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Appraisal Specification Report

North Somerset Local Plan

North Somerset Council

Project reference: North Somerset Local Plan

19 February 2021

Quality information

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1. Introduction and Objectives

Introduction

1.1 AECOM has been commissioned by North Somerset Council to provide transport consultancy services in relation to their emerging Local Plan for 2038. As part of this, strategic transport modelling will be undertaken to be used as evidence for developing and appraising the transport impacts of the Local Plan.

1.2 This Appraisal Specification Report (ASR) sets out the proposed approach to transport modelling and identifies how outputs from this work can contribute to appraisal of local plan scenarios against TAG impact areas. The ASR has been developed in line with information outlined in TAG guidance “Guidance for the Technical Project Manager”.

1.3 Chapter 2 reviews existing transport modelling tools; Chapter 3 outlines the proposed strategic transport modelling approach for this study, for both the highway and public transport modelling, and the involvement of Variable Demand Modelling (VDM). This strategic modelling will be used to assess both the impact on the highway network up until the end of the Local Plan period without any mitigation as well as assessing where transport interventions may be required to mitigate the proposed growth over this period.

1.4 Chapter 4 sets out approach to forecasting future year scenarios, including different local plan development scenarios and modelling of potential mitigation measures (highway and Public Transport (PT)).

1.5 Chapter 5 outlines how the outputs from the transport model could support appraisal of selected transport impacts of Local Plan development scenarios.

1.6 This ASR is a working document that can be defined further during subsequent phases of the project.

Background

1.7 North Somerset is a unitary district in the South-West of England, bordered by Bristol and Bath and North East Somerset to the east, Sedgemoor and Mendip to the south. According to ONS data (2019), around 215,000 people live in and 86,000 people work in the region. The largest settlement is Weston-super-Mare, with other larger settlements including Clevedon, Portishead and Nailsea. North Somerset also houses Bristol Airport, which attracted more than 9 million passengers in 2019. Figure 1.1 shows the extent of the North Somerset district.

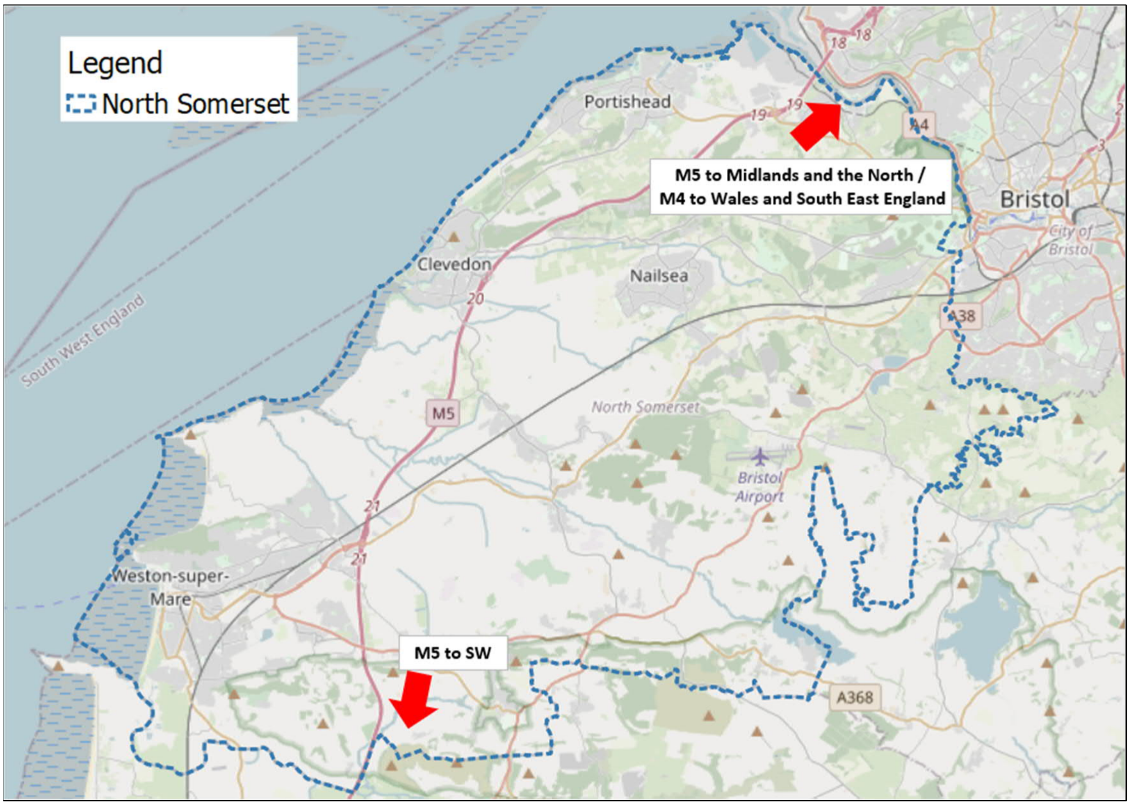

Figure 1.1: North Somerset District

1.8 The M5 runs through the district, with three major junctions located at Weston-super-Mare (Junction 21), Clevedon (Junction 20) and Portishead/Bristol (Junction 19). There are also major routes through the district including the;

- A38 (providing access to Bristol International Airport),
- A370 (Backwell, Nailsea and Weston-super-Mare),
- A368 (Banwell and Weston-super-Mare) and;
- A369 (Portishead)

1.9 In terms of rail, the Bristol to Exeter line runs through the region between Bristol Temple Meads in the east and Weston-super-Mare in the west, stopping at Nailsea and Backwell, Yatton, Worle and Weston Milton. Between Weston-super-Mare and Bristol Temple Meads, train travel times are around 30-40 minutes and there are 2 to 3 trains per hour in each direction.

1.10 Figure 1.2 shows the railway line and rail stations located within the North Somerset area.

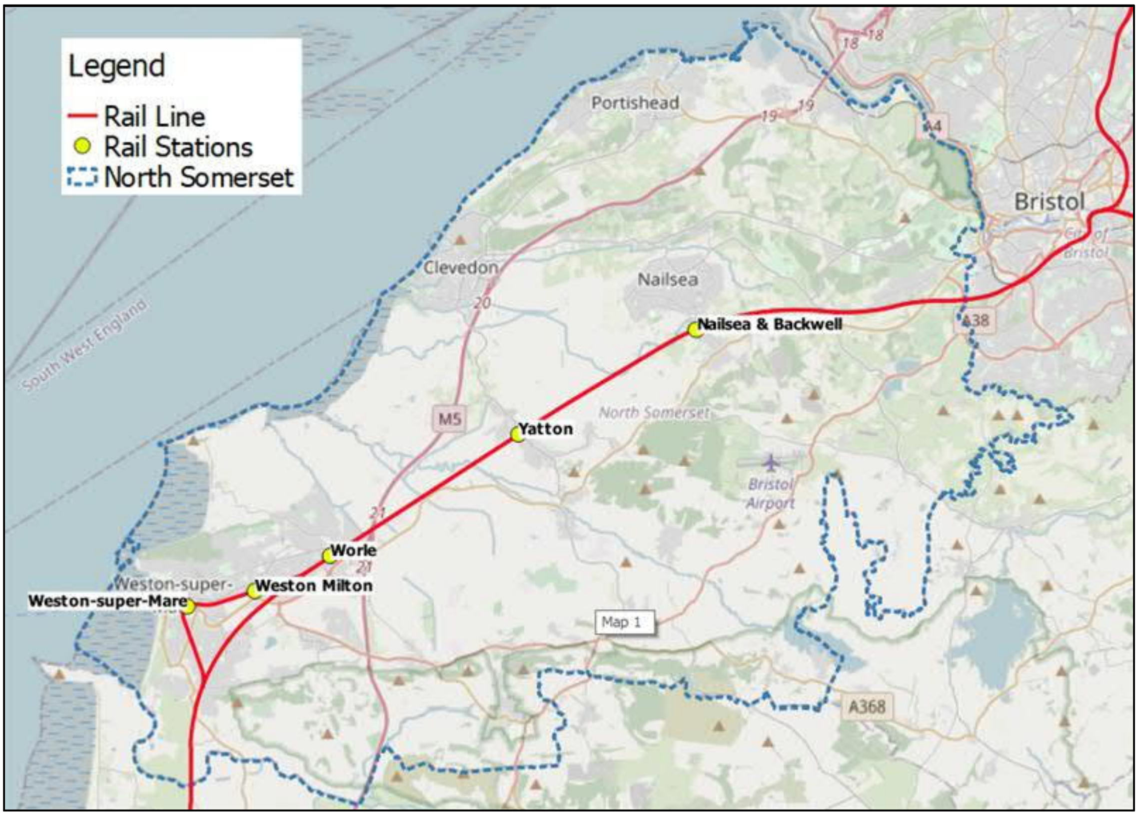

Figure 1.2: Rail Stations within North Somerset

1.11 Figure 1.3 and Figure 1.4 show the routes covered by bus services in North Somerset. There is a good coverage of services, both within and between major settlements as well as along key routes to Bristol and Bath and south towards Wells and Bridgwater. There are services which serve the Airport from Bristol, Bath, Weston-super-Mare as well as a local villages route for places such as Wrington, Sandford and Churchill. There is also a Park and Ride service for Bristol located within the North Somerset boundary located at Long Ashton.

1.12 Although there is a good network coverage of services, the frequency of services varies significantly by route. This is particularly evident on two of the major routes through North Somerset; where the A370 has a much higher frequency of services than along the A38.

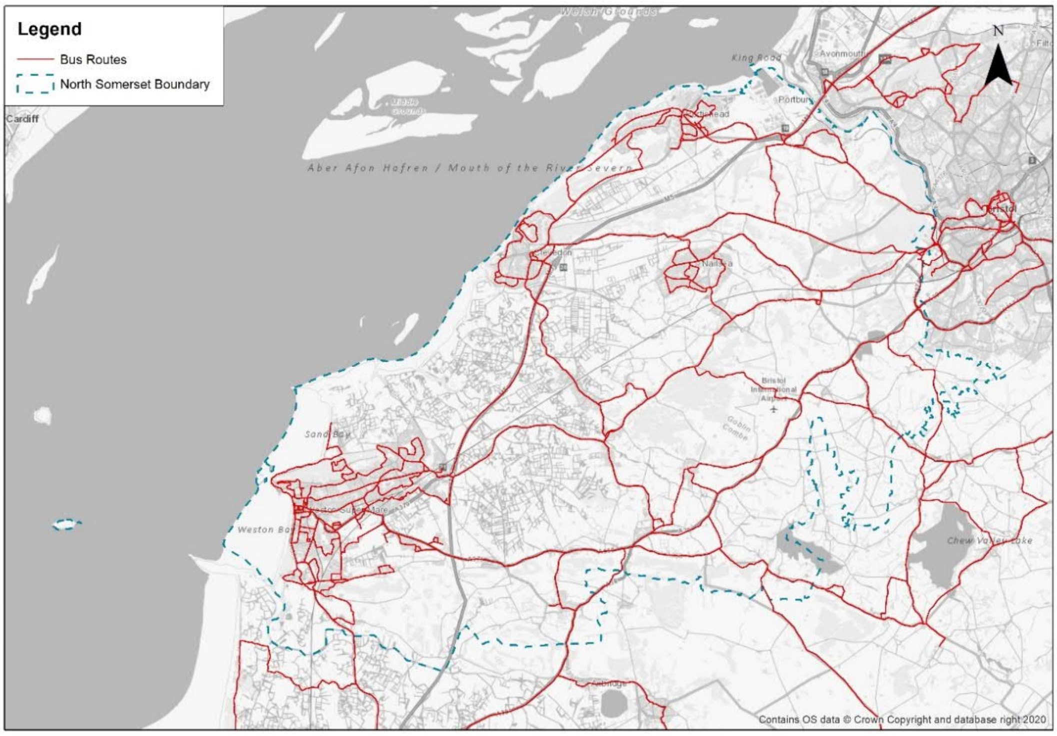

Figure 1.3: Routes covered by Bus Services in North Somerset

Figure 1.4: Main bus services serving North Somerset

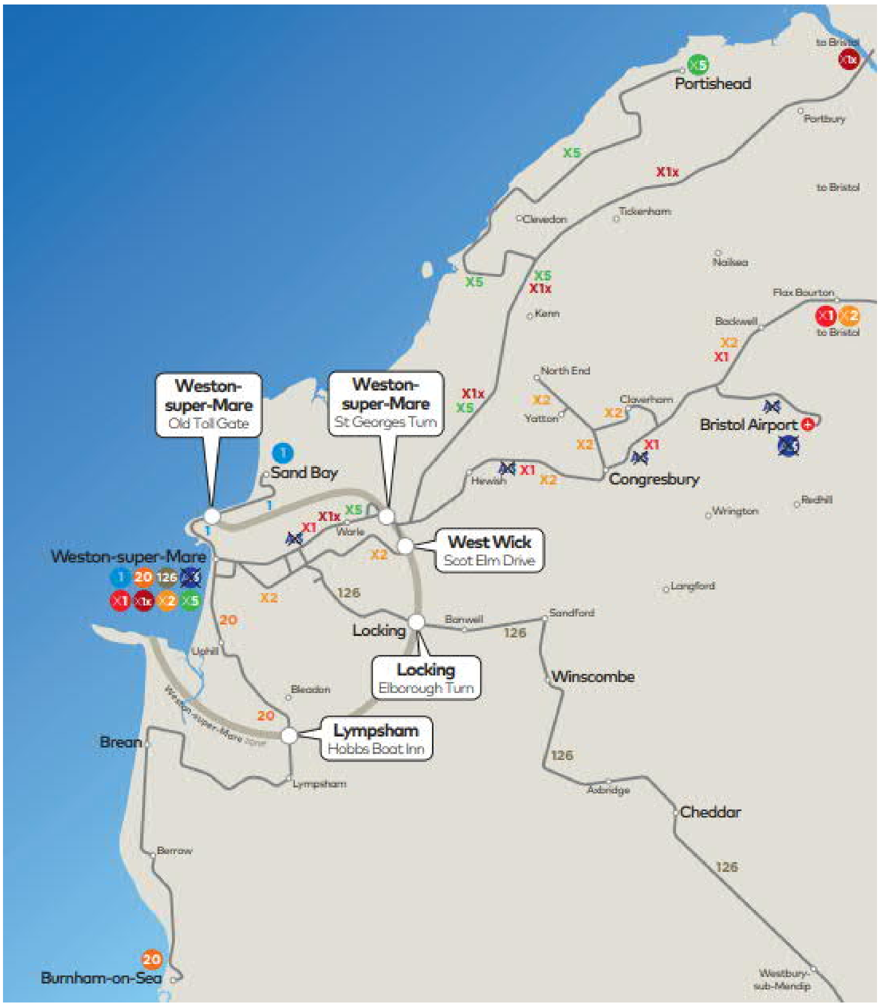

Figure 1.5: Main bus services serving Weston-super-Mare (as of August 2020)

Objectives of the study

1.13 The aim of this project is to inform the development of a new Local Plan for North Somerset, using strategic modelling to assess the impact of the proposed strategy on the transport network.

1.14 The transport model is one part of the appraisal process but is instrumental in highlighting additional network pressures, providing information on targeted PT and highway investment to release capacity and bring social, environmental and economic benefits to North Somerset. In addition, North Somerset has an ambition to be carbon neutral by 2030 therefore delivering sustainable transport is an important factor of the Local Plan. Therefore, the modelling needs to include assessment of the impact of the Local Plan on other sustainable modes, and opportunities for sustainable transport to accommodate additional travel demand generated by growth.

1.15 The transport modelling will inform, and be developed iteratively with, a Sustainable Transport Strategy which will aim to accommodate growth in as sustainable manner as possible, with the potential for targeted capacity improvements to be considered and applied to the transport modelling.

2. Existing Data and Models

Existing modelling

2.1 There are currently two transport models available which cover the North Somerset area – these are the North Somerset Strategic Model (NSSM) and the Weston Town Model. Both models are highway-only assignment models built using SATURN. These will now be discussed in turn.

<u>North Somerset Strategic Model</u>

2.2 The NSSM was developed by WSP to be used as a main strategic modelling tool for North Somerset Council, including a specific objective to inform the modelling for the North Somerset Local Plan. The model was originally cordoned from Highways England's South West Regional Transport Model (SWRTM).

2.3 The base year for this model is 2018 and it was built in line with WebTAG guidance. The model represents an average weekday (Monday to Thursday) and covers three time periods,

- Peak AM Hour (08:00 to 09:00)
- Average interpeak hour (10:00 to 16:00)
- Peak PM Hour (17:00 to 18:00)

2.4 The model was calibrated in line with TAG guidance, with details of the calibration outlined in the Local Model Validation Report, September 2020. It is currently being used in its current form to assess the Banwell Bypass scheme.

2.5 The model covers all the main road network in North Somerset as well as main strategic corridors and main access points to major towns/urban centres in the area. The coverage of the model can be seen in Figure 2.1.

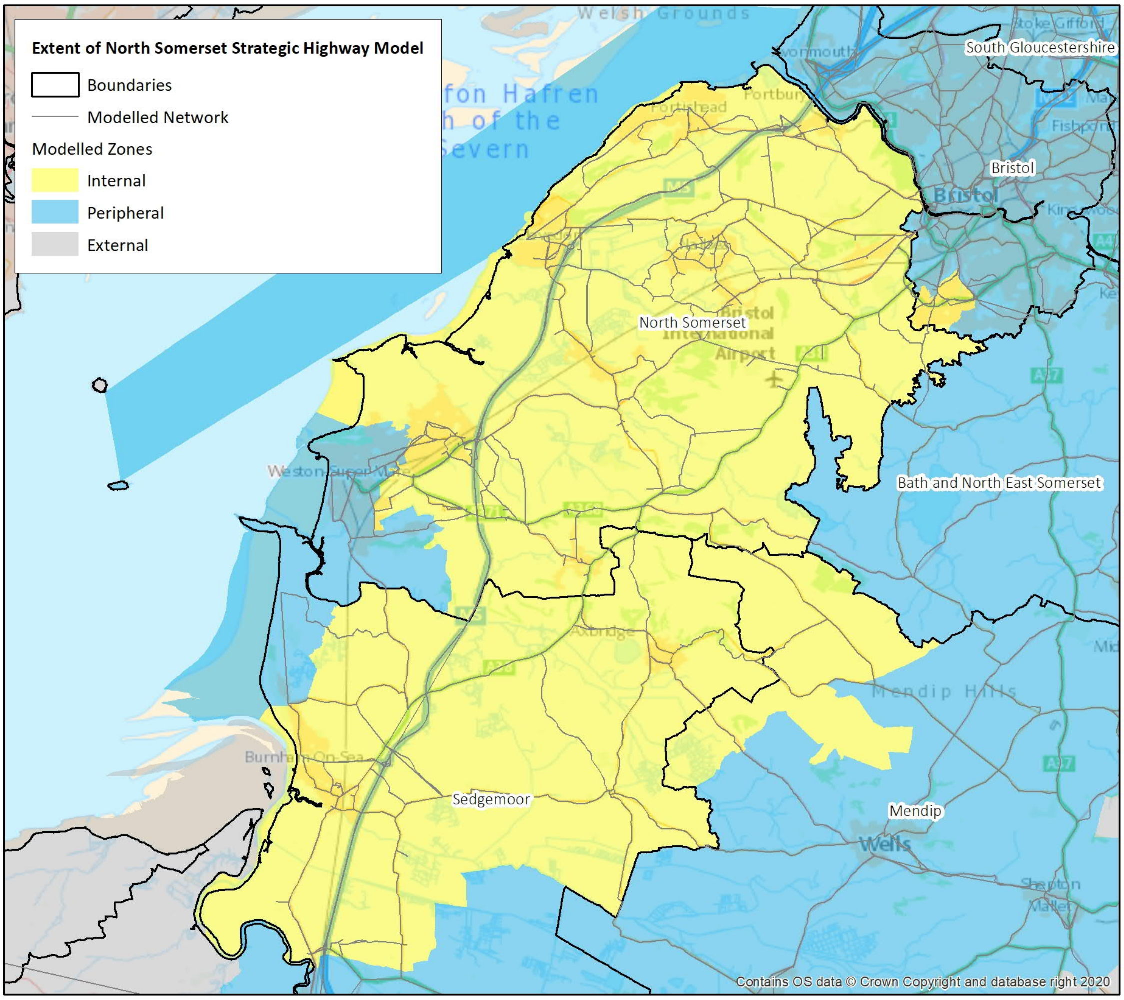

Figure 2.1: Coverage of the NSSM

2.6 Figure 2.1 shows that although the model covers all major strategic road network, there are areas within North Somerset where network coverage is less than other areas. In terms of Weston-super-Mare, there is less detail within the centre as it was expected that the NSSM could be used alongside the Weston Town Model to assess local impacts. In addition, Clevedon and Portishead have skeletal network coverage within their centres. However, it should be noted that the NSSM includes screenlines along each of the main access points to each of these three areas which have been used to calibrate trips into and out of each town. The screenlines are shown in Figure 2.2

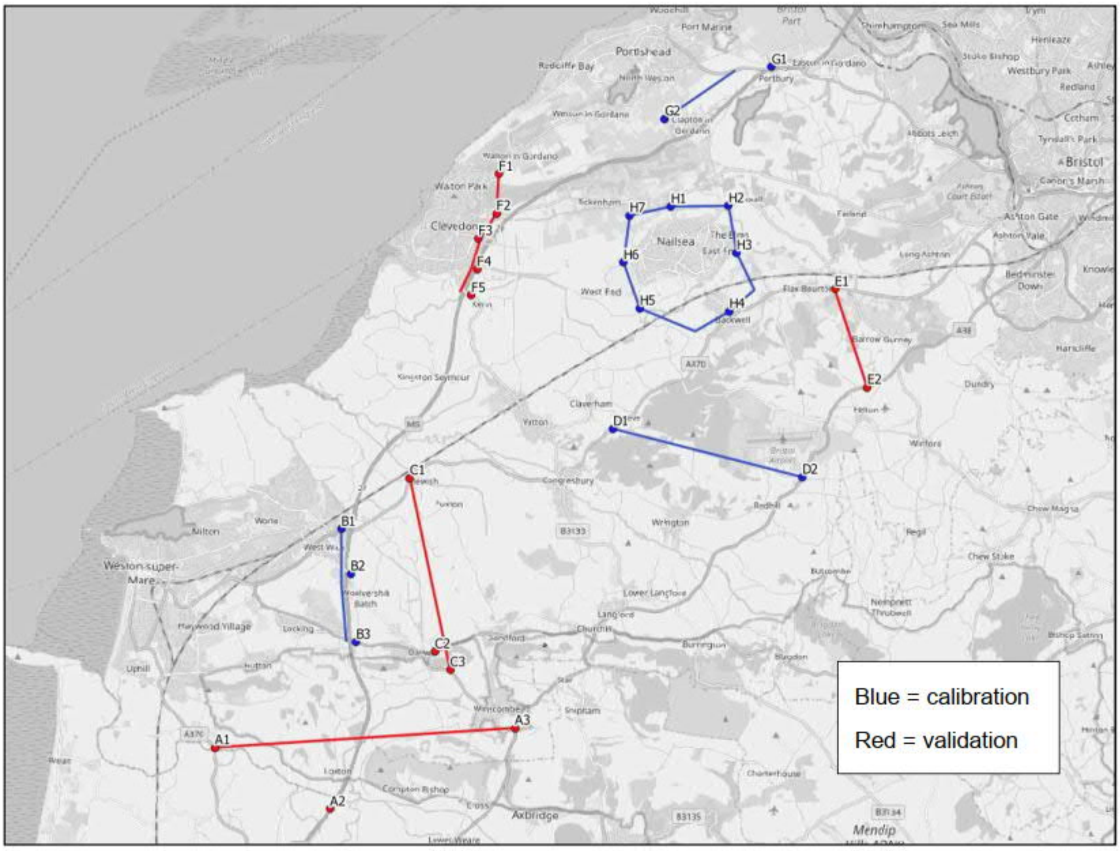

Figure 2.2: Calibration and Validation Screenlines for the NSSM

2.7 The user classes are consistent with the original RTM's, with three user classes for cars (Car Business, Car Commuting and Car Other respectively) and LGV's and HGV's. The matrices are in PCUs, with HGV's having a PCU factor of 2.5

2.8 It is our understanding that the model has been calibrated and validated in line with TAG guidance, with details of the calibration outlined in the Local Model Validation Report, September 2020.

2.9 The calibration and validation results for the model are outlined in the NSSM LMVR, the tables below show the calibration and validation results by screenline for the AM, IP and PM Peak respectively. Largely, the screenlines pass TAG criteria however there are areas, especially in the PM Peak, where the screenlines do not meet TAG criteria

Table 2.1: NSSM – Screenline Calibration and Validation: AM Peak

Screen line	Cal/Val	Direction	AM Screenline Totals							
			Obs	Mod	Diff	% Diff	<5%	<10%	GEH	GEH <5
A	Val	NB	4,073	4,102	30	0.7%	Pass	Pass	0.5	Pass
		SB	3,684	3,792	108	2.9%	Pass	Pass	1.8	Pass
B	Cal	EB	3,474	3,389	-85	-2.5%	Pass	Pass	1.5	Pass
		WB	2,922	2,969	47	1.6%	Pass	Pass	0.9	Pass
C	Val	EB	1,171	1,158	-12	-1.1%	Pass	Pass	0.4	Pass
		WB	1,292	1,351	59	4.6%	Pass	Pass	1.6	Pass
D	Cal	NB	1,420	1,440	20	1.4%	Pass	Pass	0.5	Pass
		SB	1,001	972	-29	-2.9%	Pass	Pass	0.9	Pass
E	Val	EB	1,631	1,622	-9	-0.6%	Pass	Pass	0.2	Pass
		WB	1,194	1,377	183	15.3%	Fail	Fail	5.1	Fail
F	Val	EB	3,228	3,299	70	2.2%	Pass	Pass	1.2	Pass
		WB	3,364	3,354	-10	-0.3%	Pass	Pass	0.2	Pass
G	Cal	NB	1,360	1,360	-1	0.0%	Pass	Pass	0.0	Pass
		SB	1,770	1,727	-43	-2.4%	Pass	Pass	1.0	Pass
H	Cal	In	1,470	1,472	2	0.1%	Pass	Pass	0.1	Pass
		Out	1,722	1,638	-83	-4.8%	Pass	Pass	2.0	Pass
Pass rate over all screenlines							94%	94%		94%

Table 2.2: NSSM – Screenline Calibration and Validation: Interpeak

Screen line	Cal/Val	Direction	IP Screenline Totals							
			Obs	Mod	Diff	% Diff	<5%	<10%	GEH	GEH <5
A	Val	NB	3,830	3,894	64	1.7%	Pass	Pass	1.0	Pass
		SB	3,476	3,276	-200	-5.8%	Fail	Pass	3.4	Pass
B	Cal	EB	2,211	2,205	-7	-0.3%	Pass	Pass	0.1	Pass
		WB	2,375	2,325	-50	-2.1%	Pass	Pass	1.0	Pass
C	Val	EB	975	1,082	107	11.0%	Fail	Fail	3.3	Pass
		WB	1,044	1,096	52	4.9%	Pass	Pass	1.6	Pass
D	Cal	NB	962	965	3	0.3%	Pass	Pass	0.1	Pass
		SB	963	961	-2	-0.2%	Pass	Pass	0.1	Pass
E	Val	EB	1,131	1,167	36	3.2%	Pass	Pass	1.1	Pass
		WB	1,197	1,281	84	7.0%	Fail	Pass	2.4	Pass
F	Val	EB	2,052	2,199	147	7.2%	Fail	Pass	3.2	Pass
		WB	1,988	2,177	189	9.5%	Fail	Pass	4.1	Pass
G	Cal	NB	1,039	1,118	79	7.6%	Fail	Pass	2.4	Pass
		SB	1,011	1,083	72	7.1%	Fail	Pass	2.2	Pass
H	Cal	In	1,223	1,198	-26	-2.1%	Pass	Pass	0.7	Pass
		Out	1,194	1,166	-28	-2.4%	Pass	Pass	0.8	Pass
Pass rate over all screenlines							56%	94%		100%

Table 2.3: NSSM – Screenline Calibration and Validation: PM Peak

Screen line	Cal/Val	Direction	PM Screenline Totals							
			Obs	Mod	Diff	% Diff	<5%	<10%	GEH	GEH <5
A	Val	NB	4,020	3,803	-217	-5.4%	Fail	Pass	3.5	Pass
		SB	4,312	4,167	-145	-3.4%	Pass	Pass	2.2	Pass
B	Cal	EB	2,761	2,689	-72	-2.6%	Pass	Pass	1.4	Pass
		WB	4,109	3,974	-136	-3.3%	Pass	Pass	2.1	Pass
C	Val	EB	1,140	1,229	90	7.9%	Fail	Pass	2.6	Pass
		WB	1,564	1,600	36	2.3%	Pass	Pass	0.9	Pass
D	Cal	NB	1,123	1,100	-23	-2.0%	Pass	Pass	0.7	Pass
		SB	1,652	1,576	-76	-4.6%	Pass	Pass	1.9	Pass
E	Val	EB	1,315	1,408	93	7.1%	Fail	Pass	2.5	Pass
		WB	1,762	1,871	109	6.2%	Fail	Pass	2.6	Pass
F	Val	EB	3,214	3,118	-96	-3.0%	Pass	Pass	1.7	Pass
		WB	3,308	3,283	-25	-0.8%	Pass	Pass	0.4	Pass
G	Cal	NB	1,976	1,942	-35	-1.7%	Pass	Pass	0.8	Pass
		SB	1,353	1,336	-17	-1.3%	Pass	Pass	0.5	Pass
H	Cal	In	1,773	1,709	-63	-3.6%	Pass	Pass	1.5	Pass
		Out	1,496	1,555	59	4.0%	Pass	Pass	1.5	Pass
						Pass rate over all screenlines	75%	100%		100%

Table 2.4: Overall Pass Rate for NSSM

Time Period	Pass Rate		
	5% Criterion (TAG)	10% Criterion	GEH < 5 Criterion
AM	94%	94%	94%
PM	75%	100%	100%
IP	56%	94%	100%

2.10 The model also has been validated against observed journey time data derived from TrafficMaster data, with the observed data being taken over the whole of 2018. These cover the main strategic routes across the area, including the M5. The locations of the journey time routes are shown below in Figure 2.3, Figure 2.4 and Figure 2.5.

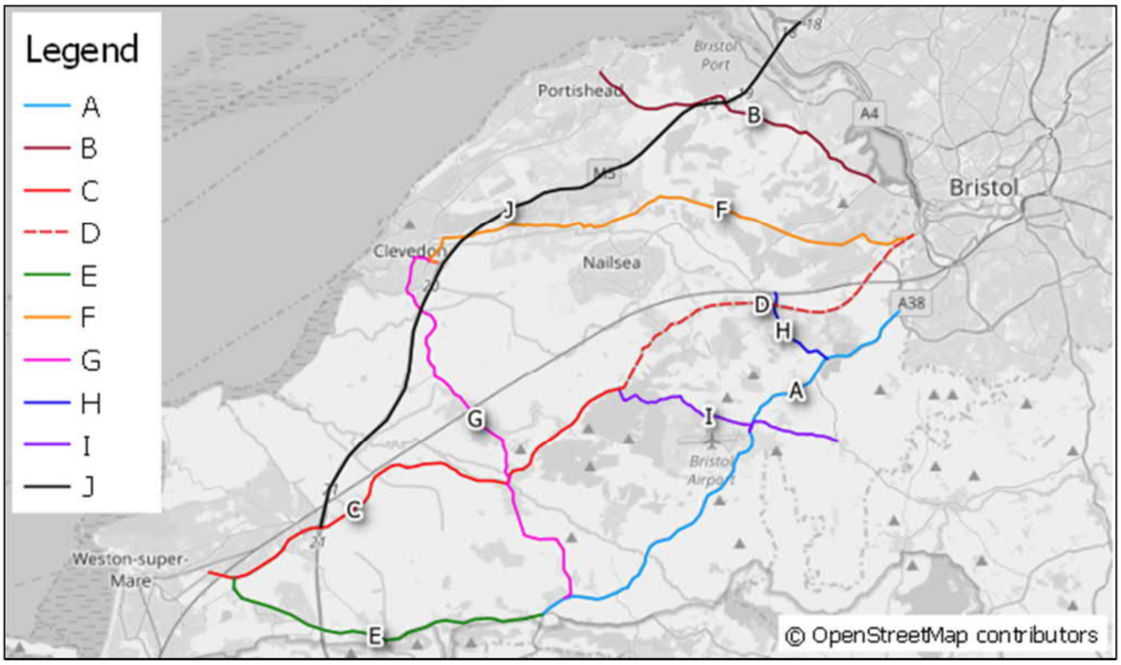

Figure 2.3: Journey Time Routes for NSSM – Part 1

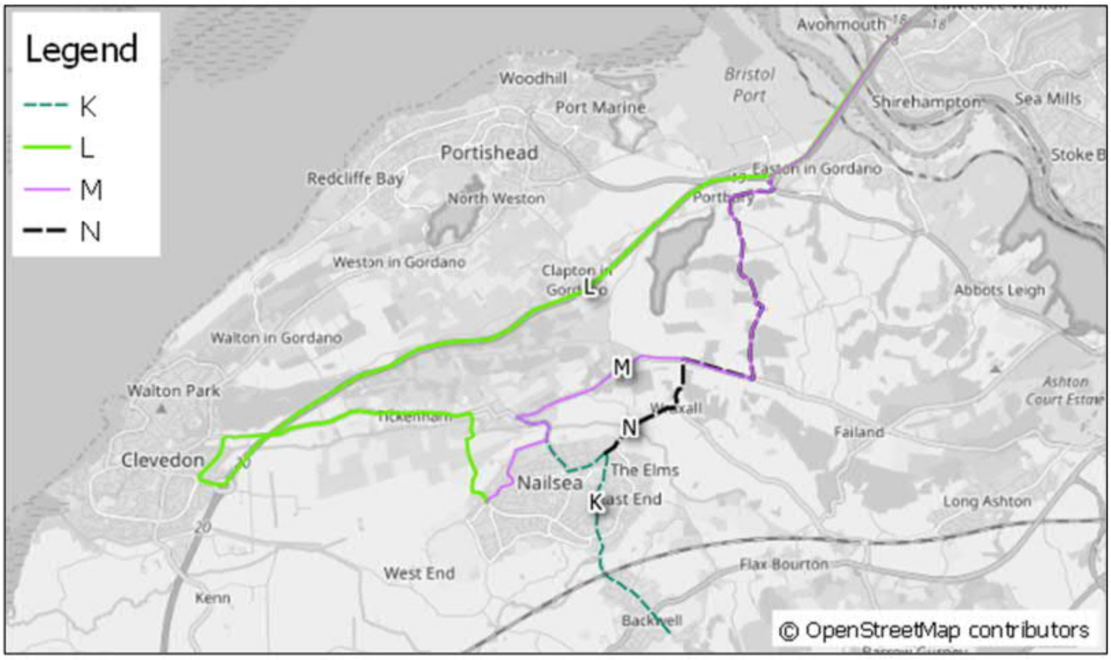

Figure 2.4: Journey Time Routes for NSSM – Part 2

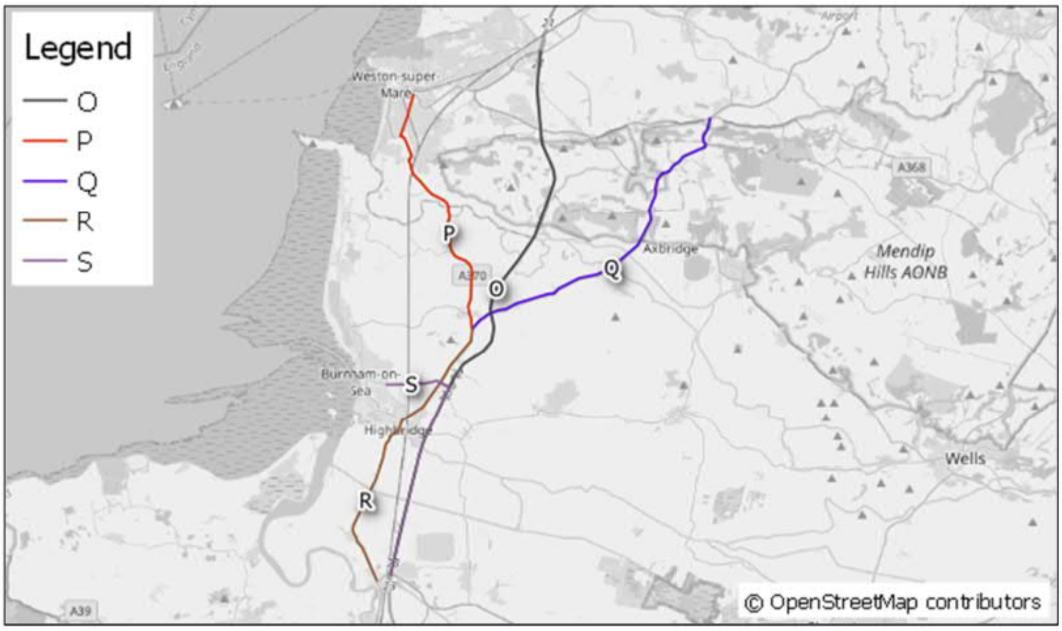

Figure 2.5: Journey Time Routes for NSSM – Part 3

2.11 Table 2.5 summarises the results from the journey time calibration. Within the PM Peak, nearly all routes pass the TAG criteria, whereas in the AM Peak this slips to 84%. Those routes which fail include:

- Route D (along the A370 into Bristol) in the AM peak – the model is too fast along this route as congestion is not fully represented close to Bristol and the A4174
- Route C (along the A370 into W-s-M) in the AM peak – the model is too fast and not representing enough delay close to the town
- Route B (between Portishead and Bristol) in all time periods – the model is too fast on this route.

2.12 The M5 and A38 journey times are generally well represented within the modelling.

Table 2.5: Journey Time Routes within NSSM - Validation Results

Time period	No. of journey time routes	Journey time routes passing	% routes passing
AM	38	32	84%
IP	38	36	95%
PM	38	37	97%

<u>Weston Town Model</u>

2.13 The Weston Town Model was built from an update of the existing North Somerset Traffic Model in 2015, with a focus on the urban area of Weston-super-Mare. This model, built by CH2M in SATURN, has a base year of 2015.

2.14 This model update includes a revision of the demand of the peak hours for trips travelling to and from Weston-super-Mare using Census Data and gravity modelling. The LMVR states that the model is largely WebTAG compliant, “although it potentially still falls short of full requirements as Census data only relates to journeys to work”. The coverage of the model is shown in Figure 2.6.

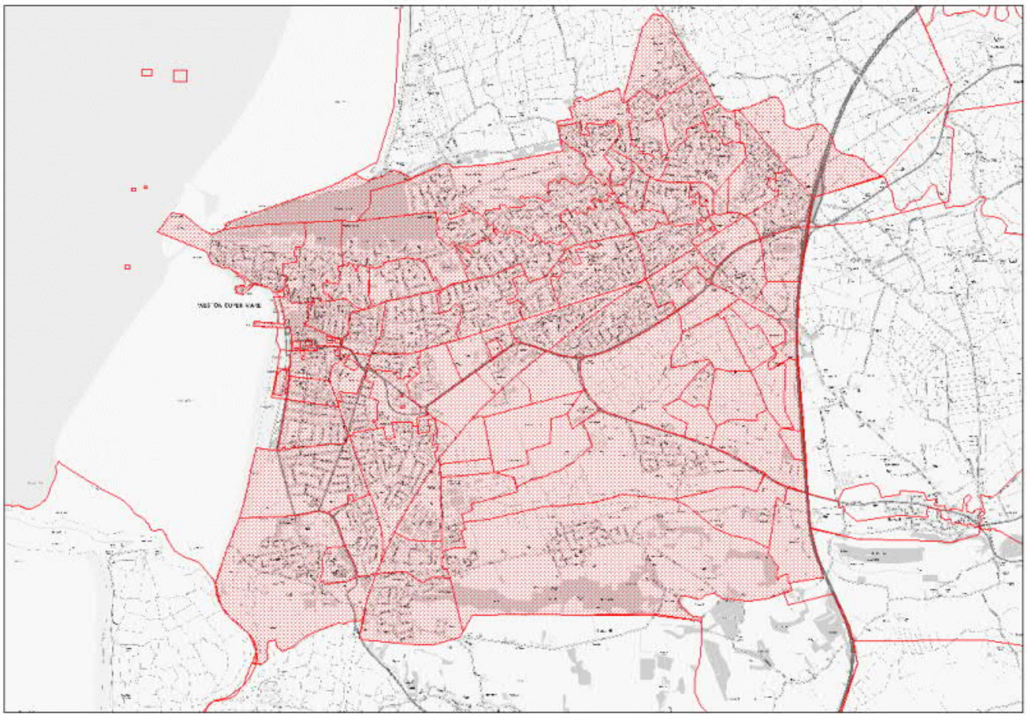

Figure 2.6: Weston Town Model Area (with zone boundaries) - taken from LMVR

2.15 The model has been recalibrated at key locations, the location of the counts and screenlines are shown in Figure 2.6. There are three screenlines covering the Weston-super-Mare area, one on the outer edge of the town, one around the centre, and one around the middle of the town. In addition to these, there are also some validation counts located around some key area including;

- Central Weston-super-Mare (close to the Railway Station)
- M5 mainline to the north and south of Junction 21
- Flowerdown Bridge

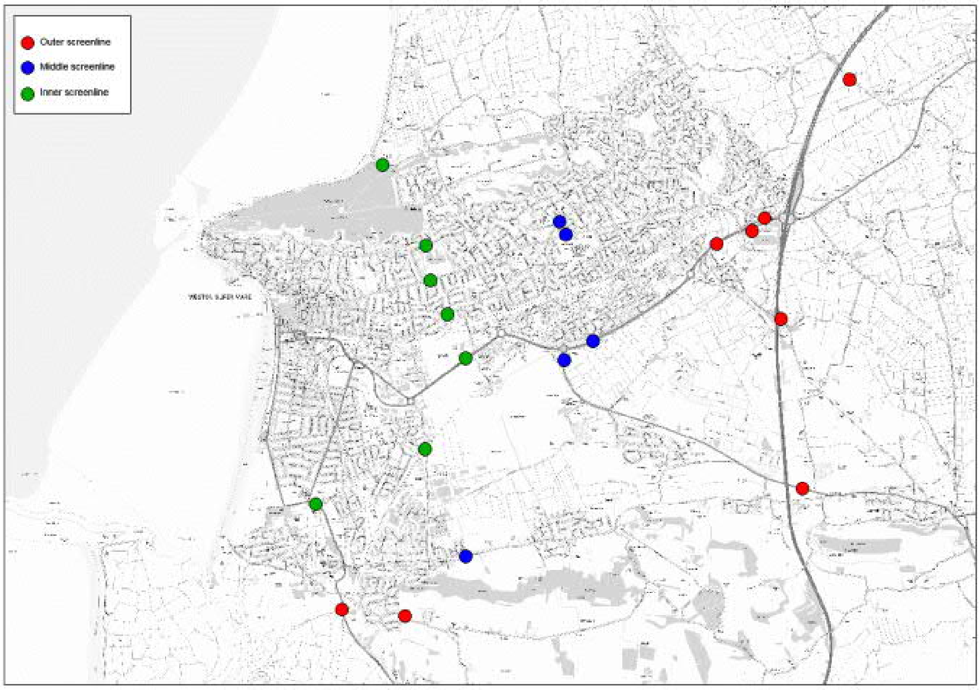

Figure 2.7: Weston Town Model – location of counts and screenlines for validation - taken from LMVR

2.16 The model has also been validated to journey times on routes within Weston-super-Mare including the main routes (A370, A371), New Bristol Road (through Worle) and through Bournville.

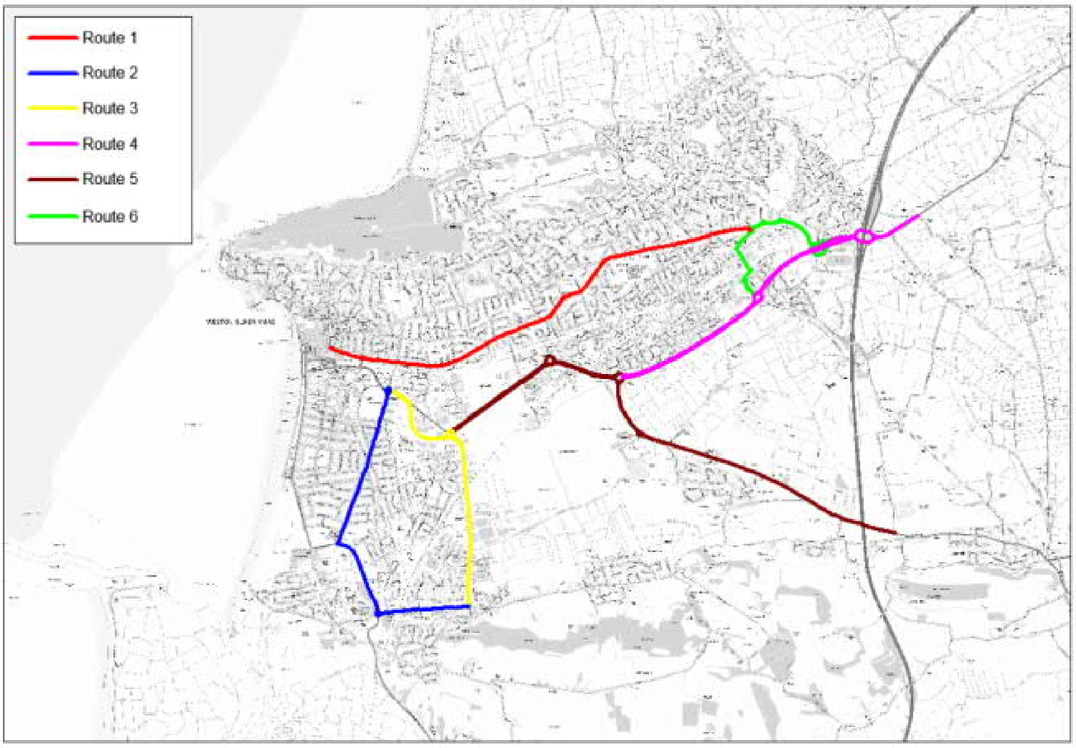

Figure 2.8: Weston Town Model – location of counts and screenlines for validation - taken from LMVR

2.17 In 2017, CH2M created forecast scenarios to be used to assess schemes and developments being brought forward in the Weston-super-Mare area. These forecast scenarios cover both 2021 and 2026 and involves the use of DIADEM as a variable demand model.

Summary

2.18 Two existing models have been reviewed for use in this study, the North Somerset Strategic Model and Weston Town Model. The key points are summarised below;

NSSM

- A WebTAG-compliant strategic highway model which covers the region and into areas such as Bristol and Bath
- Has a base year of 2018, covering the AM Peak hour (08:00 to 09:00), average Interpeak hour (10:00 to 16:00) and PM Peak hour (18:00 to 19:00).
- Is deemed suitable for use in this study, following some network enhancements

Weston Town Model

- A highway model which covers the Weston Super Mare area, with less detail across the rest of the North Somerset region
- It is not fully WebTAG-compliant
- Has a base year of 2015 therefore it is dated and would need significant updates to be used for this study

Transport Modelling Methodology

Proposed Modelling Approach

2.19 The methodology of assessing Local Plan growth options for North Somerset has been guided based on the strengths and weaknesses of the data/models already available and various potential softwares/techniques to produce a fit for purpose model that will allow a flexible and robust approach to modelling multiple modes. The proposed approach will use a bespoke spreadsheet outlining the trip rates for potential Local Plan Allocations. This tool will feed trip information into an enhanced version of the NSSM highway model. A TRACC-based public transport model will also be developed to provide public transport generalised costs to estimate the impact of potential mitigation measures. Data from these models will feed into the DIADEM Variable Demand model which will produce updated highway generalised costs (travel time and distance) which will assess the impact of the Strategy on the highway network.

2.20 The modelling platform (PT supply model, highway assignment model and variable demand model) will work together to estimate the impact of the differing traffic patterns associated with development scenarios and indicate the impact on mode shift and highway flows and congestion. The modelling tool will also allow testing of the impact of potential mitigation measures (both highway and PT interventions) on mode shift, highway flows and congestion under different development scenarios.

2.21 An overall summary of the key parts of the modelling methodology can be seen in Figure 0.1.

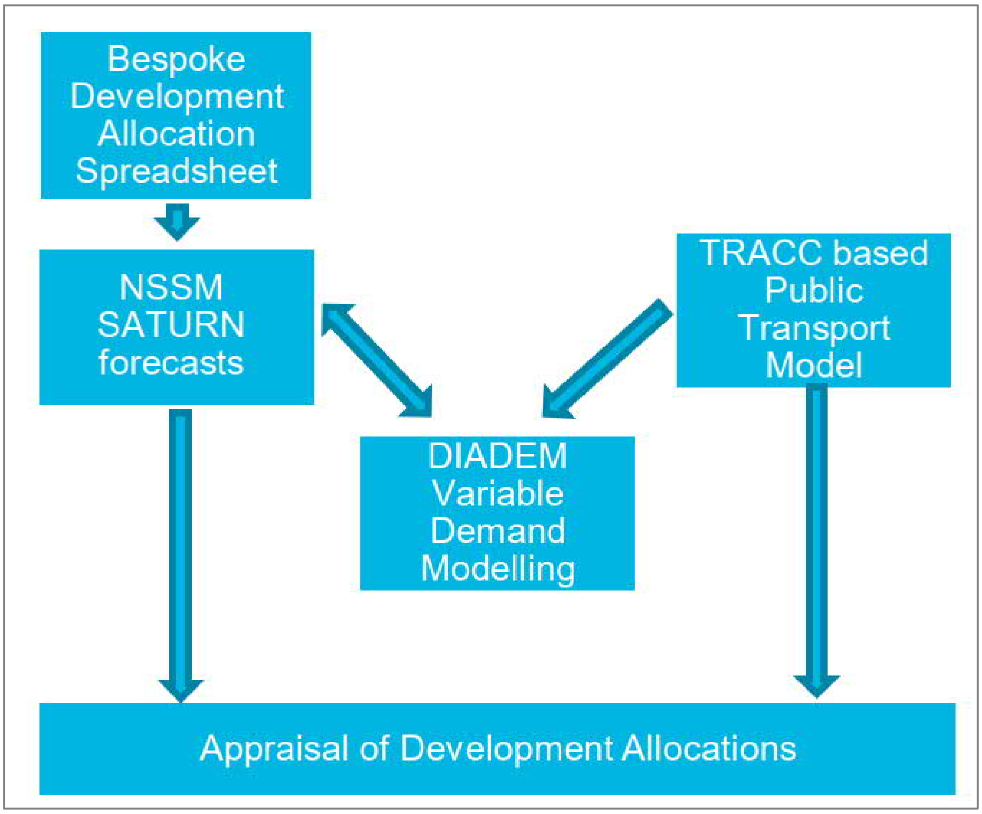

Figure 0.1: Methodology for assessing the proposed North Somerset Local Plan Options

Base Highway Model Enhancement

2.22 For the highway assessment, an enhanced version of the TAG-compliant NSSM will be developed and utilised. The current model has relatively good strategic network and zonal coverage of the North Somerset area and is calibrated well along most of the key routes. Calibration of the existing model is outlined in the NSSM LMVR. Use of the Weston Town Model as a full entity has been discounted due to the age of the model (base year is over 5 years old) however information from the WTM model may be used for extra detail within the Weston-super-Mare urban area update to NSSM.

2.23 Following a review of the NSSM, a need to undertake targeted enhancements of the model have been identified. As the preferred Spatial Strategy is yet to be confirmed and Local Plan site allocation options have not been developed yet, the review of NSSM has been based on the key strategic routes within the model, and the overall network and zonal disaggregation across the region. As detailed development sites are identified additional local network updates may also be required to allow trip loading.

2.24 There are three focus areas for which enhancements will be undertaken, however, this is subject to review once site allocations for assessment are confirmed. Through these enhancements, the model will be checked against observed flows and journey times to ensure the model still conforms to TAG guidance. The enhancements set out were presented to NSC and Highways England (HE) at a meeting on 5th January 2021 and agreed as reasonable in principal.

Expansion of the modelled network into South West Bristol

2.25 Discussions with the Council and other relevant stakeholders including Highways England (HE) have identified the importance of ensuring trips heading between North Somerset and Bristol are modelled accurately, in terms of flow levels, congestion and route choice availability. Figure 0.2 shows that the current NSSM model is in simulation (internal network) however several key junctions in south west Bristol which define key route choices are in buffer (peripheral network), including

- Parson Street Gyratory (A)
- Junctions around the Cumberland Basin (B,C,D) and;
- Hartcliffe roundabout (on Hengrove Way) (E)

Figure 0.2: Proposed change of simulation area around South West Bristol.

2.26 Therefore, as part of the enhancement it is proposed to extend the simulation area to cover these three junctions (and other associated network where related). These three junctions will be converted as a minimum; however, more junctions may be added to the simulation area as the modelling progresses. The aim of this change is to improve calibration of journey times on these two key routes into Bristol from North Somerset; and, accurately represent congestion which is typically experienced between North Somerset and Bristol. This will also ensure that speeds in future years are not fixed and instead are dependent on traffic flow levels (as in realty changing levels of demand would change the speeds in which vehicles are travelling). It is not proposed that model zone system or demand within south west Bristol will be adjusted.

Expand Weston-super-Mare network

2.27 The current NSSM has the centre of Weston-super-Mare in buffer, as it was originally intended by the developers of the model to use the Weston Town Model in parallel. Use of the Weston Town Model has been discounted, and as the Local Plan may potentially involve developments in the vicinity of W-s-M, this area of the NSSM model will require enhancement into the central Weston-super-Mare area. Figure 0.3 shows the model coverage of the W-s-M urban area and the peripheral area which is coded in buffer.

2.28 It is proposed that four key junctions (marked as A-D in Figure 0.3) and joining links are brought into the fully modelled area. It is not proposed that model zone system or demand will be adjusted.

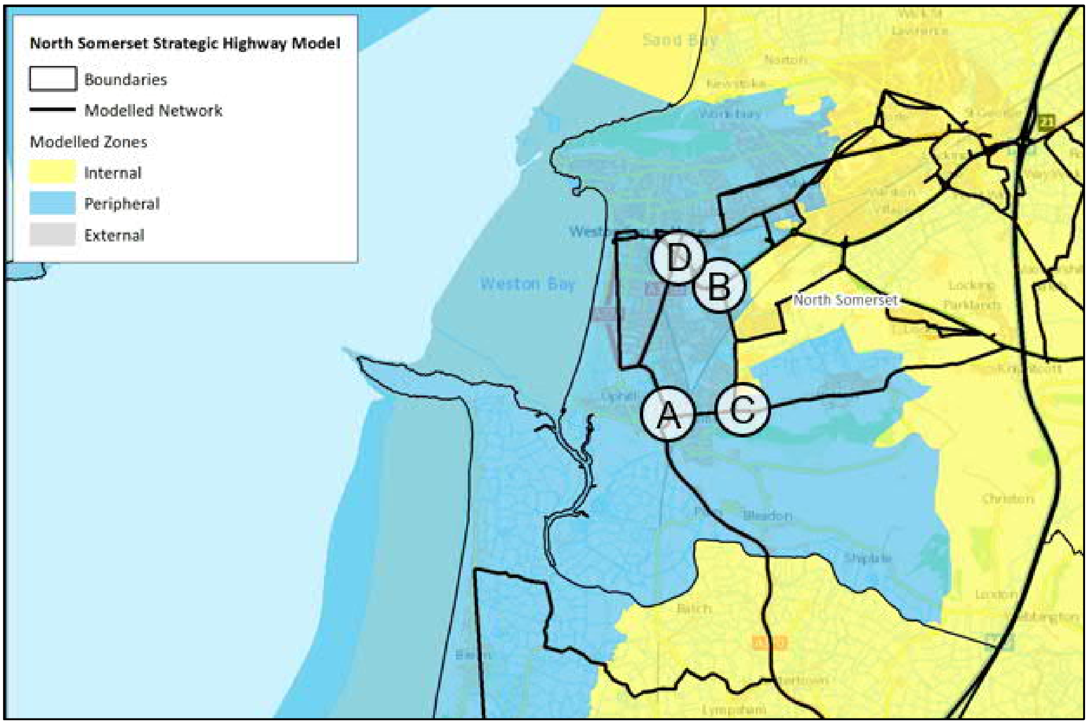

Figure 0.3: Weston-super-Mare proposed highway model changes

Update of the modelled speeds

2.29 As outlined in the NSSM LMVR, across the internal modelled network, most of the road network has been allocated free flow speeds that are relevant to the speed limit of the road, with speed flow curves being used where appropriate. However, in the original NSSM, there are several links where the modelled speed is significantly lower than speed limits. Links with speeds less than 32kph (20mph) are shown in Figure 0.4. These links will be reviewed as part of the model enhancement. These links include a number within Weston-super-Mare and some more rural links within the region. The focus will be on the links within the 'internal' area although there may be some focus on the links closest to the boundary, i.e. within Bristol and Weston-super-Mare.

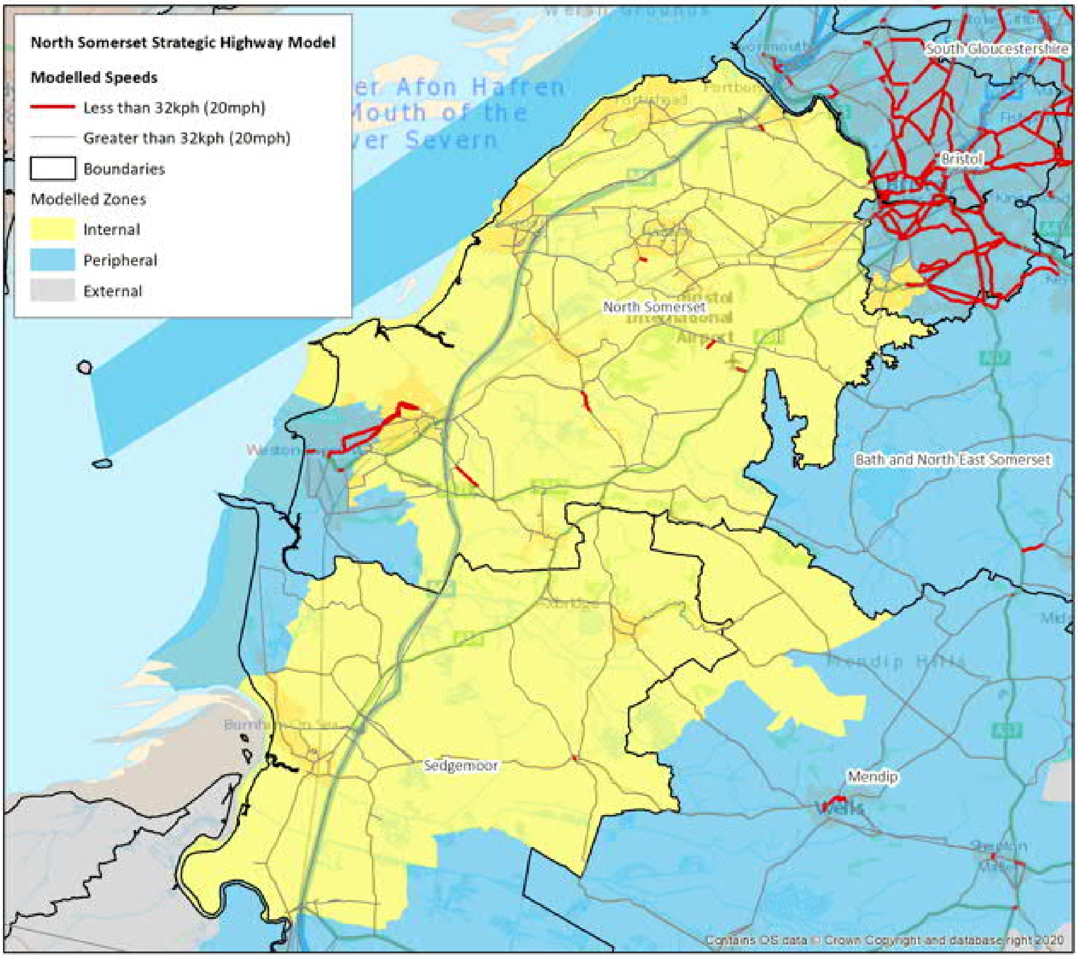

Figure 0.4: Low Modelled Speeds within the NSSM

2.30 In addition, the LMVR states that the A370 route into Bristol, is severely congested in the peak hours and speed data appears to show that vehicles regularly tail back along the A370 into North Somerset towards the South Bristol Link Road. The LMVR also states that the traffic flow on the A369 corridor and use of the Clifton Suspension Bridge (Toll) is sensitive to delay on the A370. To partially address these issues, the original NSSM takes observed 2018 speed data along the A370 as fixed speed inputs to replicate conditions within the south west of Bristol. Given that these speeds are fixed, this may not be appropriate for forecast years where flows, and consequently congestion and link speeds, are expected to change from 2018 levels. Figure 0.5 shows the area where the modelled speeds have been replaced with fixed observed speeds.

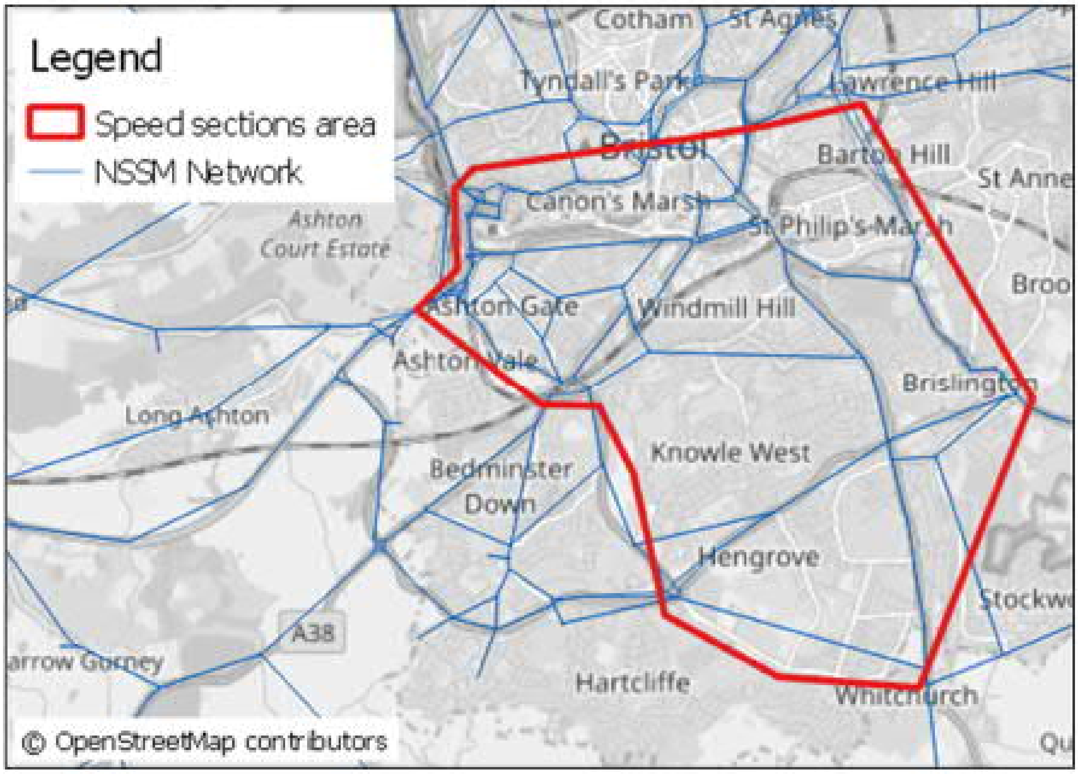

Figure 0.5: Area within Bristol where observed speeds applied in original NSSM (taken from LMVR)

2.31 For the purposes of assessment of development scenario impacts, it is essential that congestion and route choice is accurately reflected in this area when developments and potential mitigating measures are introduced. To do this, speeds need to change in response to demand and congestion. Therefore, this will be addressed in the model upgrade alongside the extension of the simulation network in this area.

Other enhancements

2.32 It is unlikely that outside of these focused areas that any significant network changes will be made however this may be reviewed further once the location of the development allocations are known. In addition, it is not expected that changes to the matrices or zone system will be undertaken however this will also be reviewed further once the site allocations for assessment are known.

2.33 As this is an enhancement rather than a recalibration exercise, matrix estimation will not be rerun. Therefore, as the enhancements are completed, the model will be checked against the observed flows and journey times outlined in the LMVR to ensure that the calibration has not been significantly negatively impacted.

Base Public Transport Modelling Development

2.34 Currently there is no existing public transport model for the North Somerset area that could be used for this project therefore a new public transport model will need to be developed. TAG Unit M3.2 states that *“the key role of public transport assignment models in demand forecasting is the provision of levels of service, the travel times, distances and costs associated with trips between origin-destination pairs, distinguishing components such as transfer and wait times, and, where relevant, different transport modes”.*

2.35 Given this, it is proposed to develop a public transport accessibility model within TRACC, which will provide a supply side assessment to PT generalised cost, to aid the assessment of the potential mode shift of trips associated with proposed development allocations and/or mitigation interventions.

2.36 TRACC software is a leading multi-modal transport accessibility analysis tool, developed in conjunction with the Department for Transport, local authorities and transport planners. TRACC analysis calculates travel times for non-highway modes (including rail, bus, walking and cycling) to give accurate journey times from many origins to many destinations in one calculation. It uses a physical network (i.e. roads and rail tracks) and public transport timetables to analyse travel times, distances and accessibility across a defined network.

2.37 This model will allow the assessment of journey times to various destinations within and just outside of the North Somerset border using a pre-determined set of parameters. Although TRACC is not a traditional public transport assignment model, it can be used effectively to produce the data that would inform variable demand modelling (generalised cost of travel by public transport). TRACC models have the advantage that the PT network and service data is readily available in suitable format, and models do not require complex calibration. Using procedures within TRACC, public transport travel times and distances for origin and destination movements corresponding to the NSSM zone system can be extracted as a key input into the variable demand model. These PT cost matrices will reflect the bus and rail service routes and timetables in the base year and, by including new or enhanced PT services proposed as mitigation for develop scenario impacts can accurately capture the effect on origin – destination public transport generalised costs.

2.38 The model base year will match the highway model base year of 2018. The public transport model network will be created using OpenStreetMap. Timetables will be obtained from DataCutter which is a licenced repository of publicly available GTF (general transit feed) specifications. These timetables will be made up of the following public transport modes;

- Bus;
- Rail; and
- Coach.

2.39 Origin and destination locations in the public transport model will be based on the population weighted centroid location of the NSSM zones. This will ensure consistency between cost skims derived from PT and highway models.

2.40 Route times will be extracted from the TRACC for each Origin / Destination pair in the zone system. Route time will include:

- Access walk time
- Wait time
- PT in vehicle time
- Interchange walk / walk (if relevant)
- Egress walk time

2.41 The TRACC model will be able to represent mitigation scenarios in two ways:

1. Inclusion of proposed mitigation services in TRACC service timetable – this will be appropriate where a specific new service, or enhanced frequency of existing service is proposed
2. Manual adjustment of cost skim matrix for selected sector to sector movements – this will be appropriate to reflect broad enhancement to PT accessibility

Variable Demand Model

2.42 DfT TAG guidance recommends VDM when appraising the impact of transport demand on network conditions. Given the basis of this study, it is proposed to include a variable demand model response using DIADEM software developed for DfT to implement the TAG recommended approach to variable demand modelling and interfacing with SATURN assignment model.

2.43 This software has been chosen for the following key features:

- DIADEM has been developed in line with TAG recommended approaches. The latest version (DIADEM 7.0 - May 2020) will be used unless an update is released before the modelling commences
- DIADEM interfaces with SATURN assignment models (the software used to run NSSM)

- DIADEM uses fixed public transport cost data (as extracted from the TRACC model) to assess mode share impacts.

2.44 DIADEM will combine fixed public transport costs from the TRACC model with highway travel costs from the updated NSSM to estimate the demand response to additional congestion associated with Local Plan development and impact of any mitigating public transport or highway schemes. DIADEM includes a procedure to iterate between highway assignments in NSSM and demand model estimations to reach convergence.

2.45 Demand model responses modelled will include mode choice, destination choice and macro-time-period choice. NSSM user classes will be retained in the DIADEM model with variable demand responses applied to car trips (commute, business, other) and freight trips unchanged.

2.46 The outcome from the DIADEM model will be an indication of change in mode share and trip distribution of development trips with highway trips assigned to the forecast highway network. Standard SATURN model data (link flows and journey times) will be available to support appraisal.

2.47 Figure 0.6 shows the VDM process as outlined in the DIADEM user manual.

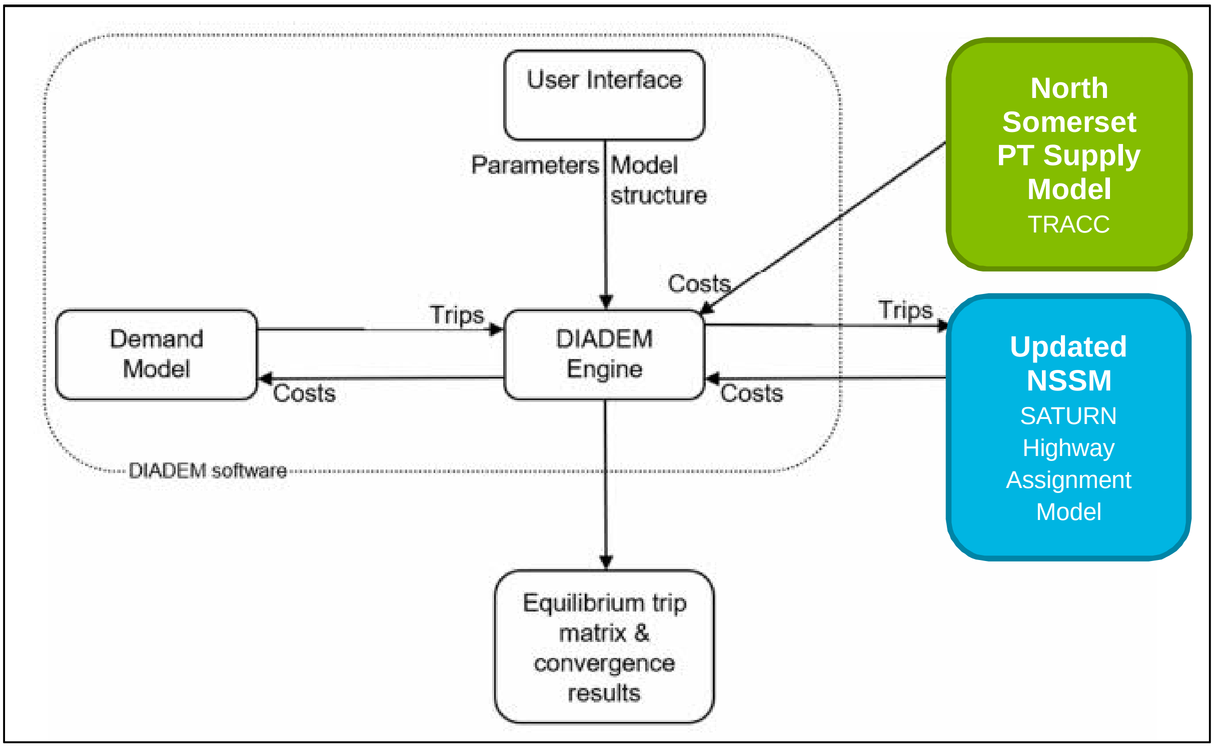

Figure 0.6: DIADEM software structure

3. Forecasting Approach

Reference Case

3.1 The assessment of the transport impacts of the Local plan development scenarios requires assessment of conditions in future years with and without development traffic. The current NSSM only consists of a base year model (2018). It will therefore be necessary to develop a forecasting approach and reference case forecast models for both highway and public transport models. The approach and models will be developed following guidance in TAG Unit M4 – Forecasting and Uncertainty.

3.2 The following forecast year will be assessed;

- 2038 (the end of the Local Plan period)

3.3 A core scenario will be defined reflecting expected network changes in model year and in line with TAG guidance, it will be:

- Based on published plans (not including speculative proposals);
- Unbiased (un-likely to over or under achieve, given existing plans and evidence);
- Coherent and self-consistent (if X is unlikely to go ahead unless Y also goes ahead, then X should only be included if Y is also included); and
- Realistic and plausible.

Highway Model

3.4 Highway trip growth between base year and future year will be based upon the forecast growth contained in the National Trip End Model (NTEM), at a spatial area consistent with the defined zone system. Freight traffic growth will be based on DfT national model forecasts (RTF18).

3.5 An uncertainty log will be developed in discussion with North Somerset Council and other relevant stakeholders (e.g. Highways England) to ensure the local planning data is included within the core scenario and will be included in the model in line with TAG guidance. A version has been supplied by NSC and this will be reviewed and confirmed at the time of starting work on forecast models. This will assume that any developments and schemes that are 'more than likely' or 'near certain' will be included within the core scenarios. This data will be used to define the spatial distribution of future growth, whilst retaining the total growth levels forecast within the National Trip End Model (NTEM). Development trips within this core reference case agreed volume of development in each scenario will be calculated using trip rates either supplied or agreed with NSC and the land area of each development. These development trips may be loaded at specific and representative locations in the model, with the remaining growth based on NTEM growth forecasts spread across existing trip ends.

3.6 For the future year, any committed highway infrastructure / schemes, which will be open by the future model year, will be added to the respective future year networks.

3.7 There is expected to be an update to TAG guidance at the end Feb 2021 which may need to be considered within this study as it may involve consideration to other factors including COVID and BREXIT. Even without this guidance, it is expected that sensitivity tests will be required to investigate the potential long-term impacts of COVID on trip making behaviour. These tests could be undertaken to understand the uncertainty of travel behaviour with more people working from home and shifting away from public transport. This scenario would be developed, if required, once TAG guidance is issued.

Public Transport Model

3.8 The public transport model only includes supply side data (service rotes and timetables). It is assumed that in the reference case public transport service levels will be maintained at base year levels, unless otherwise specified in the Uncertainty Log. As the PT model does not consider PT demand assumptions, defining growth in PT trips are not required.

Scenario Testing

Development Scenarios

3.9 For this study, several development scenarios will be tested based on potential site allocations as outlined through the Local Plan process. The number of scenarios will be agreed further along in the site sifting process. Each of these scenarios will identify development allocations across the district and will have allocated to each site a trip rate for highway and public transport that will be fed into the modelling. These trip rates will be allocated to the relevant existing zone within the network or where deemed appropriate (i.e. for larger developments) the development will be attributed its own model zone. These trip rates will have already taken into consideration factors such as trip internalisation. The number of trips for each development will then be calculated based on land use size.

3.10 The distribution for each zone will be attributed based on its location and size. For smaller developments located close to existing development i.e. on the edge of a town, the distribution will be taken from a SATURN zone which is close to the proposed development location and has a similar land use. Where developments may be bigger and/or located away from existing development, assumptions will be made based on surrounding zones and general trip attractors/producers to assume a robust and fair distribution for the proposed development.

3.11 Where schemes may be added as part of a development (i.e. a new bus route to serve a development), this will be adjusted within the public transport and highway model to accommodate this change in transport provision.

Mitigation Measures

3.12 As part of the assessment of the development scenarios above, analysis will be undertaken on the delay and congestion associated with the scenario. From this, there is likely to be some further analysis on proposed mitigation measures which could relieve the impact of the developments i.e. a new bus route or highway scheme/junction improvements. The number of these scenarios will be determined once the development scenarios have been modelled and analysed.

Potential COVID sensitivity testing

3.13 It is likely that an alternative assessment will need to be undertaken to analyse the potential impact on future travel patterns post-COVID from systemic changes in trip making behaviour. There is expected to be an update to TAG guidance in Feb 2021 which may provide guidance on this topic. However, if for any reason this is not available, then some assessment for this may need to be defined, agreed, and undertaken.

3.14 This could involve assessments such as;

- Reducing the number of commuting private cars due to a higher proportion of working from home;
- Different mode shifts due to less people using public transport.

3.15 At the time when development scenarios are finalised, COVID scenarios will be devised if relevant. These will be based on TAG guidance if available at the time.

4. Transport Appraisal

4.1 For this assessment, the modelling platforms will provide forecasts for a base year, reference case and various scenario tests. These will cover both a core scenario based on the definition from TAG as well as core plus Local Plan, and core plus Local Plan plus mitigation scenarios.

4.2 The outputs from this modelling can provide information on various impact areas that could be affected by development traffic including economic, environment and social impacts. Based on AECOM's role as transport consultants for the project, our reporting will set out the transport implications of each of the scenarios on the network, set out in terms of metrics such as;

- Change in link flows
- Change in link speeds
- Change in overall levels of congestion (V/C)
- Change in total number of vehicle trips
- Change in total number of vehicle kms travelled

4.3 TAG expects an Appraisal Specification Summary Table to be produced for an ASR. This table outlines how each of the impacts could be analysed by data output from the transport modelling and states which areas cannot be assessed or do not need to be assessed by the transport evidence at this stage. With the exception of Greenhouse Gas (GHG) emissions, it is assumed that these outputs will be used by others in their assessment of the Local Plan.

4.4 For the economy impact, TUBA will be used to provide information on the impact of the development scenarios on the various users. This includes information on user time savings, vehicle operating cost changes, fuel usage, emissions impacts and changes in indirect tax revenues. TUBA is a piece of DfT software that will economically appraise a transport scheme in line with TAG. Although not totally relevant for this study, it can be used to estimate the impact of the strategy on various factors such as emissions and vehicle operating costs.

4.5 In terms of environmental impacts, greenhouse gas emissions from road vehicles can be calculated as a result of change in fuel usage using TAG calculations outlined in TAG Unit A3. It should be noted that for this assessment, this would not include bus and train emissions.

4.6 The impact on accident rates and costs could be assessed using model data on vehicle kilometres by road type in different scenarios combined with a calculation of change in accident and injury numbers using COBA parameters.

4.7 The model would also provide other outputs which can inform a qualitative approach to the appraisal for other impact areas such as;

- vehicle kilometres,
- journey times;
- mode share,
- link flows and delays.

4.8 In some cases, the impacts are unable to be assessed as part of the transport evidence base developed from this study due to either the outputs from this stage of assessment not being detailed enough or that the impacts are dependent on the assessment of individual schemes which have not yet been identified or defined. These impacts would be reviewed in further stages of the study, if required.

4.9 The suggested contribution of the transport evidence base to the Appraisal Specification Table (AST) for the chosen Local Plan scenario is summarised in Table 4.1 below, although this will need to be confirmed with the consultants responsible for undertaking each of these work areas.

Table 4.1: Appraisal Specification Summary Table

Impacts / Sub-impacts		Proposed proportionate appraisal methodology	Reference to evidence and rationale in support of proposed methodology	Type of Assessment Output (Quantitative/ Qualitative/ Monetary/ Distributional)
Economy	**Business users & transport providers**	To be assessed using outputs from TUBA assessment	Assessment to be based on TAG and with a TAG-compliant traffic model	Quantitative PVB
Economy	**Reliability impact on Business users**	Qualitative assessment based on journey times from model	Transport model outputs could provide indication of locations with significant change in congestion leading to increased journey times	Qualitative
Economy	**Regeneration**	Not assessed as part of transport evidence base at this stage		
Economy	**Wider Impacts**	Not assessed as part of transport evidence base at this stage		
Environmental	**Noise**	Not assessed as part of transport evidence base at this stage		
Environmental	**Air Quality**	Not assessed as part of transport evidence base at this stage		
Environmental	**Greenhouse gases**	To be assessed using outputs from TUBA assessment	Assessment to be based on TAG and with a TAG-compliant traffic model	Quantitative PVB
Environmental	**Landscape**	Not assessed as part of transport evidence base at this stage		
Environmental	**Townscape**	Not assessed as part of transport evidence base at this stage		
Environmental	**Heritage of Historic resources**	Not assessed as part of transport evidence base at this stage		
Environmental	**Biodiversity**	Not assessed as part of transport evidence base at this stage		
Environmental	**Water Environment**	Not assessed as part of transport evidence base at this stage		
Social	**Commuting and Other users**	To be assessed using outputs from TUBA assessment	Assessment to be based on TAG and with a TAG-compliant traffic model.	Quantitative PVB
Social	**Reliability impact on Commuting and Other users**	Qualitative assessment based on journey times from model	Transport model outputs could provide indication of locations with significant change in congestion leading to increased journey times.	Qualitative
Social	**Physical activity**	Qualitative assessment based on development location versus trip attractors	Based on review of location development relative to services/trip attractors and cycling facilities.	Qualitative
Social	**Journey quality**	Not assessed as part of transport evidence base at this stage		
Social	**Accidents**	High level COBA based calculation using change in vehicle kms	Assessment to be based on TAG and with a TAG-compliant traffic model	Quantitative
Social	**Security**	Not assessed as part of transport evidence base at this stage		

	Access to services	Qualitative assessment based on development location versus trip attractors	Based on review of location development relative to services/trip attractors and cycling facilities	Qualitative
	Affordability	Qualitative assessment based on development location to PT services	Based on review of location development accessibility to public transport	Qualitative
	Severance	Not assessed as part of transport evidence base at this stage		
	Option values	Not relevant		
Public Account	**Cost to Broad Transport Budget**	Not assessed as part of transport evidence base at this stage		
	Indirect Tax Revenues	To be assessed using outputs from TUBA assessment	Assessment to be based on TAG and with a TAG-compliant traffic model	Quantitative PVB