TRANSPORT FOR NORTH CORRIDOR STUDIES

ECONOMIC APPRAISAL METHODOLOGY – TECHNICAL NOTE FINAL

MAY 2018

Project:	TfN Strategic Development Corridor (SDC) Studies
Subject:	Economic Appraisal Methodology – Consistency Approach for Central Pennine and Energy Coast
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1. INTRODUCTION

1.1 The challenge facing TfN is planning investment in the transport network that will support unprecedented levels of transformational economic growth in the North, in a future that is uncertain and in which different patterns of travel demand might develop in response to both transport and non-transport stimuli.

1.2 The underpinning assumption is that the Northern Powerhouse Independent Economic Review (NPIER) transformational scenario is realised in terms of population and employment growth. This equates to an increase of +21% in total employment between 2015 and 2050, which is almost double the employment growth forecast of +12% contained within DfT's National Trip End Model (NTEM). The Northern Transport Demand Model (NTDM) predicts similar output levels of transport demand growth from the input population and employment growth, e.g. +21% commuter travel growth.

1.3 In a future that is uncertain it is important that the study appraises the performance of a Strategic Outline Programme (SOP) against alternative future transformational scenarios along with a core scenario that represents the central NTEM case in line with WebTAG guidance. Alongside a NTEM growth scenario, two alternative TfN future growth scenarios will be used to inform the appraisal following analyses of the demand outputs from the NTDM.

1.4 As stated in the ASR, the outputs from those growth scenarios will be used to inform the economic assessment using TUBA for Level 1 (transport benefits) and WITA for Level 2 (connectivity).

1.5 It was discussed and agreed at the Senior Modelling Group (SMG) meeting on 11th April 2018 that each Strategic Development Corridor (SDC) consultants (WSP and Jacobs) will provide a Technical Note outlining the methodology and assumptions for the appraisal of the SDCs schemes, in particular calculation of TUBA and WITA benefits.

1.6 This Technical Note therefore discusses the methodology and data assumptions that are required for the calculation of TUBA and WITA benefits that will be used for the Central Pennine and Energy Coast SDC. This will allow:

- address DfT's questions in the ASR;
- link to the NTDM as the progenitor of transformational growth;
- calculate rail and freight benefits; and
- generate a variety of outputs to suit anticipated needs.

1.7 The report will help TfN to understand and sign off the process to the appropriate levels of technical assurance.

2. BACKGROUND

2.1 As stated in the Appraisal Specification Report (ASR), the default economic parameters contained in the TUBA software (version 1.9.10) will be used as the basis of the assessment. These parameters are based on DfT WebTAG economic DataBook December 2017 and include data on the following:

- Values of time and growth in value of time;
- Fuel costs, rates of fuel consumption and changes in vehicle efficiency over time;
- Vehicle occupancies;
- Journey purpose splits;
- Rates of taxation; and
- Carbon values for assessing the impact of the schemes on CO2 emissions

2.2 To provide a holistic, transparent and useful view of the SDC's programme impact of public value, the ASR states that a value for money (VfM) assessment will be undertaken that considers:

2.3 **Level 1: Established Monetised Impacts** to generate an initial VfM metric. Monetised impacts will focus on:

- Journey time savings;
- Vehicle operating costs;
- Greenhouse gases; and
- Indirect tax revenues.

2.4 The level 1 benefits will be calculated using TUBA. For this SOBC stage, accidents, physical activity, journey quality, noise and air quality will not be monetised.

2.5 **Level 2: Evolving Monetised Impacts** to generate an adjusted VfM metric. This will seek to assess the following elements:

- Reliability benefits;
- Static clustering – specific reference to Northern Powerhouse Independent Economic Review (NPIER) prime / enabling capabilities;
- Output in imperfectly competitive markets; and
- Labour supply impacts

2.6 Level 2 static Wider Economic Benefits (WEBs) will be assessed using a WITA tool based on agglomeration and decay parameters, incorporating the impacts of Wider Economic benefits described in WebTAG unit A2-1. This approach to assessing Static WEBs will use WPS's WITA emulation tool which was previously been approved for use on the Trans-Pennine Tunnel Study Stage 0 by Highways England and DfT.

2.7 **Level 3: Indicative Monetised Impacts**. This will be reported at a pan-northern level and will not form part of the SDC appraisal.

2.8 The VfM assessment will reflect a consideration of all material economic, social and environmental impacts, including those which cannot be sufficiently or easily monetised for inclusion in benefit-cost ratios.

3. APPRAISAL PARAMETERS

Model Parameters

3.1 The Central Pennine (CP) and Energy Coast (EC) SDC's forecast models utilised the Trans-Pennine South Regional Transport Model (TPS RTM) and the North Region Transport Model (NRTM) respectively to develop forecast networks for each relevant corridor. The base year 2015 models were refined with revised zone system and network improvements where appropriate prior to the forecast years' network development.

3.2 As stated in the ASR, the two forecast years to be used for the assessment of the SDC's programme are as below:

- Opening Year: 2035;
- Design Year: 2050;
- As stated in the ASR, the Horizon Year of 2060 may be developed to test the impacts of NTDM high growth scenario in order to identify the level of capacity forecast to be left on the network in 2060. The development and subsequently appraisal of the horizon year 2060 will need to be agreed between DSC's consultants and TfN at the SMG meeting.

3.3 The model parameters developed for both CP and EC SDC corridors are provided in Table 1 below.

Table 1 Model Parameters

Mode	Time Period	Vehicle Type	Trip Purpose
Highways Assignment Model	Average hour for: AM Peak: 07:00 to 10:00 Inter-Peak: 10:00 to 16:00 PM Peak: 16:00 to 19:00	Car	Employers' Business Commuting Other
		LGV	LGV (Freight + Non-Freight)
		HGV	HGV (OGV1 + OGV2)
Public Transport Model (Rail)	Average hour for: AM Peak: 07:00 to 10:00 Inter-Peak: 10:00 to 16:00 PM Peak: 16:00 to 19:00	Rail Passenger	Employers' Business Commuting Other

TUBA and WITA Parameters

3.4 For the economic appraisal, TUBA and WITA require the benefits to be calculated for all the periods for the whole year with pre-defined user classes/purpose as provided in Table 2.

Table 2 Economic Appraisal Parameters

Time Slice	Vehicle Type	Trip Purpose
1. Weekday AM Peak: 07:00 to 10:00 2. Weekday Inter-Peak: 10:00 to 16:00 3. Weekday PM Peak: 16:00 to 19:00 4. Weekday Off-Peak: 19:00 to 07:00 5. Weekend + Bank Holiday (24 hours)	Car	1. Employers' Business 2. Commuting 3. Other
	LGV	4. LGV Non-Freight 5. LGV Freight
	HGV	6. HGV (OGV1) 7. HGV (OGV2)
	Rail Passenger	8. Employers' Business 9. Commuting 10. Other

3.5 It is therefore required that assignment user classes need to be converted to TUBA/WITA pre-defined user classes/purpose as provided in Table 3.

Table 3 Conversion to TUBA/WITA User Class

Vehicle Type	Assignment User Class	TUBA/WITA User Class	Conversion Factor
Car	Employers' Business	Employer Business	1.00
	Commuting	Commuting	1.00
	Other	Other	1.00
LGV	LGV (Freight + Non-Freight)(1)	LGV Non-Freight	0.12
		LGV Freight	0.88
HGV	HGV (OGV1 + OGV2)(2)	OGV1	0.40
		OGV2	0.60
Rail Passenger	Employer Business	Employer Business	1.00
	Commuting	Commuting	1.00
	Other	Other	1.00

Note: *(1) – Non-freight/Freight proportional split is based on Table A1.3.4 of the WebTAG DataBook Dec 2017*

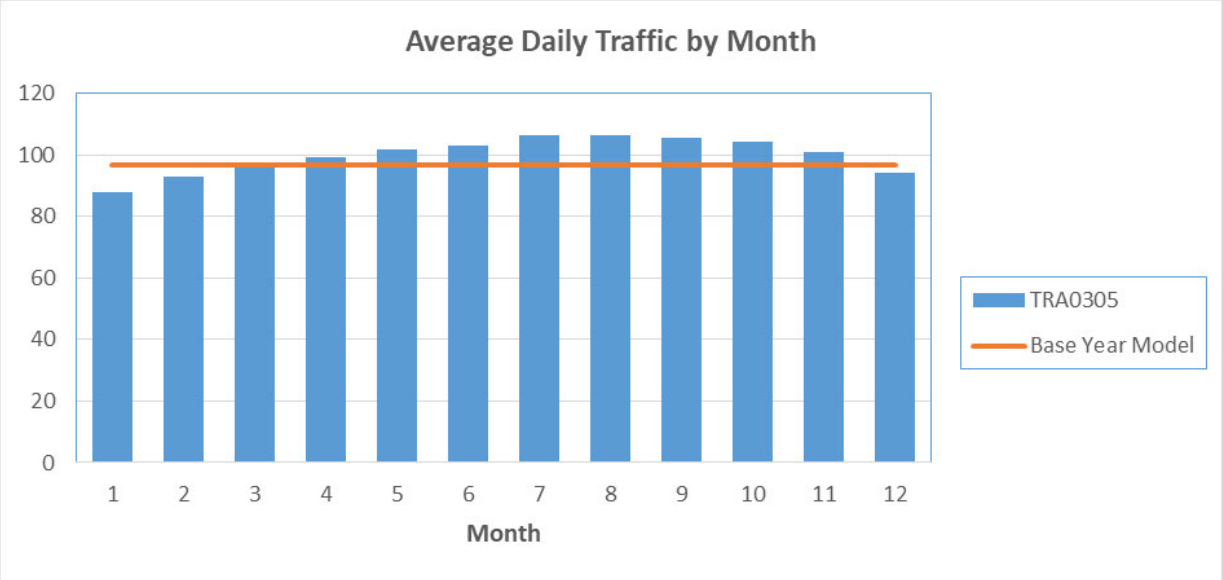
(2) – OGV1/OGV2 proportional split is derived from NTM 2015 database for the base year 2015 during the development of the RTM models

Non-Modelled Hours and Annualised Benefits

3.6 As mentioned in the previous section, TUBA and WITA require benefits to be calculated for all relevant periods for the whole year. As the SDC's models were developed for average weekday for March 2015 with three distinct average peak period of AM peak, Inter-Peak and PM peak, it is necessary to apply annualisation factors to convert the benefits that accrued for each average hour to the annual values.

3.7 Analysis of the TRA0305[1] 2012-2016 average data across all the roads for Great Britain shows that traffic volumes in March are generally lower than annual average, as provided in Figure 1 below.

Figure 1 Average Daily Traffic by Month (TRA0305)



3.8 It is therefore proposed that to capture annualised benefits, annualisation factors need to take into account the monthly variations. Table 4 below summarises the average daily traffic flow variation by month as extracted from TRA0503.

Table 4 Average Daily Traffic Flow by Month

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Index	87.8	93.0	**96.9**	99.4	101.9	103.0	106.3	106.5	105.6	104.2	100.9	94.4

From the data it is proposed that the uplift factor to be applied to March's data to represent annual benefits is $\frac{\sum_i \text{Index}_i}{12 * \text{Index}_{\text{March}}}$ = 1.032

3.9 Table 5 below summarises the annualisation factors that will be applied to each modelled period's benefits to represent the annual benefits.

Table 5 Annualisation Factors for Modelled Hours

Period	Modelled Hour	Annualisation Factor
Weekday AM Peak (07:00 – 10:00)	Average AM Peak Model	3x253x1.032 = 783
Weekday Inter-Peak (10:00 – 16:00)	Average Inter-Peak Model	6x253x1.032 = 1,566
Weekday PM Peak (16:00 – 19:00)	Average PM Peak Model	3x253x1.032 = 783

[1] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/610670/tra0305.ods

3.10 For non-modelled periods, it is not appropriate to expand the modelled hours' benefits to cover the non-modelled hours. It may potentially overestimate the benefits/dis-benefits for the non-modelled hours due to the following:

- Significantly lower volume during the non-modelled hours (i.e. night time) compared to the modelled hours (i.e. peak hours), thus travel cost difference between Do-Minimum and Do-Something is significantly less than that during the peak hours; and
- There is no explicit model to represent accurately the travel costs during the non-modelled hours.

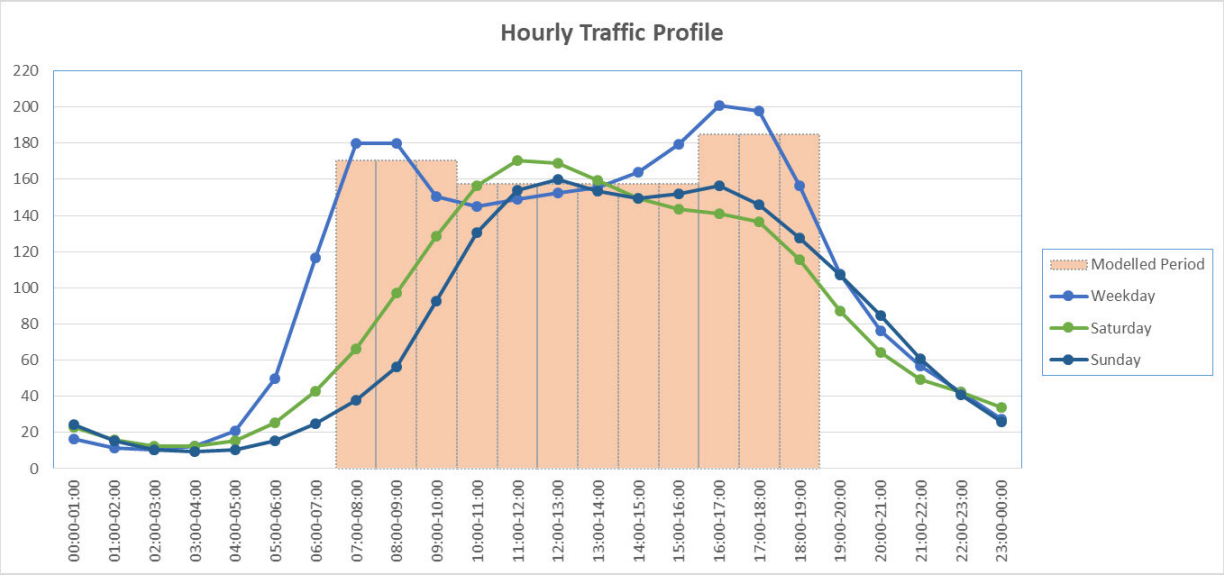
3.11 TUBA guidance suggests that a conservative approach should be used to identify benefits/dis-benefits for non-modelled hours so that it would represent as close as possible the change in travel costs between Do-Minimum and Do-Something compared to changes between the Do-Minimum and Do-Something in the modelled hours. It is therefore established that it is only appropriate to calculate benefits for hours in which traffic levels are similar to those in the modelled hours.

3.12 A traffic profile for a study area where proposed schemes are assessed is normally used to determine whether any of the non-modelled hours to have traffic volume that is similar to the modelled hours. Ideally, each SDC's assessment should have different traffic profile due to geographical differences. However, for consistency, it was advised that all three SDC team to seek for a common traffic profile so that a common set of factors can be used to estimate benefits for non-modelled periods for all three SDC corridors.

3.13 The road traffic statistics TRA0307 (Motor vehicle traffic distribution by time of day and day of the week on all roads, Great Britain) is publicly available from DfT website and was used to provide summary of traffic profile for the purpose of the assessment of TUBA and WITA.

3.14 Figure 2 below provides a summary of highway's hourly traffic profile by time of day that was produced from the TRA0307[2] dataset for 2016.

Figure 2 Hourly Traffic Profile by Day Type (TRA0307)



[2] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/610672/tra0307.ods

3.15 It can be seen, traffic volume significantly reduces before 7AM and after 7PM during a weekday. The two hours with the highest volume during the off-peak period are 6-7AM and 7-9PM, where traffic volume are only around 50-70% of the weekday AM and PM period's volume. It is therefore advised that the AM and PM modelled hour travel costs should not be used directly to derive estimate of TUBA/WITA benefits for the off-peak period. Instead, the following approach is proposed in order to capture benefits for the pre-AM (06:00-07:00) and Post-PM (19:00-21:00) periods:

- Derive off-peak travel costs for the pre-AM and post-PM shoulders from the respective AM and PM period's travel costs using appropriate weighting factors;
- Derive average off-peak demand for the pre-AM and post-PM shoulders from the respective AM and PM demand using ratios of pre-AM to AM and post-PM to PM respectively that are obtained from TRA0308[3] data;
- Calculate average off-peak travel costs and demand using respective demand weighted average calculated from steps 1 and 2 above; and
- Include costs and demand into the calculation of TUBA and WITA benefits.

3.16 The equation to derive the off-peak costs and demand from the AM and PM modelled periods is provided below, at OD level:

$$\mathrm{Cost_{OP}} = \frac{\mathrm{WFactor_{AM} x Cost_{AM} x Ratio_{AM} x Demand_{AM}} + \mathrm{WFactor_{PM} x Cost_{PM} x 2Ratio_{PM} x Demand_{PM}}}{\mathrm{WFactor_{AM} x Ratio_{AM} x Demand_{AM}} + \mathrm{WFactor_{PM} x 2Ratio_{PM} x Demand_{PM}}}$$

$$\mathrm{Demand_{OP}} = \frac{\mathrm{Ratio_{AM} x Demand_{AM}} + \mathrm{2Ratio_{PM} x Demand_{PM}}}{\mathrm{Ratio_{AM}} + \mathrm{2Ratio_{PM}}}$$

3.17 Where:

- $\mathrm{WFactor_{AM}}$, $\mathrm{WFactor_{PM}}$ – weight factors to convert AM and PM travel costs to the respective pre-AM and post-PM travel costs. These are calculated by assigning the derived base year pre-AM and post-PM demand on to the respective base year AM and PM networks.
- $\mathrm{Cost_{AM}}$, $\mathrm{Cost_{PM}}$ – travel costs (Time, Distance, Toll skims) for the AM and PM modelled period;
- $\mathrm{Ratio_{AM}}$, $\mathrm{Ratio_{PM}}$ – ratios of pre-AM (06:00-07:00) to the average AM period (07:00-10:00) and post-PM (19:00-21:00) to the average PM period (16:00-19:00) respectively (obtained from TRA0308 data); and
- $\mathrm{Demand_{AM}}$, $\mathrm{Demand_{PM}}$ – demand matrices for the AM and PM modelled period.

TRA0308 provides distribution of traffic on all roads by time of day and day of week, for cars, LGVs and HGVs separately. Table 6 below summarises the ratios that will be used to derive the pre-AM and post-PM demand from the respective AM and PM average period demand.

Table 6 Annualisation Factors for Modelled Hours

Period / Vehicle Class	Car	LGV	HGV
Ratio of Pre-AM to AM Average Period	0.627	0.770	0.914
Ratio of Post-PM to PM average period	0.475	0.444	0.601

3.18 It is assumed that during the pre-AM and post-PM shoulders, traffic patterns would be similar as those during the AM and PM period. Therefore, it was decided that the purpose split during the pre-AM and

[3] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/610673/tra0308.ods

post-PM shoulder would be similar to those in the AM and PM period and there is not required to apply any adjustment to the purpose split for the two peak shoulders.

3.19 The steps carried out to produce the weight factor for the pre-AM and post-PM shoulders is summarised as below:

- Apply relevant ratios from Table 6 to the base year AM and PM demand to derive base year pre-AM and post-PM shoulder's demand;
- Carry out pre-AM and post-PM assignments using respective base year AM and PM network;
- Extract skim costs from the pre-AM and post-PM assignments
- Calculate weight factors using the equation: $\text{WFactor}_{\text{AM(PM)}} = \frac{\text{Skim Cost}_{\text{pre-AM(post-PM)}}}{\text{Skim Cost}_{\text{AM(PM)}}}$

3.20 For the weekend period, the graph suggests that there are number of hours that have similar traffic volume compared to the weekday AM peak and inter-peak volume and therefore either the AM peak or inter-peak models can be used to derive estimates of the TUBA and WITA benefits for the weekend period.

3.21 It is also noted that the travel patterns during the weekend are similar to those during the inter-peak period in terms of trips distribution and travel costs, therefore it was recommended that the inter-peak model will be used as the 'donor' model to derive travel costs for the purpose of TUBA and WITA calculation.

3.22 It was recommended that the volume for the non-modelled hours should be at least 90% of the inter-peak traffic volume to ensure that the travel cost difference between Do-Minimum and Do-Something are similar between the non-modelled hours and the modelled hours.

3.23 Table 6 below provides summary of the derivation of the annualisation factors for the non-modelled hours that are calculated using the inter-peak volume as a threshold.

Table 6 Selection of Non-Modelled Hours for Annualised Benefits

Time of day	Hourly Profile			Weekday		Saturday		Sunday	
	Weekday	Saturday	Sunday	Model	Ratio	Model	Ratio	Model	Ratio
00:00-01:00	16.3	23.1	24.3	AM	0.10	IP	0.15	IP	0.15
01:00-02:00	11.7	15.8	15.5	AM	0.07	IP	0.10	IP	0.10
02:00-03:00	10.4	12.4	10.6	AM	0.06	IP	0.08	IP	0.07
03:00-04:00	12.4	12.5	9.5	AM	0.07	IP	0.08	IP	0.06
04:00-05:00	20.7	15.3	10.3	AM	0.12	IP	0.10	IP	0.07
05:00-06:00	50.0	25.4	15.3	AM	0.29	IP	0.16	IP	0.10
06:00-07:00	116.5	43.0	24.9	AM	0.68	IP	0.27	IP	0.16
07:00-08:00	179.9	66.3	38.1	**AM**	**1.00**	IP	0.42	IP	0.24
08:00-09:00	180.0	97.1	56.5	**AM**	**1.00**	IP	0.62	IP	0.36
09:00-10:00	150.7	128.4	92.7	**AM**	**1.00**	IP	0.82	IP	0.59
10:00-11:00	144.9	156.6	130.6	**IP**	**1.00**	IP	**0.99**	IP	0.83
11:00-12:00	149.2	170.6	153.8	**IP**	**1.00**	IP	**1.08**	IP	**0.98**
12:00-13:00	152.3	168.7	160.1	**IP**	**1.00**	IP	**1.07**	IP	**1.02**
13:00-14:00	155.6	159.6	153.7	**IP**	**1.00**	IP	**1.01**	IP	**0.98**

Time of day	Hourly Profile			Weekday		Saturday		Sunday	
	Weekday	Saturday	Sunday	Model	Ratio	Model	Ratio	Model	Ratio
14:00-15:00	163.9	149.4	149.6	**IP**	**1.00**	IP	**0.95**	IP	**0.95**
15:00-16:00	179.2	143.3	152.0	**IP**	**1.00**	IP	**0.91**	IP	**0.96**
16:00-17:00	200.6	141.0	156.4	**PM**	**1.00**	IP	**0.90**	IP	**0.99**
17:00-18:00	198.0	136.3	146.2	**PM**	**1.00**	IP	0.87	IP	**0.93**
18:00-19:00	156.2	115.4	127.5	**PM**	**1.00**	IP	0.73	IP	0.81
19:00-20:00	107.8	87.4	107.3	PM	0.58	IP	0.55	IP	0.68
20:00-21:00	76.4	64.1	84.7	PM	0.41	IP	0.41	IP	0.54
21:00-22:00	56.8	49.2	60.9	PM	0.31	IP	0.31	IP	0.39
22:00-23:00	42.4	42.2	40.6	PM	0.23	IP	0.27	IP	0.26
23:00-00:00	27.5	34.1	25.8	PM	0.15	IP	0.22	IP	0.16

3.24 From the analysis of the non-modelled hours to be selected for the calculation of benefits as produced in Table 6, it is proposed that:

- No off-peak hours should be used for the calculation of off-peak period's benefits; and
- 13 hours during the weekend can be used for the calculation of weekend + bank holiday benefits.

3.25 Table 6 below provides annualisation factors to be used for calculation of benefits for the off-peak and weekend + bank holiday periods.

Table 6 Annualisation Factors for Non-Modelled Hours - Highways

Period	Modelled Hour Used	Annualisation Factor
Weekday Off-Peak (19:00 – 07:00)	Derived Off-Peak Costs/Demand	3x253x1.032 = 783
Weekend + Bank Holiday (all days)	Average Inter-Peak Model	13x52x1.032 = 688

3.26 For rail, it is currently no information regarding the rail demand from the Northern Rail Models (NoRMS) in terms of demand profile by weekday and weekends, thus not possible to derive annualisation factors for calculation of rail benefits. It is therefore proposed to adopt the same annualisation factors for rail as per for highways. As rail economics are being derived using the NoRMS platform this difference can be accommodated by blending the outputs at the reporting stage.

Demand Purpose Split for Non-Modelled Hours

3.27 According to WebTAG DataBook, trip purpose splits vary by time period with noticeably lower proportion of Commuting and Business trips and higher proportion of 'Other' trips travelling during the weekend compared to the weekday's split. To allow as close as possible the calculation of benefits for each purpose during the non-modelled hours, it was required that the 'donor' model's demand (i.e. inter-peak model) needs to be adjusted to account for the difference in purpose split between the non-modelled hours from the inter-peak purpose split.

3.28 Table 7 provides summary of the purpose split by time periods as extracted from WebTAG DataBook Dec 2017 (Table A1.3.4) and adjustment factors required to be applied for each purpose of the non-

modelled periods from the inter-peak demand. This will yield the same traffic volume but will adjust to reflect relative impact of different values of time.

Table 7 Adjustment Factors for Non-Modelled Hours' Demand

Purpose	WebTAG DataBook's Purpose Split (%)		Adjustment Factor
	Non-Modelled Period	'Donor' Model Period	
Weekday Off-Peak period			
Car - Business	NA	NA	NA
Car - Commuting	NA	NA	NA
Car - Other	NA	NA	NA
Rail – Business	NA	NA	NA
Rail – Commuting	NA	NA	NA
Rail – Other	NA	NA	NA
Weekend + Bank holiday			
Car - Business	12.88	16.47	0.21089
Car - Commuting	38.54	11.81	0.66820
Car - Other	48.58	71.72	1.23581
Rail – Business	17.72	15.76	0.11733
Rail – Commuting	38.55	5.49	0.50854
Rail – Other	43.73	78.75	1.21090

4. APPRAISAL APPROACH

4.1 The Economic Appraisal for each SDC will be undertaken at 2 Levels. The 2 levels are considered below. It should be noted that Level 3 benefits will be reported at a Pan-Northern Level by TfN.

Level 1: Established Monetised Impacts

This level of benefits will be used to generate initial VfM and focus on the following:

- Journey time savings;
- Vehicle operating costs;
- Greenhouse gases; and
- Indirect tax revenues

4.2 The level 1's impacts will be produced using TUBA 1.9.10, that uses the latest WebTAG DataBook December 2017's values and will include highways, rail passengers and highway freights appraisal.

4.3 The assumption of annualisation factors and demand adjustment as described in the previous section will be used for calculation of TUBA benefits. Required demand and costs for each relevant elements are assumed as below:

- Highways demand and costs: extracted from SDC post-VDM highways assignments by each SDC consultant by time period, user class and OD format;

- Rail passenger demand: extracted from SDC post-VDM PT demand by each SDC consultant for each time period, user class and OD format;
- Rail travel costs: provided by NoRMS model converted into each SDC zone system and broken into time period, OD and user class;
- Freight demand and costs: extracted by each SDC consultant, post-VDM highways assignment model, by time period and OD format; and
- Rail freight: not assessed within the SDC's programme

Level 2: Evolving Monetised Impacts

4.4 The level 2 impacts will be used to generate an adjusted VfM metric in addition to the initial VfM, with consideration given to:

- Reliability benefits;
- Static clustering – specific reference to NPIER prime / enabling capabilities;
- Output in imperfectly competitive market; and
- Labour supply impacts

4.5 The methodology for the calculation of the reliability benefits is not covered this this technical note, and will need to be discussed and agreed at the SMG meeting. WSP proposes that the 'stress' test methodology as provided in the WebTAG Unit A1.3 to be adopted for the calculation of reliability benefits.

4.6 WebTAG A1.3 states that, for journey predominantly on single carriageways outside urban areas, it is not currently possible to estimate monetised reliability benefits. Instead, the assessment of changes in reliability should be based on changes in "stress", the ratio of the annual average daily traffic (AADT) flows to the Congestion Reference Flow (CRF). Reliability of road journey is believed to decline as flows approach capacity. Thus "stress", is, with some limitation, considered to be a reasonable proxy for reliability.

4.7 The "stress" approach is based on the change in "stress" within the range 75% to 125% as a result of the proposal, combined with numbers of vehicles affected. Stress is the ratio of counted or measured AADT flows to the congestion reference flows. Where a proposal provides a new route, the approach takes account of improvements in reliability for those remaining on the old route as well as those transferring to the new. Proposals that provide modest improvements for large volumes of traffic may be more highly rated than those providing large improvements for small volumes.

4.8 To take account of possible "bottleneck" effects, where the effect of one link or junction operating close to capacity affects the reliability of an extended length of road, the method focuses on those key links/junctions rather than the whole length of roads.

4.9 WebTAG A1.3 states that it is not appropriate to present the numeric results of the calculations, instead the result should be used to assist in reaching an appropriate textual score, using the following guidelines:

- Values in excess of 3 million will usually assessed as "Large" ("Beneficial" if the value is positive, "Adverse" if the value is negative;
- Values between 1 and 3 million will usually be assessed as "Moderate";
- Values between 200 thousand and 1 million will usually be assessed as "Slight"; and
- Values less than 200 thousands will usually be assessed as "Neutral"

4.10 The document "**Value for Money Assessment: Advice Note for Local Transport Decision Makers**[4]" para. 3.7 then can be used to provide estimate of reliability benefits in monetary terms by applying uplifts of 5%, 10% or 20% of time savings, reflecting "Slight", "Moderate" or "Large" impacts respectively.

4.11 For the calculation of the Wider Economic Benefits (WEBs), given that WITA2.0 software has been provided to DfT for further testing and not yet released for public use, Level 2 static WEBs will be assessed using a WITA emulation tool (developed by WSP) based on agglomeration and decay parameters with fixed employment/economic dataset as currently publicly available from DfT.

4.12 The WITA emulation tool is a macro-enabled Excel spreadsheet that was developed by WSP during the Trans-Pennine Tunnel Study to address number of issues with the WITA 1.2 at the time.

4.13 WITA's parameters will be updated to the latest DfT WebTAG DataBook December 2017 to be consistent with TUBA 1.9.10.

4.14 Data requirements for the calculation of Wider Economic benefits:

- Highways demand and costs: extracted from post-VDM highways assignments;
- Rail passenger demand: extracted from post-VDM PT demand;
- Rail travel costs: provided by NoRMS model; and
- Employment and economic dataaset as available at DfT website.

5. ANALYSIS OF APPRAISAL OUTPUTS

5.1 To provide quality assurance to TfN on the technical works and also help TfN to understand the impacts of the SOP schemes, number of outputs and analyses will be carried out, as below:

Level 1 Impacts:

- Summary of checks on TUBA warnings and provide comentary on TUBA warnings, to ensure significant change in travel costs between Do-Minimum and Do-Something are justified and addressed if applicable.
- The Transport Economic Efficiency (TEE) table: summarises total transport user benefits by mode, journey purposes for each of the journey time savings and vehicle operating costs
- Sectoral benefits: detailed benefits at defined sectoral level, by time period, mode, purpose and modelled years. This is to check if the benefits look plusible at sectoral level, to provide commentary of where the majority of benefits are acrrued to, and to determine if any masking process to be carried out to remove the benefits that are not associated with the schemes.
- Benefit profile over the appraisal period
- Summary (tabulars and graphs) of user benefits by mode, time period and journey purposes. This is to check if any inconsistency in terms of benefits accross the time period and journey purposes. The caveat exists that rail benefits will be better assessed directly via NoRMS
- Summary (tabulars and graphs) of travel time benefits by distance travelled and size of time savings. This is to check the plausibility of time saving benefits by travelled distance and size of time savings against the SOP schemes.
- Summary of CO2 emission by modes

[4] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/267296/vfm-advice-local-decision-makers.pdf

Level 2 Impacts:

- Tabular summary of Wider economic benefits in terms of agglomeration impacts for each of the four industrial sectors
- Detailed summary tables and plots of the wider economic benefits at sectoral level, both in respect of labour market changes and monetised values. This is to check if the results look plausible at sector level and provide commentary where the majority of wider economic benefits are acrrued.