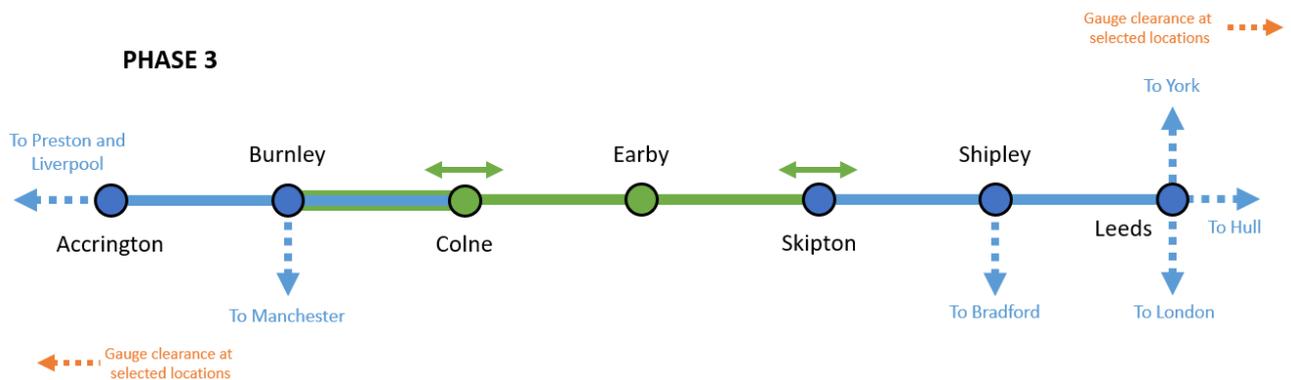
PHASE 1A



PHASE 2



PHASE 3



While Phases 1A, 2 and 3 of the scheme would result in increased passenger demand due to the provision of new direct connectivity and line speed improvements, their impact on demand has **not** been assessed within this study. This is to ensure that the assumptions behind the demand estimates are directly comparable with those that will inform the next stage of development work being produced by the DfT.

2 Methodology

This methodology has been designed to identify appropriate comparator trip rates, and then generate a robust forecast for Phase 1 passenger demand at Earby Station. Although it is acknowledged that a new station will also likely be delivered at Colne, given the additional complexities around using a trip rate model to forecast demand at an operational station, the decision has been made to focus primarily on Earby. Likely demand generated from Colne, along with other key drivers, is discussed further in Chapter 8. Further, the next steps required to develop and refine the forecast for Colne are set out in Chapter 10.

GIS software has been used to define 1000m and 2000m walking and cycling catchments around each of the 74 stations in scope. The population in each catchment from the 2011 Census was calculated in GIS and then uplifted using TEMPro v7 growth factors to a 2025 base for Earby and 2018 base for other stations

For the purpose of this study, it has been assumed that demand from wider catchments (i.e. more than 2km) for all stations is reflected in trip rates for inner catchment bands. In reality, the percentage of overall demand that is drawn from outside 2km catchment depends on many local factors and can vary from 1 to 40%¹.

The number of entries at each station was informed by Office of Road and Rail (ORR) entry and exit data (2017/2018²). The data was split using an assumption that 75% of trips at existing stations would be from within the 1,000m catchment, and 25% would be from the wider 2,000m catchment³.

The entry and exit data were automatically adjusted to reflect the differences in service frequencies and journey times between the benchmark stations and the proposed station on the Skipton – Colne line at Earby. This was done using the journey time to the nearest core economic centre for each route, the Passenger Demand Forecasting Handbook (PDFH) service frequency penalty⁴, and an elasticity of -1.2⁵.

2.1 Additional Key Assumptions

- For Earby, it has been assumed that Phase 1 would be operational in 2025 and that the station would be served by 2tph direct to Leeds, with a journey time of 45 minutes. The operational feasibility of this solution is outside the scope of this study.
- Kirkstall Forge, Altrincham and Navigation Road have been excluded from further analysis as they either opened too recently to hold enough data or have atypical catchments (i.e. additionally served by tram). Additionally, Blackburn has been excluded given it is a journey attractor with a strong market facing Manchester.

¹ PDFH 5.1, Table 10.2

² 2018/2019 station usage data is not representative for the East Lancashire Line as partly affected by May 2018 Timetable disruption

³ This has been estimated based on figures from Table B9.3 in PDFH 6.0 and Section 7 of *Station Usage and Demand Forecasts for Newly Opened Lines and Railway Stations*, Steer, 2010

⁴ PDFH 6.0, Table B4.11

⁵ *ibid.*, Table B4.5 (Non-London, over 20 miles flows)

2.2 Unconstrained Trip Rates

Table 1 below shows the average trip rates for all stations on each line for the 1,000m and 2,000m catchments. The trip rates in the table are unconstrained in that they do not apply the journey time or frequency penalties. The trip rates range from 3.3 (1,000m) and 0.6 (2,000m) on the East Lancashire Line to 54.3 and 4.0 on the Airedale Line. The total average trip rates for all the benchmarks as used in the modelling are 27.2 and 4.1.

Line	Entries per Head 1,000m	Entries per Head 1,000m – 2,000m
Airedale Line	54.3	4.0
Birmingham – Worcester	34.0	8.3
Borders Railway	18.3	3.3
East Lancashire Line	3.3	0.6
Mid-Cheshire Line	26.8	4.1
Weighted Average	27.2	4.1

Table 1: Average Unconstrained Trip Rate by Line

2.3 Explaining the Variation

The variation in trip rates from catchments depends on the functions each station has for their surroundings. They can be very high for stations in commuter belts and low for sites close to central areas or free-standing industrial towns⁶, and are driven by the level of socio-economic interaction between the trip generator (i.e. station in scope) and its key attractors. The multiple rail offering qualities (e.g. frequency, journey time, rolling stock capacity and reliability) can help to facilitate this interaction, while competitiveness of other modes of transport (e.g. journey times by road) can drive users away from rail. Each station has its own unique set of circumstances, with many local characteristics at play to affect trip rates.

2.4 Constrained Trip Rates

Appendix A presents the trip rate data for each individual station in full, including car parking and journey time and distance to the nearest city (key attractor). The key attractors are Leeds (for the Airedale Line), Manchester (for Mid-Cheshire Line), Birmingham (for Birmingham to Worcester), Edinburgh (for the Borders Railway) and Preston (for the East Lancashire Line). There is also commentary pointing out likely reasons for higher trip rates where they occur.

The total average constrained trip rates for each of the comparator lines (now accounting for frequency and journey time to key economic centre) are presented below in Table 2.

⁶ PDFH 5.1, Section C10.3.2

Line	Entries per Head 1000m	Entries per Head 1000m – 2000m
Airedale Line	26.6	4.1
Birmingham to Worcester	12.3	1.7
Borders Railway	16.1	2.9
East Lancashire Line	3.3	0.6
Mid-Cheshire Line	11.5	1.8
Weighted Average	11.6	1.8

Table 2: Average Constrained Trip Rate by Line

Even if constrained trip rates are considered, the discrepancy between trip rates for the East Lancashire Line and other lines is apparent. This urban rail line suffers from a low frequency (1tph, below the TfN aspiration of a minimum of 2tph), and uncompetitive journey times. The line also has a poor reliability record, with the Public Performance Measure (PPM) well below 90% for most months since Period 18-01 (i.e. from April 2017, see Figure 1 for details).

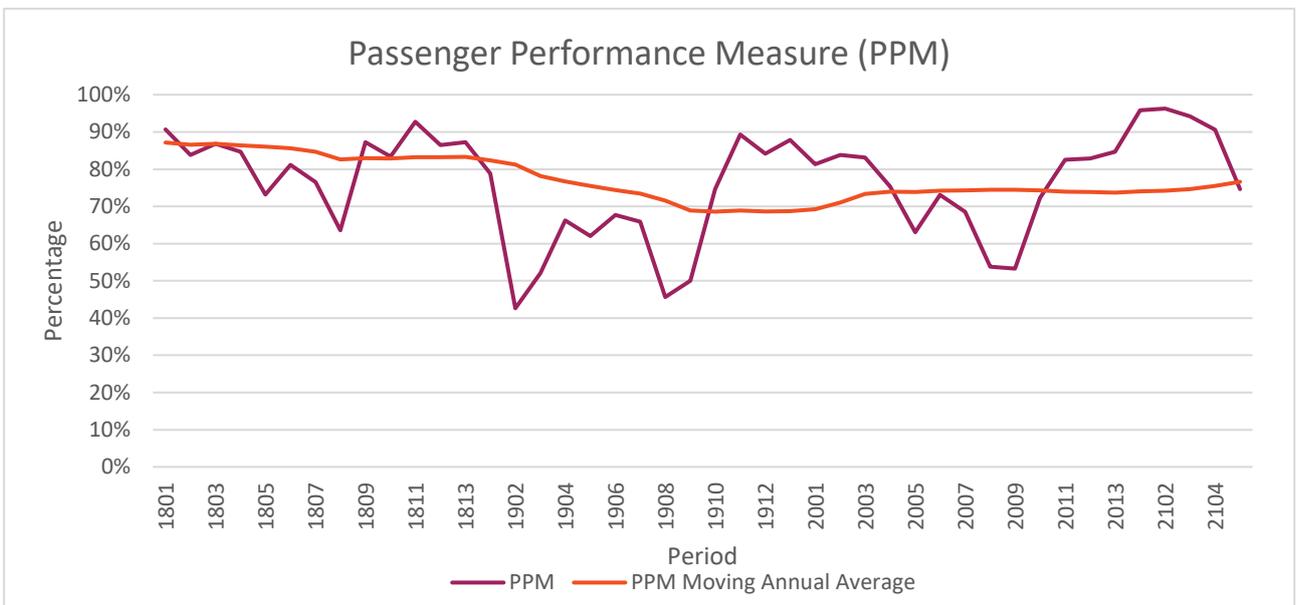


Figure 1: PPM Measure, Blackpool South - Colne Services, Network Rail Periods 18-01 – 21-05⁷

Following further analysis, and for the reasons outlined above, the East Lancashire Line is not considered to be a good comparator for this study. Phase 1 of the Skipton to Colne project is expected to bring two trains per hour, connectivity to the major economic centre of Leeds and high-quality modern trains, three characteristics not found on the East Lancashire Line. Therefore, the line has been excluded from the main trip rate analysis in subsequent sections, with results reported separately where appropriate to highlight the difference in the scale of projected demand.

The other notable outlier – the Airedale Line – has a high trip rate that can be attributed to the high quality of service with regards to journey times and rolling stock and the presence of two key attractors (Bradford and Leeds). Additionally, the line was electrified relatively early (1994), with the ‘sparks effect’ helping to boost demand in the early stages of its service offering. Given the ambitious aspirations for the Skipton to Colne services it is considered appropriate to keep this line within the main calculations.

⁷ Source: Northern Rail

3 Model Type Comparison

The model used in this study follows an industry-established practice, described in Chapter B9.3.2 of PDFH. According to the guidance demand for a new station can be calculated in three ways:

- Using current true / origin destination data by rail and other modes;
- Trip rate or trip end models (i.e. the current model); or
- Large models or those specifically constructed for the scheme being considered (i.e. the New Flows gravity model used for the SOBC).

While this study is based on the modelling of trip rates, the passenger demand for Earby station included in the Steer-produced SOBC is derived from a constrained gravity model. Gravity models take into account the attractiveness of destinations as well as service quality and are based on the observation that the volume of demand between two places is proportional to the relative attractiveness of the two places, but inversely proportional to a measure of the separation of the two places. The measure of separation is expressed using Generalised Journey Times (GJT).

The analysis based on Generalised Journey Times (GJT) would use current journey times by different modes, so it would likely ignore gradual increases in road drive time due to congestion as well as journey time reliability. Additionally, the concept of GJT reduces user travel behaviour to being responsive to perceived journey time benefits. In reality, passengers may be attracted to rail for a variety of reasons that are unrelated to journey time. These include the ability to use their journey productively (e.g. to work), easy access to destination at trip end, environmental motives, perception of travel safety etc.

On the other hand, the trip rate model ignores GJTs and the competitiveness of other modes of transport. However, it assumes that flows from the station are expected to be dominated by a single journey attractor (e.g. Leeds). In reality, numerous types of flow are likely to emerge after the two new Earby and Colne stations are built. Additionally, the model ignores the station choice aspect e.g. abstraction from other stations. (explored in Chapter 8).

In conclusion, there is no one perfect method for calculating forecast demand – each are built on numerous assumptions and have both pros and cons. While a trip rate model is less complex than a gravity model, there is no reason why it should be any less accurate. This study has attempted to move away from a subjective selection of comparator stations to a more evidence-led trip rate approach which has brought it closer to the SOBC estimates but still significantly higher.

4 Results at Earby

As part of the proposed reopening of the Skipton – Colne line a new station is proposed at Earby. This would serve the town as well as the wider geographic area, including the town of Barnoldswick two miles to the west.

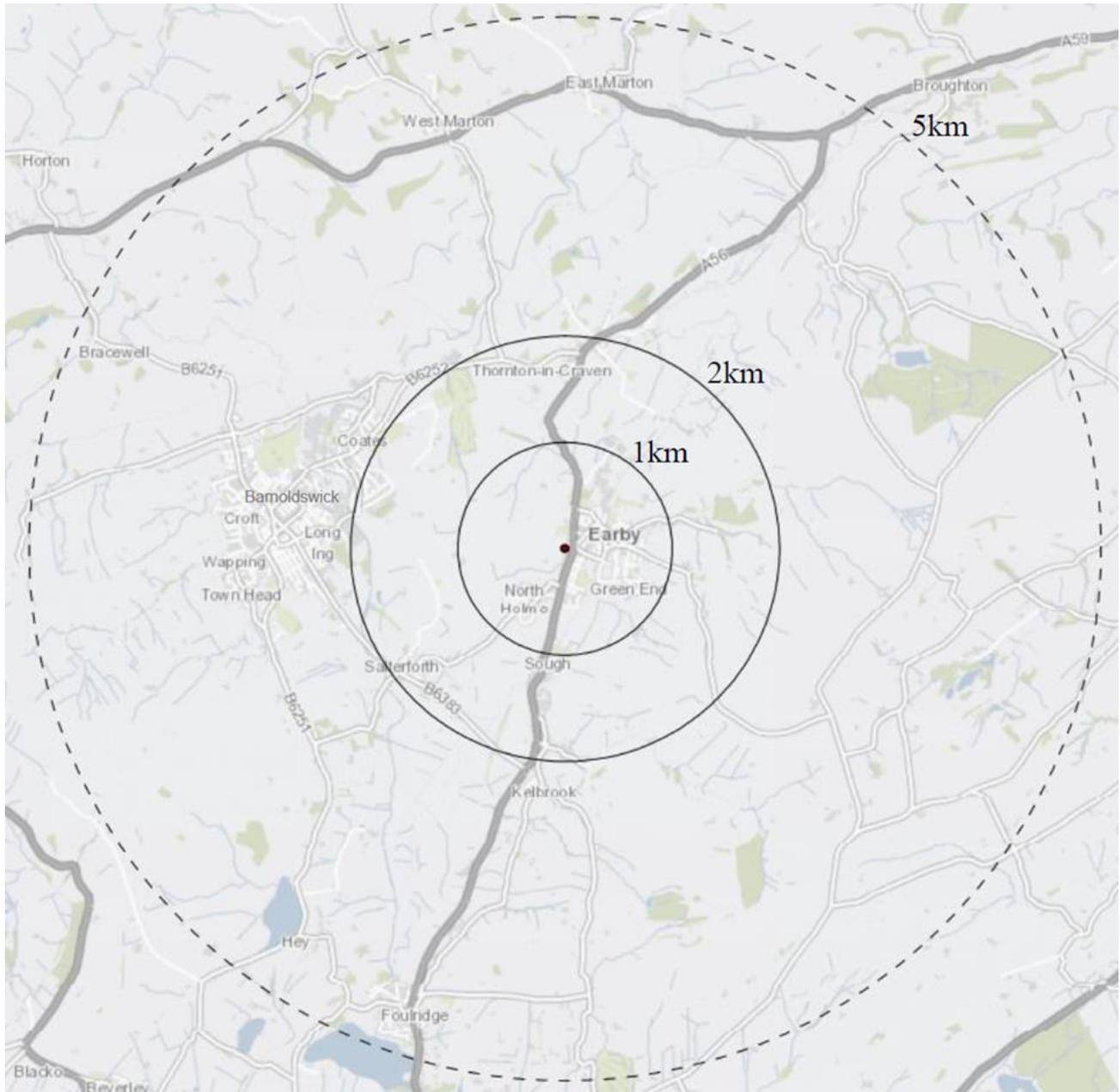


Figure 2: Catchments of proposed Earby station (1,000m, 2,000m and 5000m)

Figure 2 above presents the extent of the 1,000m and 2,000m catchments for Earby, and the GIS analysis shows that there are around 4,353 residents within the 1,000m catchment and around 6,633 in the wider 2,000m catchment, as shown in *Table 3* below.

It also shows that Barnoldswick, the town with population of 10,752 (*2011 Census*) falls entirely within the 5km catchment. Up until 1965 it was linked with Earby by the Barnoldswick Branch, with Earby station providing an interchange for journeys to/from the town. While journey patterns and land use in the area has long been transformed, it may be expected that Earby would attract some demand from Barnoldswick and other places in the area, especially if the provision of the

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station was accompanied by improvements to cycling, adjustment to bus timetables and with provision of kiss and ride and car parking. However, due to the higher uncertainty about trip rates in the wider catchment, and the increased likelihood of the catchment overlapping with other stations - particularly for comparator stations, potential demand from outside the 2km catchment has been excluded from this study.

Station	Usual Residents 1,000m	Usual Residents 1,000m – 2,000m
Earby	4,353	2,280

Table 3: Earby Population Catchment, 2025

The constrained trip rates from each comparator line in Table 2 have been applied to the population totals in Table 3 to gain a range of estimates of the likely number of trips at the proposed station at Earby based on each comparator line. These totals are shown below in Table 4.

Comparator Line	Trips (1,000m) Annual	Trips (1,000m-2,000m) Annual	Total Trips (one Way)	Total Trips (Two-way)
Airedale Line	115,946	9,325	125,271	250,543
Birmingham - Worcester	53,588	3,825	57,413	114,826
Borders Railway	69,991	6,691	76,682	153,364
Mid-Cheshire Line	50,214	4,065	54,279	108,558
Weighted Average	63,005	4,807	67,812	135,624
<i>East Lancashire Line</i>	<i>14,547</i>	<i>1,332</i>	<i>15,879</i>	<i>31,759</i>

Table 4: Total Trips in Earby Based on Lines Benchmarks

The results range from **250,543** two-way trips per year if the Airedale Line comparator trip rates are used to **108,558** two-way trips per year if the Mid-Cheshire Line is selected.

5 Socio-Economic Analysis

To further explore the data and extract some more targeted trip rates, additional analysis has been undertaken to show a range of key socio-economic indicators for the comparator lines. The following datasets have been collated for areas around all the stations:

- Households with access to a car (% of households);
- Income (disposable household income £ per annum);
- Level 4 qualifications or above (% of population); and
- Economically active (% of population).

The full socio-economic datasets for all the benchmarked stations are presented in Appendix B. They have only been shown for England as the same indicators are not readily available from the Scottish Census.

Collated averages for each of the comparator lines are presented in Table 5. The data shows that there is a clear pattern of higher deprivation and lower education outcomes in the catchments of stations on the East Lancashire Line, with significantly lower levels of household income and educational attainment. Levels of economic activity are not significantly lower pointing to the low skill and low paying nature of employment in the area. These findings lend further weight to the decision to exclude the East Lancashire Line from the main analysis.

Line	Households with Access to a Car (% of Households)	Income (Disposable Household Income £ per Annum)	Level 4 Qualifications or Above (% of Population)	Economically Active (% of Population)
Airedale Line	73%	6,936	30%	72%
Birmingham - Worcester	75%	7,401	28%	67%
Mid-Cheshire Line	83%	6,673	36%	71%
<i>East Lancashire Line</i>	<i>69%</i>	<i>1,493</i>	<i>18%</i>	<i>65%</i>

Table 5: Socio-Economic Analysis Average by Line

6 Benchmarking by Selected Criteria

Table 6 below presents a range of sensitivity tests that have been carried out using the socio-economic data. For each criterion, the 20 stations from the three remaining comparator lines which most closely match the characteristics of Earby have been selected and the resulting trip rates, along with the projected estimates for total two-way trips for Earby, are presented.

Station selection criteria	Number of stations within the pool	Trip rate (1,000m)	Trip rate (1000-2,000m)	Total trips (two-way)
Similar population within 2km catchment (all frequencies)	20	20.9	4.0	200,414
Similar car ownership in the area (all frequencies)	20	17.9	2.8	168,965
Similar disposable income in the area (all frequencies)	20	15.9	2.4	149,312
Same level of higher qualifications in the area (all frequencies)	20	14.0	1.9	130,783
Same level of economic activity in the area (all frequencies)	20	17.9	2.4	167,072
Only stations with similar distance to key attractor (all frequencies)	20	22.8	4.7	219,744

Table 6: Demand by selected criteria

The results show a large range of projected demand for Earby from **149,312** to **219,744**.

Following further consultation with SELRAP, it was agreed that some of the stations in the overall pool have inappropriate levels of service to be comparable with Earby. For example, Stockport has a total frequency of 15tph and is served by local, regional and national operators. These factors are smoothed out using the frequency and distance penalties but there are likely a number of other rail service-related factors that make these stations incomparable with Earby (e.g. rolling stock quality, reliability, accessibility, integration with other modes etc.) For this reason, additional sensitivity testing has been carried out using a ‘frequency switch’.

Station selection criteria	Number of stations within the pool	Trip rate (1,000m)	Trip rate (1000-2,000m)	Total trips (two-way)
All stations selected	54	14.5	2.1	135,624
All stations served by not more than 4tph	39	15.5	2.5	146,566
All stations served by not more than 3tph	28	13.4	2.2	126,535
All stations served by not more than 2tph	26	11.4	1.6	106,390

Table 7: Demand excluding various frequencies

The results show that as the frequency threshold reduces, the projected number of trips for Earby also reduces. From **146,566** with stations with a frequency not more than 4tph, it reduces to **106,390** with stations with a frequency not more than 2tph.

Table 8 combines the socio-economic analysis with the frequency thresholds. 2tph has been selected as the frequency threshold and then applied to each of the socio-economic criteria to attain merged trip rates.

Station selection criteria	Number of stations within the pool	Trip rate (1,000m)	Trip rate (1,000-2,000m)	Total trips (two-way)
Similar population within 2km catchment and served by not more than 2tph	12	21.0	4.3	202,063
Similar car ownership in the area and served by not more than 3tph	6	12.0	2.2	114,682
Similar disposable income in the area and served by not more than 2tph	8	5.6	0.8	52,452
Same level of higher qualifications in the area and served by not more than 2tph	5	7.0	0.8	64,720
Same level of economic activity in the area and served not more than 2tph	7	14.8	2.5	140,437
13Only stations with similar distance to key attractor and served by not more than 2tph	11	15.3	3.5	148,536

Table 8: Demand by combination of selected criteria

For stations served by not more than 2tph that are also filtered by one socio-economic criterion, calculated demand for Earby varies from **52,452** to **148,536**. It should be noted that with the two filters switched on the number of stations in the pool can be quite small which will impact on the robustness of the results.

Table 9 below attempts to address this issue by maintaining the frequency filter but also including any station that meets one or more of the six socio-economic criteria. Results have been presented for no greater than 2tph and the revised methodology maintains 17 stations in the pool.

Station selection criteria	Number of stations within the pool	Trip rate (1,000m)	Trip rate (1,000-2,000m)	Total trips (two-way)
Only stations meeting at least one of the socio-economic criteria and served by not more than 2tph	17	11.4	1.6	106,390

Table 9: Demand by combination of selected criteria - expanded

The results show that the total demand for this scenario is **106,390**. On the basis of the analysis conducted for this commission, it is considered to be the central case output. As it was shown above, the calculated demand depends on a subjective choice of stations in the benchmarking pool, so cannot be reduced to a single core figure with a great degree of certainty. For this reason, we have presented the final output within a range. Table 10 below shows the final output from the updated demand analysis. Furthermore, it shall be assumed that only 70% of calculated demand will be achieved in Year 1 after opening, with the station reaching its full demand potential at the end of Year 4⁸.

⁸ PDFH 6.0, Section B9.5

	Number of stations within the pool	Trip rate (1,000m)	Trip rate (1,000-2,000m)	Total trips (two-way)
Central case output (only stations meeting at least one of the socio-economic criteria and served by not more than 2tph)	17	11.4	1.6	106,390
Lower estimate (similar disposable income in the area and served by not more than 2ph)	8	5.6	0.8	52,452
Upper estimate (only stations with similar population within 2km catchment and served by not more than 2tph)	12	21.0	4.3	202,063

Table 10: Final demand estimates

7 Comparison with Previous Analysis and Steer OBC

Table 11 presents the demand numbers forecast at Earby from previous studies, alongside the updated analysis.

Study	Methodology	Trips to and From Earby
Arup 2013 Analysis	Trip rate model	174,750
Steer SOBC	Gravity model	8,291 - 44,707
Arup 2020 (this study)	Trip rate model (refined)	106,390 (with a range of 52,452 – 202,063)

Table 11: Total Trips Forecast by Study

As this analysis has shown, using a wide range of line and station comparators, along with an evidence-led targeting of specific stations has resulted in a range of scenarios, all of which are higher than the top end of Steer's estimate in the SOBC. Part of this may be explained by the relative merits and challenges associated with different model types (explored in Chapter 3), but this clearly needs to be a key input into the development work going forward. On this basis, it is understood that SELRAP are willing to work with the DfT to better understand and refine the demand figures that inform the next stage of the business case process.

8 Additional Demand outside Earby

While this study has focused on calculating demand for the future catchment of Earby station, the scheme is going to generate additional demand to and from other stations in the area. The scheme is expected to have a **transformational impact** on journey times and will likely result in changes to land use, the housing market and economic activity in the area. This will result in complex journey patterns and a build-up in demand in both directions (e.g. towards Blackburn and Skipton/Leeds) that will respond to different phases of the scheme.

There are numerous aspects to the potential additional demand that cannot be easily quantified by trip rate modelling which is known to be more appropriate for new stations in small towns and stations with relatively simple journey patterns. These additional aspects have been presented in Table 12, with further detail outlined in the following sections. It is expected that all of these combined would have a significant and material impact on the overall demand generated by the scheme, perhaps not dissimilar to the demand calculated for Earby alone.

It is important here to understand the issues that are currently suppressing demand at Colne, which if addressed will drive a significant uplift. The current, relatively low station usage at Colne is a result of limited journey opportunities. It is served by the Preston/Blackpool South stopping service, with a journey time of 1h 10 mins to Preston. Travelling to Manchester requires changing at Rose Grove or Blackburn and takes at least one hour, depending on the time of day and the route taken. Colne demand was recently affected by issues with the May 2018 timetable update, with Entries and Exits falling by 28% in 18/19 when compared with the previous year to 66,000⁹.

⁹ ORR Estimates of Station Usage 2018/19

Additional Demand	Key Flows Affected	Realised in Phase	Expected Magnitude at Phase 1 Opening	Expected Magnitude for Future Phases
Colne towards Leeds	Colne – Skipton Colne – Leeds	1	Potentially significant	Potentially significant
Colne through journeys	e.g. Burnley – Skipton Nelson – Leeds	1 (1A for direct)	Moderate	Potentially significant
Long distance	Colne – London Earby (P&R) – London	1	Low	Low
Other demand	e.g. Manchester – Skipton Preston to Skipton	1 (1A for single change)	Low	Low
Earby & Colne P&R (from outside 2km catchment)	e.g. Barnoldswick - Leeds	1	Potentially significant	Potentially significant
Existing flows	Colne – Blackburn Colne – Manchester Burnley – Leeds (currently alternative route)	2	N/A	Moderate
Abstracted from existing stations	Stations towards Leeds Stations towards Lancashire	1	Low (Negative)	Low (Negative)
Potential future new station	Foulridge	N/A	N/A	Potentially moderate
Burnley station locations	Burnley - Leeds	1 (1A for direct)	Low	Moderate

Table 12: Different pockets of additional demand resulting from the scheme

The following segments of additional demand have been identified:

New journeys from Colne (in addition to the journeys which will continue to be made on the existing East Lancashire Line) – Located at the northern end of the built-up area of Pendle, near the end of the M65 Motorway, the station in Colne has good access by road from the south. It is ideally located as a park and ride and a public transport interchange for journeys northbound (e.g. towards Skipton and Leeds). This will attract demand from the wider catchment. It is estimated that 235,295 people live within 20 min drive time to Colne with 68,676 people living within a 5km catchment (Census 2011, see also Table 13). Additional demand is expected to materialise in Phase 1 with the transformational 50 minute journey time to Leeds and is not dependent on other Phases being delivered. Subject to other timetabling changes there would also be the future option of a semi-fast passenger service running from Colne to Leeds, which could further reduce journey times to approximately 35 minutes with a limited stop service.

Station	Usual Residents 1,000m	Usual Residents 1,000m – 2,000m	Usual Residents 2000m – 5000m
Colne	8,705	22,140	68,676

Table 13: Colne Population Catchment

Journeys through Colne to Skipton and Leeds - additional through journeys (e.g. from Nelson, Brierfield and Burnley). This will materialise gradually throughout different Phases of the scheme as follows:

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- In Phase 1, it would require passengers to walk across platforms, similar to arrangements in Kirkby or Huddersfield (for the Penistone Line) and will depend on the coordination of timetables between services on the East Lancashire Line and Skipton to Colne link.
- In Phase 1A, this will fully materialise, with provision of direct rail connectivity to Skipton/Leeds.
- In Phase 2, this will be further enhanced with journey time improvements due to the line upgrading.

Table 14 presents road and rail journey time to Leeds from stations on the East Lancashire Line to Leeds. With rail journey times around 70 mins to Manchester, Leeds will become the closest metropolitan centre with competitive journey times to each of these of around 1 hour. This will create new rail markets that don't currently exist.

The road journey times presented below are best estimates taken from Google Maps and therefore may not always be representative of actual on-street conditions, particularly in the peak where there can be large day-to-day variance due to congestion. For this reason, it is recommended that part of the future scheme development work includes the gathering of actual road timing data to better inform the GJTs used in any future modelling.

It should also be noted that future rail journey times are based on the assumed 'all-stop' service patterns. There may be opportunities to further reduce these times and increase the relative competitiveness versus other modes and alternative rail routes by introducing alternative stopping patterns such as semi-fast, skip-stop style services.

Journey	Journey time by road (in minutes) ¹⁰	Journey time by rail (in minutes)	New journey time by rail (in minutes) – Phase 1	New journey time by rail (in minutes) – post-Phase 2
Colne – Leeds	60 – 90	136 (1 change)	50	50
Nelson – Leeds	60 – 85	131 (1 change)	62 ¹¹	57 (Phase 1A)
Brierfield – Leeds	60 – 85	128 (1 change)	65	60 (Phase 1A)
Burnley – Leeds	60 – 85	67	65	60 ¹²
Colne – London	240 – 320	240 (1 change)	148 (after 2033, 1 change) ¹³	

Table 14: Comparison of current and new journey times for selected origin-destinations pairs

Long distance demand – despite a high population, the presence of businesses in the area and tourism being a key attractor, due to uncompetitive journey times to Preston and Manchester, the nearest entry points to the national rail network, long distance demand on the East Lancashire Line is at very low levels. With the introduction of Colne – Leeds services in Phase 1, it will open new connectivity toward London, the North East and Scotland. This will include connecting to the high-

¹⁰ Based on travel times by road obtained from Google Maps for AM peak, average working day

¹¹ Assuming coordinated timetables between two lines, 5 mins transfer time

¹² Journey time achieved in Phase 2 based on assumed stopping pattern – a revised stopping pattern (e.g. skip-stop semi-fast) has the potential to make the route via Colne and Skipton even more attractive than the alternative (Calder Valley)

¹³ Based on HS2 Leeds – London frequency of 3tph and journey time of 88 min

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speed rail network in 2033, which will reduce journey times from Colne to London from 4 hours to just over 2 hours.

Other demand – the scheme will provide an additional route through the Pennines, linking Manchester with the Yorkshire Dales and Airedale. It will also provide future opportunities for further enhancement of services.

Earby and Colne Park and Ride – although not included in the core demand analysis for reasons outlined in Chapter 4, it is expected that there will be some demand from beyond the 2km catchment for Earby, for example from Barnoldswick and other locations. There is also strong potential for park and ride from the wider catchment using the new Colne station from Phase 1.

Additional demand due to benefits to existing flows – for example on the East Lancashire Line (e.g. for Brierfield, Nelson, Colne) towards the east could be expected in Phase 2 due to the increase of frequency and journey time improvements. The average speed between Colne and Gannow Junction is currently 21mph, which is the lowest from all comparator lines. Additional demand due to existing flow benefits has been estimated to be between 809 and 36,342¹⁴ and it would need to be recalculated in the light of revised train service assumptions.

Abstraction of demand from existing stations – a proportion of people included in the demand forecast for Earby will already be using rail by driving to their nearest station e.g. to Skipton or Cononley to access Leeds. The impact of abstracted demand will need to be assessed and subtracted from the overall figures to give a fair representation of the overall net change in demand.

Potential future new station – although not included in SELRAP's phasing plan, there is a long-term aspiration to open a second station on the Skipton to Colne link, at Foulridge. Although unlikely to have the same magnitude of demand as Earby given its smaller catchment, it would add additional demand that should be considered.

Burnley station locations – Burnley Central Station is considered to be better located for demand generated in the centre of the town than Burnley Manchester Road, meaning that strategic trips across the Pennines will benefit from the new alternative route via Colne and Skipton. Although benefits will be realised in Phase 1 and 1A, the significant benefits will be seen from Phase 2 onwards when the direct connectivity with a competitive journey time is available.

¹⁴ Skipton to Colne Railway Reinstatement SOBC, Table 3.1

9 Conclusions

The following key conclusions can be drawn from this analysis:

- Using a more targeted and refined trip-rate model has resulted in a two-way demand estimate at the future Earby Station of **106,390** (with a range of 52,452 –202,063) in the year 2029. Notably, this demand estimate excludes new demand from Colne Station in Phase 1 which requires a more detailed study (see Next Steps).
- This estimate is based on a targeted set of comparator lines, with the selection of stations further refined based on socio-economic data that is comparable to the area around Earby.
- This evidence-led approach has resulted in a range of scenarios, all of which are higher than the top end of Steer’s estimate in the SOBC. Part of this may be explained by the relative merits and challenges associated with different model types (explored in Chapter 3), but this clearly needs to be a key input into the development work going forward. On this basis, it is understood that SELRAP are willing to work with the DfT to better understand and refine the demand figures that inform the next stage of the business case process.
- Central to this ongoing collaborative approach should be the acknowledgement that no single demand forecasting model (or methodology) is perfect and each will have unique strengths and weaknesses. The targeted trip rate analysis carried out for this study is considered robust and able to stand up to scrutiny.
- The analysis does not take account of various other potential sources of demand, beyond Earby Station, that should be considered in the wider case making and business case development.

10 Next Steps

It is recommended that the following steps are undertaken to move this project forward:

- 1) A more detailed study of Colne Station demand for Phase 1 of the project which should include local footfall, bus feeder, transferring rail passengers and M65 related park and ride trips.
- 2) Quantification of additional demand from/to Colne generated at subsequent Phases of the project, building upon the additional Phase 1 task outlined above. This could be done through the creation of a bespoke model and/or identification of the existing model that would allow the estimation of the impact of high-level changes in employment, population and the transport network.
- 3) Quantification of additional demand from outside the 2km Earby catchment (e.g. from Barnoldswick) through the creation of a bespoke GJT-based spreadsheet model that quantifies park & ride and long-distance demand.
- 4) Quantification of benefits to existing flows, similar to that which was included in the SOBC, using revised train service assumptions.
- 5) The gathering of actual road timing data to better inform the GJTs used in any future modelling.
- 6) An operational review to find the impact of service extensions (or provision of additional services) on rail timetables.
- 7) Updating the cost assumption to be based on the new service specification (e.g. direct services to Leeds).
- 8) Calculate indicative Value for Money (VfM) – this could be based on a *Financial Benefit Cost Ratio*, comparing the expected revenue based on demand numbers against the expected capital and operating costs over a 60-year appraisal period.
- 9) Continue to explore with Government how changes to the HMT Green Book could strengthen the wider economic impacts and benefits of the scheme.

Appendix A: Line and Station Descriptions

Airedale Line

The Airedale Line in the North of England is linking towns along the valley of the River Aire and provides commuter services for the regional centres of Leeds and Bradford. The line was electrified in 1994 and serves the key settlements of Skipton, Steeton and Silsden, Keighley, Bingley, Saltaire and Shipley. The Skipton to Leeds service runs at 4tph with 5tph during the morning and evening peaks as a combination of limited and all stopping services. The Skipton to Bradford service runs at a lower frequency at 2tph during the morning and evening peaks with services stopping at all stations. Additional services run along the Airedale Line predominately catering for leisure trips including from Leeds to Morecambe / Heysham Port (one train per weekday with up to six trains per day at the weekend) and from Leeds to Carlisle via Settle (seven trains per weekday with up to eight trains at the weekend). During the week a twice a day service operates to London from Keighley via Leeds departing in the early morning and returning in the late evening catering for predominately business travellers.

Line	Benchmarks	Usual Residents 1000m	Usual Residents 1000m-2000m	17/18 Entries	Penalty (related to frequency and journey time)	Penalised Entries	Entries per Head 1000m	Entries per Head 1000m - 2000m	Journey Time to Key Attractor	Train frequency	Car parking spaces	Commentary
Airedale Line	Apperley Bridge	1,855	17,547	187,897	49%	91,842	37.1	1.5	14	2	98	
	Bingley	7,642	19,547	603,571	44%	267,295	26.2	5.6	21	4	22	
	Cononley	1,172	2,879	98,313	70%	68,403	43.8	10.0	37	4	16	
	Crossflatts	4,834	16,547	266,101	49%	130,067	20.2	2.8	24	4	100	
	Keighley	11,457	36,976	832,302	55%	458,734	30.0	4.5	28	4	0	
	Saltaire	10,950	27,565	451,474	38%	172,841	11.8	2.6	17	4	0	
	Shipley (Yorks)	11,501	42,441	858,166	25%	211,777	13.8	1.7	14	8	150	
	Skipton	7,754	15,168	603,278	78%	469,596	45.4	15.8	42	4	100	Likely rail heading due to poor frequency beyond Skipton.
	Steeton & Silsden	2,766	11,361	419,476	61%	257,868	69.9	7.5	32	4	143	Large car park with significant rail heading due to PTE boundary.

Birmingham - Worcester

The Birmingham -Worcester line in the West Midlands that provides commuter services for the regional centre of Birmingham. The line is not currently electrified and through a combination of both limited and all stopping services serves Birmingham and Worcester city centres, Birmingham conurbation towns such as Handsworth, Smethwick, Oldbury, Blackheath, Cradley Heath and Stourbridge and intermediate Worcestershire settlements such as Hagley, Kidderminster and Droitwich. Service frequencies run at 6tph from Birmingham to Stourbridge of which four continue to Kidderminster and two continue to Worcester. A twice a day service operates from Kidderminster to London departing in the early morning and returning in the evening.

Line	Benchmarks	Usual Residents 1000m	Usual Residents 1000m-2000m	17/18 Entries	Penalty (related to frequency and journey time)	Penalised Entries	Entries per Head 1000m	Entries per Head 1000m - 2000m	Journey Time to Key Attractor	Train frequency	Car parking spaces	Commentary
Birmingham - Worcester	Alvechurch	3,700	3,700	99,076	66%	65,703	13.3	0.0	31	3	0	
	Barnt Green	1,794	6,365	151,659	44%	67,163	28.1	3.7	25	6	45	
	Blakedown	1,604	2,599	55,640	83%	46,110	21.6	11.6	35	2	10	
	Bournville	13,290	54,059	609,147	28%	171,537	9.7	1.1	14	6	0	
	Bromsgrove	7,259	20,587	345,447	57%	195,850	20.2	3.7	29	4	251	
	Cradley Heath	9,792	46,305	422,871	38%	161,891	12.4	1.1	21	6	243	
	Droitwich Spa	8,657	22,129	283,898	80%	225,732	19.6	4.2	39	3	89	
	Five Ways	19,674	56,169	917,715	16%	147,027	5.6	1.0	5	6	0	
	Hagley	4,875	7,934	308,744	60%	184,856	28.4	15.1	31	4	33	
	Hartlebury	954	1,828	28,906	119%	34,520	27.1	9.9	45	1	20	
	Kidderminster	11,409	36,005	847,695	69%	584,254	38.4	5.9	39	5	224	
	Kings Norton	9,914	49,089	680,896	31%	211,072	16.0	1.3	16	6	105	
	Langley Green	10,716	46,710	102,466	54%	54,866	3.8	0.4	17	2	28	
	Longbridge	12,750	44,714	493,911	38%	189,088	11.1	1.5	21	6	0	
	Lye (West Midlands)	9,881	44,807	50,746	73%	36,975	2.8	0.3	29	2	15	
	Northfield	15,842	55,470	447,833	35%	158,261	7.5	1.0	19	6	205	
	Old Hill	12,636	45,396	102,098	63%	64,404	3.8	0.5	23	2	51	
	Rowley Regis	13,580	49,369	560,676	31%	173,805	9.6	1.2	16	6	0	
Selly Oak	17,231	47,136	1,486,144	24%	356,537	15.5	3.0	11	6	376		
Stourbridge Junction	11,373	40,199	792,600	40%	315,221	20.8	2.7	27	12	797		

Line	Benchmarks	Usual Residents 1000m	Usual Residents 1000m-2000m	17/18 Entries	Penalty (related to frequency and journey time)	Penalised Entries	Entries per Head 1000m	Entries per Head 1000m - 2000m	Journey Time to Key Attractor	Train frequency	Car parking spaces	Commentary
Birmingham - Worcester	Stourbridge Town	13,530	47,785	317,247	76%	240,829	13.3	1.8	45	6	0	
	University (Birmingham)	29,441	98,381	1,785,609	14%	252,097	6.4	0.9	6	8	0	

Borders Railway

The Borders Railway is a recently constructed railway which commenced operation in 2015 with the purpose of supporting the growth of the Edinburgh city region by increasing the city centre's catchment. The line connects both Edinburgh city centre and its northeastern suburbs with several rural towns and villages terminating at the village of Tweedbank located within the Scottish Borders area. The line is partly electrified from Edinburgh to Newcraighall and unelectrified from Newcraighall to Tweedbank. Services operate at 2tph during weekdays and Saturday with an hourly service operating in the late evening and Sundays.

Line	Benchmarks	Usual Residents 1000m	Usual Residents 1000m-2000m	17/18 Entries	Penalty (related to frequency and journey time)	Penalised Entries	Entries per Head 1000m	Entries per Head 1000m - 2000m	Journey Time to Key Attractor	Train frequency	Car parking spaces	Commentary
Borders Railway	Brunstane	9,889	26,900	88,645	46%	40,607	3.1	0.6	12	2	0	
	Eskbank	5,515	19,508	169,466	65%	109,636	14.9	2.0	24	2	259	Within Edinburgh commuter belt with large car park
	Galashiels	5,568	11,167	178,131	119%	212,730	28.7	9.5	56	2	0	
	Gorebridge	4,289	6,952	57,551	75%	42,885	7.5	4.0	30	2	78	
	Newcraighall	4,264	20,645	139,263	52%	72,392	12.7	1.1	16	2	600	Within Edinburgh commuter belt with large car park
	Newtongrange	6,098	14,785	78,508	70%	54,623	6.7	1.6	27	2	56	
	Shawfair	1,181	6,082	15,794	58%	9,205	5.8	0.5	20	2	56	
	Stow	719	756	34,917	123%	42,953	44.8	290.2	47	1	36	
	Tweedbank	2,671	6,805	218,489	127%	276,660	77.7	16.7	60	2	266	Large car park and significant rail heading likely

East Lancashire Line

The East Lancashire Line is a unelectrified line in the Lancashire region which runs between Preston and Colne. It connects several smaller towns and villages with the key employment areas of Preston, Blackburn town centre and adjoining suburbs, Burnley, Nelson and Colne. Services between Preston and Colne operate at 1tph (2tph during peak hours) with services stopping at all stations however there are several stop on request only stations. In addition, there are two regional services which use the line providing connectivity to the key northern cities of Manchester, Leeds and York. The first is a limited stop service operating at 1tph during the week and weekend between Blackpool and York with intermediate stops on the line at Preston, Accrington and Blackburn. The second is also a limited stop service operating 1tph between Manchester and Blackburn through the Todmorden Curve with intermediate stops on the line at Accrington and Rose Grove.

Line	Benchmarks	Usual Residents 1000m	Usual Residents 1000m-2000m	17/18 Entries	Penalty (related to frequency and journey time)	Penalised Entries	Entries per Head 1000m	Entries per Head 1000m-2000m	Journey Time to Key Attractor	Train frequency	Car parking spaces	Commentary
East Lancashire Line	Accrington	18,955	38,791	229,707	73%	167,373	6.6	2.1	35	3	39	Higher trip rate likely due to improved service frequency and town centre location
	Bamber Bridge	9,404	23,840	44,360	63%	27,983	2.2	0.5	12	1	0	
	Brierfield	6,976	29,606	15,675	150%	23,589	2.5	0.3	62	1	6	
	Burnley Barracks	11,149	39,615	11,065	136%	15,018	1.0	0.1	54	1	0	
	Burnley Central	8,230	43,661	60,163	145%	87,189	7.9	0.6	59	1	50	
	Cherry Tree	7,934	28,682	19,006	80%	15,112	1.4	0.2	22	1	5	
	Church & Oswaldtwistle	12,832	34,099	19,532	103%	20,213	1.2	0.2	36	1	0	
	Colne	8,705	22,140	46,066	166%	76,241	6.6	1.4	70	1	15	
	Hapton	1,979	10,039	8,272	125%	10,325	3.9	0.3	48	1	0	
	Huncoat	2,936	11,523	11,190	118%	13,163	3.4	0.4	44	1	0	
	Lostock Hall	9,306	23,717	22,275	60%	13,337	1.1	0.2	10	1	0	
	Mill Hill (Lancs)	15,325	42,920	34,728	83%	28,780	1.4	0.3	24	1	0	
	Nelson	20,200	40,993	61,615	156%	96,176	3.6	1.2	65	1	15	
	Pleasington	2,442	8,119	4,681	75%	3,488	1.1	0.2	19	1	5	
Rishton	6,331	9,818	25,507	98%	25,064	3.0	1.8	33	1	10		
Rose Grove	6,993	27,536	40,437	109%	43,978	4.7	0.5	50	2	0		

Mid-Cheshire Line

The Mid-Cheshire line is an unelectrified line in the northwest of England, between the cities of Chester and Manchester predominately catering for commuter services to the key employment centre of Manchester city centre. It serves several destinations within Greater Manchester including Stockport, Altrincham and Hale and then several more rural intermediate Cheshire towns and villages the largest of which are Knutsford, Northwich and Greenbank. Frequencies drop to 0.5tph on a Sunday.

Line	Benchmarks	Usual Residents 1000m	Usual Residents 1000m-2000m	17/18 Entries	Penalty (related to frequency and journey time)	Penalised Entries	Entries per Head 1000m	Entries per Head 1000m - 2000m	Journey Time to Key Attractor	Train frequency	Car parking spaces	Commentary
Mid-Cheshire Line	Ashley	323	3,182	4,057	107%	4,341	10.1	0.4	38	1	0	
	Cuddington	4,043	5,868	42,998	147%	63,110	11.7	8.6	67	2	5	
	Delamere	277	715	23,644	169%	40,028	108.4	22.8	72	1	5	Rural location likely to suppress local catchment size.
	Greenbank	5,818	22,273	120,853	152%	184,124	23.7	2.8	63	1	15	
	Hale (Manchester)	11,857	29,931	78,844	88%	69,346	4.4	1.0	34	2	0	
	Heaton Chapel	14,457	55,078	417,516	31%	129,426	6.7	0.8	12	4	0	
	Knutsford	8,908	13,191	250,903	109%	272,876	23.0	15.9	46	2	45	
	Levenshulme	25,695	81,161	288,427	27%	77,177	2.3	0.3	9	4	0	
	Lostock Gralam	2,198	7,851	28,105	123%	34,573	11.8	1.5	54	2	5	
	Mobberley	325	1,611	8,267	112%	9,283	21.4	1.8	41	1	10	
	Mouldsworth	559	1,495	18,090	179%	32,351	43.4	8.6	77	1	15	Rural location likely to suppress local catchment size.
	Northwich	6,574	18,008	119,452	121%	144,796	16.5	3.2	57	2	50	
	Plumley	643	643	12,687	130%	16,525	19.3	0.0	51	1	10	
Stockport	11,728	53,856	1,926,604	19%	358,684	22.9	2.1	13	15	1000	High frequency, interchange	

Appendix B: Station Catchment Characteristics

Line	Benchmark Station	Households with Access to a Car (% of Households)	Income (Disposable Household Income £ per Annum)	Level 4 Qualifications or Above (% of Population)	Economically Active (% of Population)
Airedale Line	Apperley Bridge	91%	9,204	37%	77%
	Bingley	71%	7,471	33%	75%
	Cononley	89%	1,154	43%	75%
	Crossflatts	80%	7,471	34%	72%
	Keighley	55%	7,471	11%	58%
	Saltaire	66%	7,471	38%	76%
	Shipley	58%	7,471	25%	73%
	Skipton	72%	1,154	30%	75%
	Steeton & Silsden	85%	7,467	30%	73%

Line	Benchmark Station	Households with Access to a Car (% of Households)	Income (Disposable Household Income £ per Annum)	Level 4 Qualifications or Above (% of Population)	Economically Active (% of Population)
Birmingham - Worcester	Alvechurch	88%	2,017	32%	72%
	Barnt Green	90%	2,017	50%	70%
	Blakedown	91%	1,952	36%	68%
	Bournville	69%	16,065	39%	72%
	Bromsgrove	89%	2,017	35%	77%
	Cradley Heath	77%	4,826	15%	72%
	Droitwich Spa	77%	2,546	22%	70%
	Five Ways	48%	16,065	42%	66%
	Hagley	91%	2,123	42%	72%
	Hartlebury	94%	2,546	30%	72%
	Kidderminster	72%	1,952	22%	73%
	Kings Norton	70%	16,065	39%	74%
	Langley Green	64%	4,348	15%	65%
	Longbridge	67%	16,065	17%	69%
	Lye (West Midlands)	69%	5,014	13%	64%
	Northfield	72%	16,065	23%	72%
	Old Hill	76%	4,365	18%	70%
	Rowley Regis	71%	4,610	14%	67%
	Selly Oak	55%	16,065	21%	36%
	Stourbridge Junction	83%	5,014	33%	68%
Stourbridge Town	75%	5,014	26%	69%	
University	60%	16,065	26%	40%	

Line	Benchmark Station	Households with Access to a Car (% of Households)	Income (Disposable Household Income £ per Annum)	Level 4 Qualifications or Above (% of Population)	Economically Active (% of Population)
East Lancashire Line	Accrington	58%	1,198	13%	58%
	Bamber Bridge	77%	1,946	18%	72%
	Blackburn	53%	1,878	13%	53%
	Brierfield	69%	1,343	18%	57%
	Burnley Barracks	59%	1,288	15%	65%
	Burnley Central	51%	1,288	13%	55%
	Cherry Tree	75%	1,878	21%	67%
	Church & Oswaldtwistle	61%	1,198	15%	64%
	Colne	68%	1,343	17%	69%
	Hapton	86%	1,288	23%	69%
	Huncoat	80%	1,198	20%	70%
	Lostock Hall	85%	1,946	22%	74%
	Mill Hill	61%	1,878	15%	69%
	Nelson	58%	1,343	13%	57%
	Pleasington	87%	1,879	31%	72%
	Rishton	78%	1,198	22%	69%
Rose Grove	68%	1,288	15%	69%	

Line	Benchmark Station	Households with Access to a Car (% of Households)	Income (Disposable Household Income £ per Annum)	Level 4 Qualifications or Above (% of Population)	Economically Active (% of Population)
Mid-Cheshire Line	Altrincham	82%	4,531	50%	78%
	Ashley	91%	8,613	33%	71%
	Cuddington	91%	6,809	41%	67%
	Delamere	95%	6,809	41%	65%
	Greenbank	84%	6,809	29%	73%
	Hale (Manchester)	86%	4,531	56%	76%
	Heaton Chapel	78%	5,293	43%	76%
	Knutsford	84%	8,613	46%	71%
	Levenshulme	58%	7,285	30%	64%
	Lostock Gralam	86%	6,809	19%	73%
	Mobberley	92%	8,613	37%	74%
	Mouldsworth	89%	6,809	37%	70%
	Navigation Road	84%	4,531	41%	78%
	Northwich	73%	6,809	17%	72%
	Plumley	94%	8,613	36%	64%
Stockport	56%	5,293	21%	72%	

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