TECHNICAL NOTE

DATE:	03 September 2021	**CONFIDENTIALITY:**	Public
SUBJECT:	Harrogate Station Gateway TCF – Traffic Modelling Summary		
PROJECT:	Harrogate Station Gateway TCF	**AUTHOR:**	Ben Hope / Amanda Fogg
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INTRODUCTION

This technical note summarises the traffic modelling which has been undertaken to inform the design of the Harrogate Station Gateway TCF scheme. This traffic modelling has been based on the following two separate models:

- Strategic modelling using the Harrogate Borough Transport Model
- Microsimulation modelling using a bespoke model covering the scheme location and immediate surrounding area.

STRATEGIC MODELLING

Base Model

The Harrogate Borough Transport Model is a strategic traffic model in the VISUM software. It was originally built by Jacobs in 2015. Details of the original model build are contained within the Local Model Validation Report (LMVR), dated November 2015.

A review of the Base model has been undertaken in relation to the Harrogate Station Gateway scheme. The review had addressed a lack of detail and calibration / validation counts within the vicinity of the scheme.

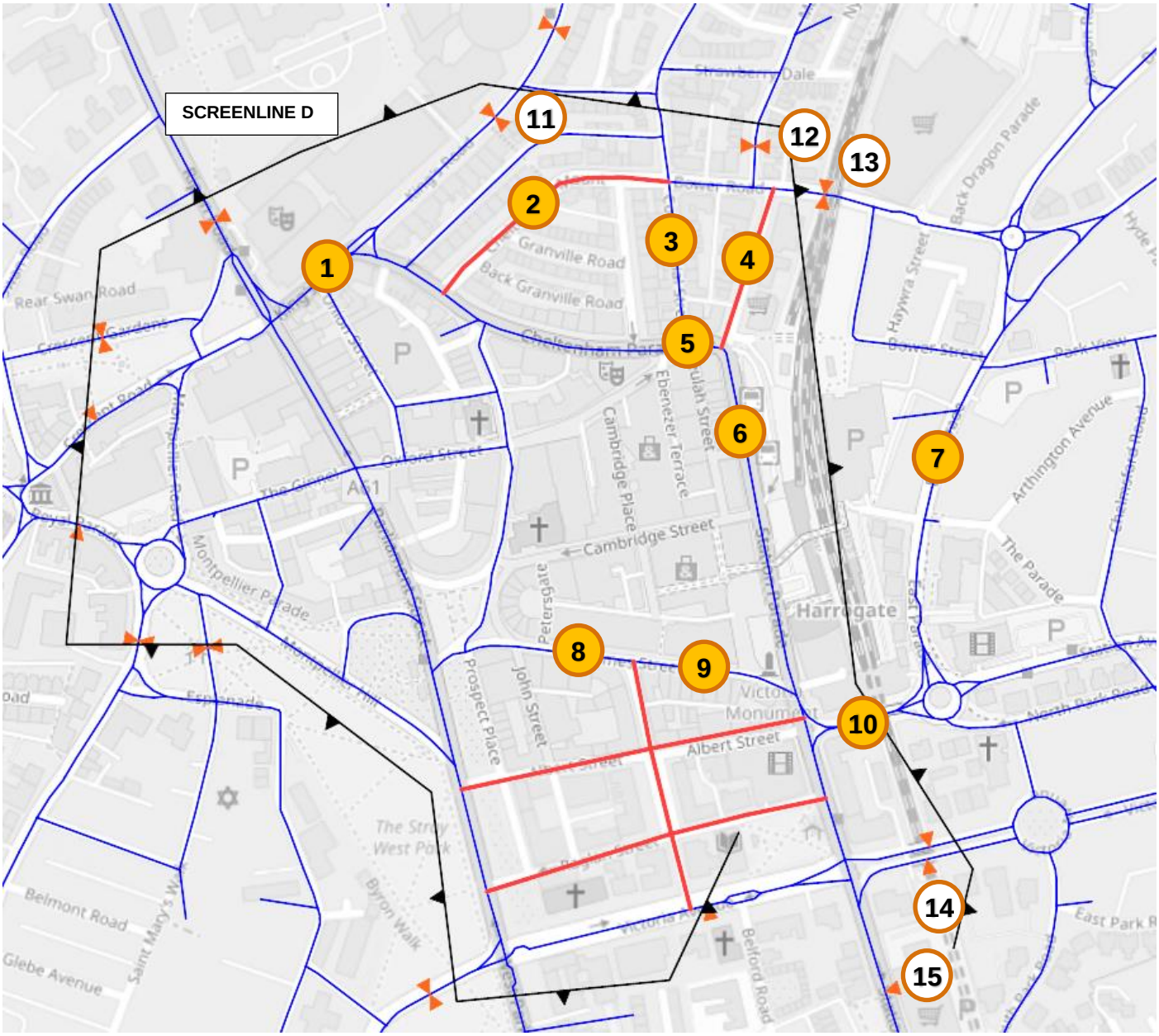
Initial model runs indicated that significant traffic flows changes are likely to be limited to the town centre in the proximity of the scheme. Flows changes are expected on the scheme links themselves in addition to alternative routes (e.g. Bower Road, East Parade, etc). The review of the model's performance has therefore focused on this area.

For the purpose of the analysis traffic flows for 10 sites were derived from junction turning counts undertaken in July 2018. These sites are numbered 1-10 and their locations are illustrated in **Figure 1**.

The new traffic counts have been combined with 5 calibration / validation sites from the original model build for the purpose of the analysis.

In addition to the individual count sites the original model build included a town centre screenline known as Screenline D. The purpose if the screenline is to compare total modelled and observed flows in and out of the town centre area. This is also illustrated in Figure 1.

Figure 1 Map of Local Count Sites



Traffic flows from the updated base model have been compared against observed flows with reference to the Department for Transport's (DfT) guidance. The DfT criteria for individual links are summarised in Table 1.

Table 1 TAG Link Flow Validation Criteria

Criteria	Description of Criteria	Acceptability Guideline
1	Individual flows within 100 veh/h of counts for flows less than 700 veh/h	> 85% of cases
	Individual flows within 15% of counts for flows from 700 veh/h to 2,700 veh/h	> 85% of cases
	Individual flows within 400 veh/h of counts for flows more than 2,700 veh/h	> 85% of cases

2	GEH[1] < 5 for individual flows	> 85% of cases

The updated base model performance results showed that the DfT criteria are met at 88% and 92% of the links in the AM and PM peaks respectively. The results show a good level of fit across both time periods with the GEH criteria comfortably met.

Table 4 Screenline D Statistics AM Peak

Screenline Comparison with Observed Flows AM Vehicles					
ScreenLine	**Observed Flow**	**Modelled Flow**	**% Diff**	**GEH**	**In Guideline**
D_Inbound	2,612	2,746	5.12%	2.58	**Yes**
D_Outbound	3,447	3,290	-4.55%	2.70	**Yes**

Table 5 Screenline D Statistics PM Peak

Screenline Comparison with Observed Flows PM Vehicles					
ScreenLine	**Observed Flow**	**Modelled Flow**	**% Diff**	**GEH**	**In Guideline**
D_Inbound	3,180	3,232	1.62%	0.91	**Yes**
D_Outbound	3,550	3,483	-1.90%	1.13	**Yes**

The updated highway assignment model has been demonstrated to achieve a high level of validation with regard to WebTAG criteria both across the full model area and in the town centre where the scheme is expected to have the most significant impacts.

Forecast Model

The updated Base model has been used to create Forecast models for the purpose of testing the Harrogate Station Gateway scheme. An Uncertainty Log has been produced, in line with guidance set out in DfT TAG Unit M4.1 'Forecasting and Uncertainty'; this allows for the inclusion of developments, as well as transport improvement schemes, within the forecast models. Each potential development (land use and highway) has been assigned a likelihood of occurring, categorised as follows:

- Near Certain;
- More Than Likely;
- Reasonably Foreseeable; and
- Hypothetical.

For the purpose of this assessment, only developments deemed 'Near Certain' or More Than Likely' to occur were modelled; this is in line with a Core Scenario, as defined by DfT TAG.

A trip generation exercise was undertaken, to estimate the number of trips generated by each of the developments in the AM (08:00-09:00) and PM (16:45-17:45) peak periods. Where possible the trip generation was taken from the corresponding Transport Assessment, or from previous Harrogate Borough

[1] GEH is a formula used in traffic modelling to compare two sets of traffic volumes

Council Local Plan studies (undertaken by Jacobs). If no information was available, from either of these sources, trip rates were derived using the industry standard TRICS database.

The trip distribution patterns applied were taken from the existing zones in which the developments are located. Where developments have been allocated to a new zone, the trip distribution of a neighbouring zone (with similar land-use) has been used. This approach is in line with previous forecasting work undertaken with this model.

The Do Nothing, which provides a basis from which to model potential schemes, comprises the existing transport network with the addition of any transport schemes likely to come forward by 2023, as per the Uncertainty Log.

Forecast networks have been created for each option which comprise the modifications made to the Do Nothing network as well as the scheme coding. Model scenarios were created for the following:

- **Do Minimum** – Two-lane scheme on Station Parade, one-way operation on Cheltenham Mount and northern section of Station Parade, amended layout of Station Parade / Station Bridge junction, additional signalised crossings and new signal junction on East Parade with the station access. James Street open to traffic at all times.
- **Proposed TCF Scheme** – One-lane scheme on Station Parade, one-way operation on Cheltenham Mount and northern section of Station Parade, amended layout of Station Parade / Station Bridge junction, additional and updated signalised crossings. Part-time pedestrianisation of James Street (east).

Signal staging arrangements and timings for the above junctions have been taken from the corresponding microsimulation models that have been developed for the operational assessments (see below for more information on the microsimulation modelling).

Model Outputs

In order to understand the potential impact of each option, flow differences have been forecast for peak network periods. A significance threshold of forecast changes in traffic are 3 vehicles per minute on average has been applied to identify streets where potentially significant changes in traffic levels are forecast.

The modelling results indicate that the implementation of the scheme is forecast to result in a **reduction** in traffic of more than 3 vehicles per minute on the following streets in the **AM peak hour**

- Station Parade (average reduction of 3 vehicles per minute)
- Cheltenham Parade (average reduction of 3 vehicles per minute)
- Station Bridge (average reduction of 7 vehicles per minute)

There are no streets where forecast **increases** in traffic flows in the **AM peak hour** exceed the threshold of 3 vehicles per minute. The streets where the greatest increases are predicted are:

- Cheltenham Mount (average increase of between 2 or 3 vehicles per minute)
- Bower Road (average increase of between 2 or 3 vehicles per minute)
- East Parade (average increase of between 1 or 2 vehicles per minute)

The modelling results for the **PM peak hour** indicate that the implementation of the scheme is forecast to result in an **increase** in traffic of more than 3 vehicles per minute on East Parade only (average increase of 5 vehicles per minute).

There are no other streets where forecast **increases** in traffic flows in the **PM peak hour** exceed the threshold of 3 vehicles per minute. The streets where the greatest increases below the significance threshold are predicted are:

- Bower Road (average increase of between 2 or 3 vehicles per minute)
- Cheltenham Mount (average increase of between 1 or 2 vehicles per minute)

The modelling results indicate that the implementation of the scheme is forecast to result in a **reduction** in traffic of more than 3 vehicles per minute on the following streets in the **PM peak hour**

- Station Parade (average reduction of 6 vehicles per minute)
- Cheltenham Parade (average reduction of 6 vehicles per minute)
- Station Bridge (average reduction of 6 vehicles per minute)
- James Street – west (average reduction of between 2 or 3 vehicles per minute)

MICROSIMULATION MODELLING

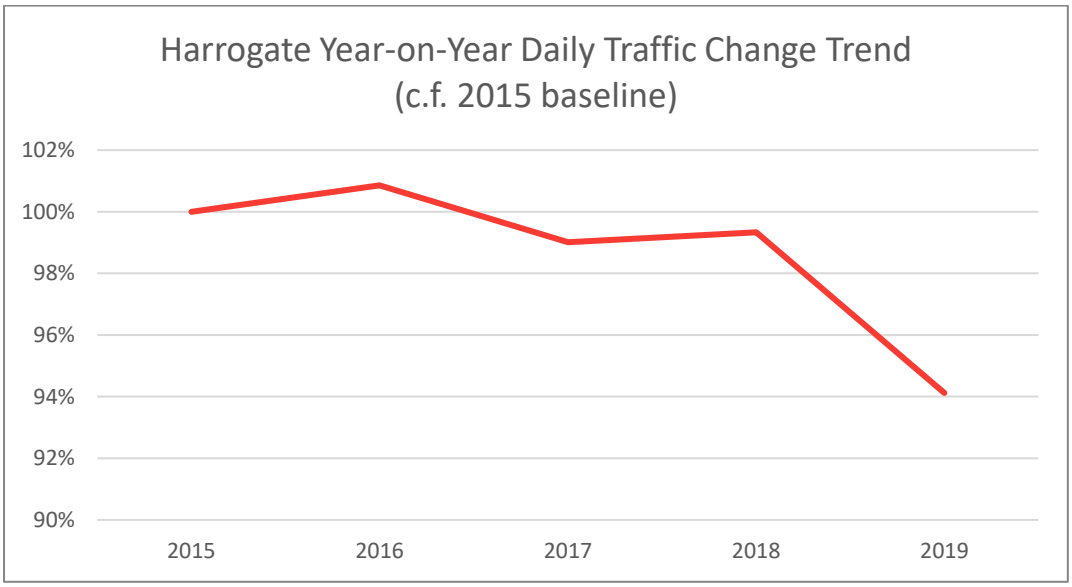
A microsimulation model has also been developed to enable a more detailed analysis of the Scheme and the local network to be undertaken, and to feed into the option development process. This model has been developed using Paramics Discovery software and covers the area shown in Figure 2 below:

Figure 2: Paramics Discovery Model Network

A programme of traffic survey data collection was undertaken in July 2018 and used along with other available data to form an understanding of traffic patterns and network conditions. The survey data, along with traffic signal information and bus service data was used to develop the 2018 base model.

A review has been undertaken of traffic data from permanent count sites maintained by NYCC across the town centre. This has shown that there is an overall trend of reducing traffic volumes across the road network. The year-on-year comparison, starting from 2015 is presented for the pre-Covid-19 pandemic data.

Figure 3: Comparison of daily traffic levels across the Harrogate road network between 2015 and 2019. The daily flows have been baselined to the 2015 to aid comparison.



The effects of the COVID pandemic on traffic volumes have also been observed and follow a logical pattern, with a significant reduction compared with the pre-COVID period during the three national lockdowns (March 2020, November 2020 and January 2021). It is noted that by July 2021 (the latest month for which data has been obtained), weekday peak hour traffic levels were close to, but still lower than, pre COVID volumes.

Therefore, 2018 base traffic flows have been used to inform the option development process. This is considered appropriate given that historic traffic data shows no growth for many years and also taking into account some of the limitations of model process, including:

- No allowance has been made for users who may choose to switch from their cars to other modes in future, in response to the TCF Scheme itself or future policy changes to encourage more sustainable travel choices
- No allowance is made for users who may choose to travel at different times of day, or to travel less often in response to permanent changes resulting from the COVID pandemic such as an increase in home working
- Traffic is constrained to within the model area, whereas in reality may tend to reassign across the wider network in response to the TCF Scheme.

The latest version of the Scheme design has been coded into the Paramics model and compared with the "do nothing" scenario (i.e. the existing network operation). Key parameters have been extracted from the model to enable a comparison to be made. These are presented in Table 6.

Table 6: Paramics Discovery Model Results Comparing Do Nothing and Proposed Harrogate Station Gateway TCF Scheme Proposals

	Do Nothing (AM Peak Hour)	Proposed TCF Scheme (AM Peak Hour)	Do Nothing (PM Peak Hour)	Proposed TCF Scheme (PM Peak Hour)
Total Vehicles	7386	7393	8030	8029
Average Time (s) / Vehicle	140	179	148	201
Average Distance (m) / Vehicle	745	774	767	805
Average Speed (kph)	19	16	19	14

In terms of average journey time across the network, the Scheme is forecast to result in an additional 39 seconds in the morning peak period and 53 seconds in the evening peak period. There is also a small increase in the average distance travelled, as some drivers may choose to re-route from Station Parade to East Parade.

SUMMARY

This traffic modelling technical note summarises the following traffic models used as part of the Harrogate Station Gateway TCF scheme design:

- Strategic modelling using the Harrogate Borough Transport Model
- Microsimulation modelling using a bespoke model covering the scheme location and immediate surrounding area.

The Harrogate Station Gateway TCF proposals aim to rebalance the provision for all transport mode users within the scheme area. This includes greater provision for people walking, wheeling and cycling and public transport. The scheme proposals also aim to ensure that journeys by motorised remain viable for journeys which cannot be undertaken by more sustainable methods

The modelling results have been used to inform the design progression and to forecast the potential impacts of the scheme proposals on the road network.