TECHNICAL NOTE

Project:	Great Yarmouth Third River Crossing	**Date:**	21/09/2020
Subject:	Wider Impact Benefits Technical Note	**TN Ref:**	N/A
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1 INTRODUCTION

1.1.1 This technical note details the appraisal process and results for the wider impacts assessment of the Great Yarmouth Third River Crossing (GYTRC). The proposed scheme will provide a third crossing over the River Yare, creating a new, more direct link between the western and eastern parts of Great Yarmouth. Specifically, it will provide a connection between the Strategic Road Network (A47) and the South Denes Business Park, Enterprise Zone, Great Yarmouth Energy Park and the Outer Harbour, all of which are located on the South Denes peninsula.

1.1.2 The location of the proposed third river crossing is provided in Plate 1 below.

Plate 1 - GYTRC Scheme Location

2 WIDER IMPACTS IN TRANSPORT APPRAISAL

2.1.1 WebTAG Unit A2.1 advises that all benefits of a transport scheme may not be realised through analysis of user benefits if there are 'distortions' or market failures that mean the economy is not functioning efficiently. These benefits are defined as 'wider impacts' and will arise as the impact of transport improvements are transmitted into the wider economy. These impacts can be large and form an important element of the overall appraisal of a transport scheme. The types of Wider Impacts DfT includes in transport appraisals are:

WI1 – Agglomeration

"Agglomeration" refers to the concentration of economic activity over an area, also known as the 'effective density'. Transport schemes can alter the accessibility of firms in an area to other firms and workers, thereby affecting the level of agglomeration. Businesses derive benefits from being located close to one another through greater business interaction; more efficient/effective labour market interaction and knowledge/technology spill overs.

WI2 – Output change in imperfectly competitive markets

A reduction in transport costs (to business and/or freight) allows firms to profitably increase output of the goods or services that require use of transport in their production. A transport intervention that leads to increased output of goods and services will deliver a welfare gain as consumers' willingness to pay for the increased output will exceed the cost of producing it.

WI3a – Tax revenues arising from labour supply impacts

Transport costs are likely to affect the incentives for an individual to work. In deciding whether or not to work, an individual will weigh the costs associated with work, including travel costs, against the wage of the job. A change in transport costs alters the net financial return to individuals from employment. This is likely to affect the number of people choosing to work and as a result, the overall amount of labour supplied in the economy.

WI3b – Tax revenues arising from moves to more or less productive jobs

Transport schemes are likely to affect the overall costs and benefits to an individual from working in different locations and the benefits to business of operating and employing people in different locations. As a result, transport schemes are likely to have an impact on the overall productivity of employment as productivity varies by location. WebTAG guidance advises that the assessment of benefits from the move to more or less productive jobs should only be calculated for projects where a Land Use Transport Interaction (LUTI) model has been developed as this must be used to model changes in employment location between areas. For the purpose of this note, the 'move to more or less productive jobs' is therefore not assessed.

3 METHODOLOGY

3.1 INTRODUCTION

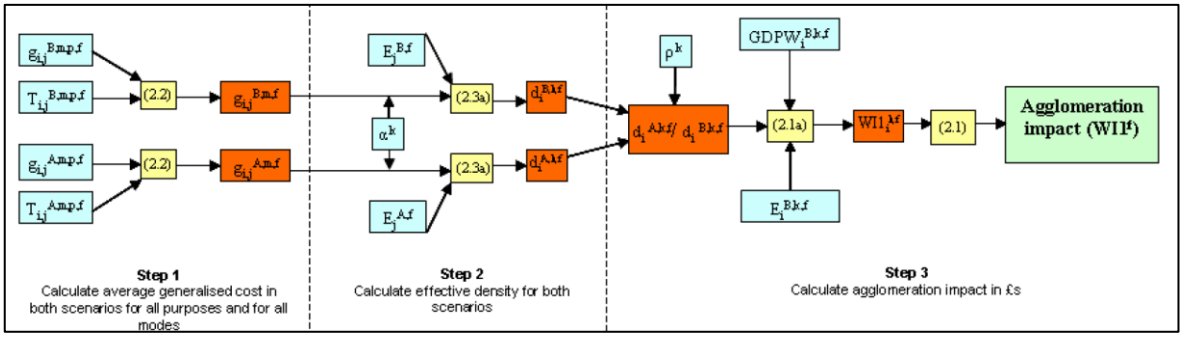
3.1.1 The Wider Impacts for the scheme have been calculated using WSP's Wider Impacts in Transport Appraisal (WITA) emulation tool. The emulation tool, a macro-embedded spreadsheet that applies the methodology set out in WebTAG A2.1 has previously been accepted for use by Highways England, Transport for the North and the DfT for assessment of wider impact benefits for the Trans-Pennine Tunnel and the M60 North West Quadrant. The WITA tool assesses all three types of Wider Impacts discussed above.

3.1.2 The following section discusses the inputs required to run the WITA tool and the definitions used for the assessment of Great Yarmouth Third River Crossing.

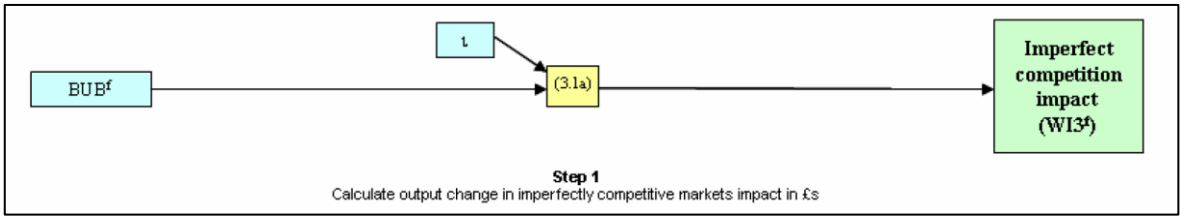
3.2 WIDER BENEFIT IMPACT FORMULATION

3.2.1 WSP's WITA tool adopts the principles and formulation as stated in the TAG A2.1, Appendix D, with each element of the wider impact assessment is calculated using the formulae as follows:

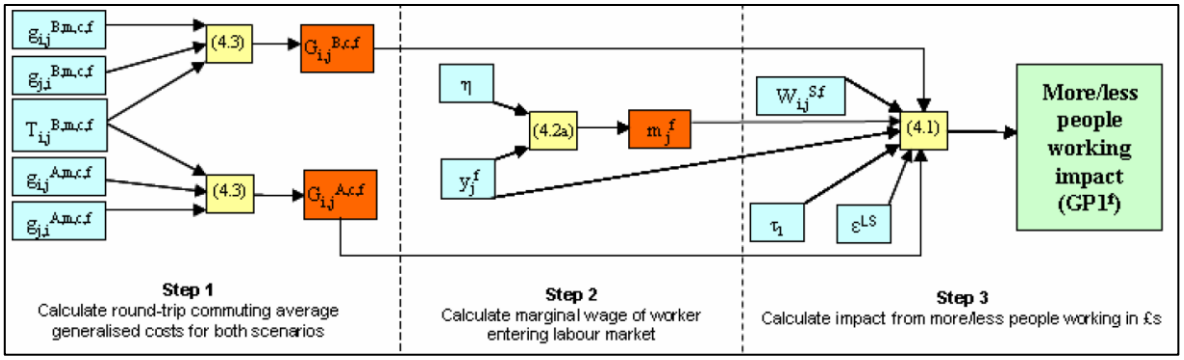
3.2.2 Agglomeration Impacts:



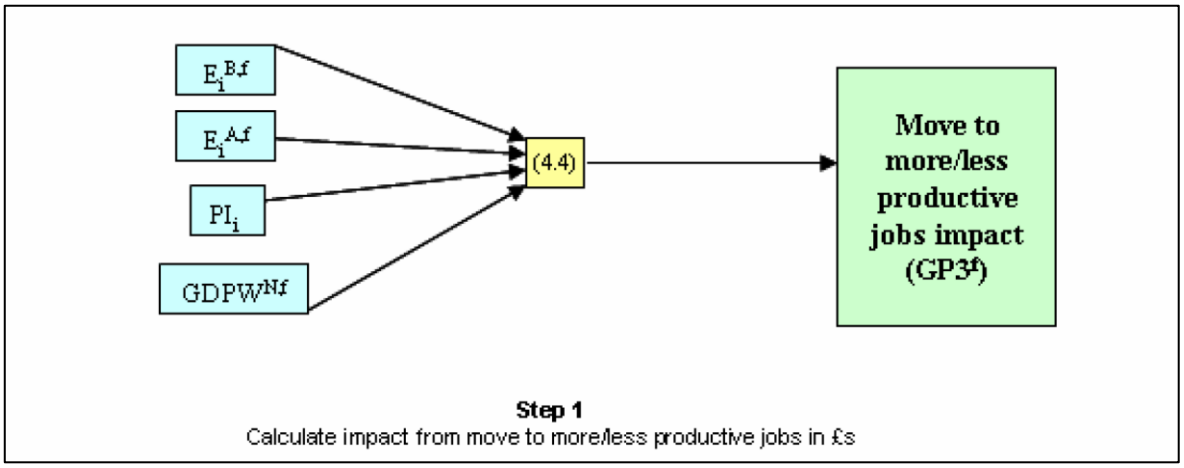
3.2.3 Imperfect Competition Impacts:



3.2.4 Labour Supply Impact:



3.2.5 Move to More/Less Productive Jobs:



3.2.6 Detail of the formulae used to calculate wider impacts benefits are provided in Appendix D of TAG Unit A2.1.

3.3 GENERALISED COST CALCULATIONS

3.3.1 Generalised costs derived from the transport models play a key role in calculation of wider impact benefits, particularly for agglomeration impacts and labour supply impacts. Generalised costs used in calculation of wider impact benefits, as stated from the TAG A2.1, should be in unit of pounds and in 2010 prices and by WITA zone system. Since transport models provide travelled time and travelled distance information at transport model zone systems, it is necessary to convert travelled time and distance to generalised costs in monetary terms in 2010 prices. Detailed calculation of generalised costs from the transport model zones to WITA zone system are explained below:

3.3.2 First, generalised costs for each journey purpose, each modelled year, Do-Minimum /Do-Something and by time periods separately are calculated in accordance with the TAG A1.3 guidance, as below:

$$g_{i,j}^{S,m,p,f,t} = VoT_{Total}^{S,m,p,f,t} * Time_{i,j}^{S,m,p,f,t} + VoC_{i,j}^{S,m,p,f,t} * Dist_{i,j}^{S,m,p,f,t} + Charge_{i,j}^{S,m,p,f,t}$$

Where:

- $\boldsymbol{Time_{i,j}^{S,m,p,f,t}}$, $\boldsymbol{Dist_{i,j}^{S,m,p,f,t}}$, $\boldsymbol{Charge_{i,j}^{S,m,p,f,t}}$ are travel time (in hours), travel distance (in km) and charge (in pounds) from origin (i) to destination (j) from the transport models for scenario (S), mode (m), purpose (p), forecast year (f) and time period (t) respectively.
- $\boldsymbol{VoT_{Total}^{S,m,p,f,t} = VoT_{Driver}^{S,m,p,f,t} + Occupancy * VoT_{Passenger}^{S,m,p,f,t}}$ is the total value of time per vehicular trip. If demand is by person trips then $\boldsymbol{VoT_{Total}^{S,m,p,f,t}}$ is either $\boldsymbol{VoT_{Driver}^{S,m,p,f,t}}$ $\boldsymbol{or}$ $\boldsymbol{VoT_{Passenger}^{S,m,p,f,t}}$ where relevant.
- $\boldsymbol{VoC_{i,j}^{S,m,p,f,t} = Fuel\, VoC_{i,j}^{S,m,p,f,t} + NonFuel\, VoC_{i,j}^{S,m,p,f,t}}$ is Vehicle Operating Costs, calculated in accordance with the WebTAG A1.3 guidance.

3.3.3 The generalised costs are then converted to daily costs, all purposes by weighted averaging over travel purpose (p), time period (t) with number of corresponding trips for each type, and aggregated to WITA zone levels for each forecast year (f), scenario (S) and mode (m) separately:

$$G_{i,j}^{S,m,f} = \frac{\sum_{p,t} g_{i,j}^{S,m,p,f,t} * T_{i,j}^{S,m,p,f,t} * Dur^t}{\sum_{p,t} T_{i,j}^{S,m,p,f,t} * Dur^t}$$

Where:

- $\boldsymbol{Dur^t}$ is the duration (annualisation factor) for each time period (t);
- $\boldsymbol{g_{i,j}^{S,m,p,f,t}}$, $\boldsymbol{T_{i,j}^{S,m,p,f,t}}$ is the generalised cost and corresponding trips for each OD pair, by scenario (S), mode (m), purpose (p), forecast year (f) and time period (t).

3.3.4 For Labour supply impacts, it is required that the round-trip commuting generalised cost of travel is calculated, using the formula:

$$G_{i,j}^{S,c,f} = \frac{\sum_{m} (g_{i,j}^{S,m,c,f,t} + g_{j,i}^{S,m,c,f,t}) * T_{i,j}^{S,m,c,f,t} * Dur^t}{\sum_{m} T_{i,j}^{S,m,c,f,t} * Dur^t}$$

3.3.5 The generalised costs from the formulae above are then used to calculate agglomeration impacts and labour supply impacts respectively, following the equations stated in the Appendix D of the WebTAG A2.1.

3.3.6 For intra-zonal trips, the assignment model does not output costs since intra-zonal trips are not assigned. However, it is important that intra-zonal travel costs are included in the wider impact assessment to ensure a full picture of how transport impacts on journey accessibility across the full area affected. To estimate intra-zonal trip costs, half of the minimum inter-zonal costs for that zone are used. This follows guidance on intra-zonal trip costs as stated in Appendix A of WebTAG Unit M2.

3.4 PROFILING OVER APPRAISAL PERIOD

3.4.1 Since it is not possible to model every individual year over an appraisal period, the Wider impact benefits for the non-modelled years are either interpolated or extrapolated from the modelled years as follows:

- For non-modelled years between the modelled years, wider impact benefits are interpolated using the lower bound and upper bounds' modelled years; and
- For non-modelled years after the last modelled year, the calculation of wider impact benefits uses the benefits produced from the last modelled year and growth by the GDP growth rates to the end of the appraisal period.

4 WIDER IMPACT ASSESSMENT FOR GYTRC

4.1 ECONOMIC DATA

4.1.1 The economic and employment data were obtained from the latest WebTAG Wider Impacts dataset v3.1, released in May 2019. This data is available by Local Authority Districts (LAD) from 2011 to 2081 in five-year intervals. The forecasts presented in the dataset have been developed by DfT specifically for the estimation of Wider Impacts to fit the sectoral definitions used in the estimation of agglomeration elasticities and decay parameters. These forecasts are only used for estimating wider impacts.

4.1.2 The values for the relevant LADs between 2016 and 2041 are presented in Appendix A.

4.1.3 The assessment also requires the following information from the WebTAG data book:

- Value of Time (VoT) for business users
- Forecast growth in VoT
- Discount rates
- Vehicle occupancies
- Proportion of travel in work and non-work time
- Fuel Costs and VAT rates
- Vehicle operating cost parameters

4.1.4 Values from the above were obtained from the WebTAG data book (v1.12 released in May 2019) to be consistent with the economic data that was used for TUBA benefits.

4.2 DEFINITION OF ASSESSMENT AREA

4.2.1 WITA uses economic data at a Local Authority District (LAD) level and model data at a model zone level. In order to run the assessment, a WITA zone system must be defined to link the two other zone systems together.

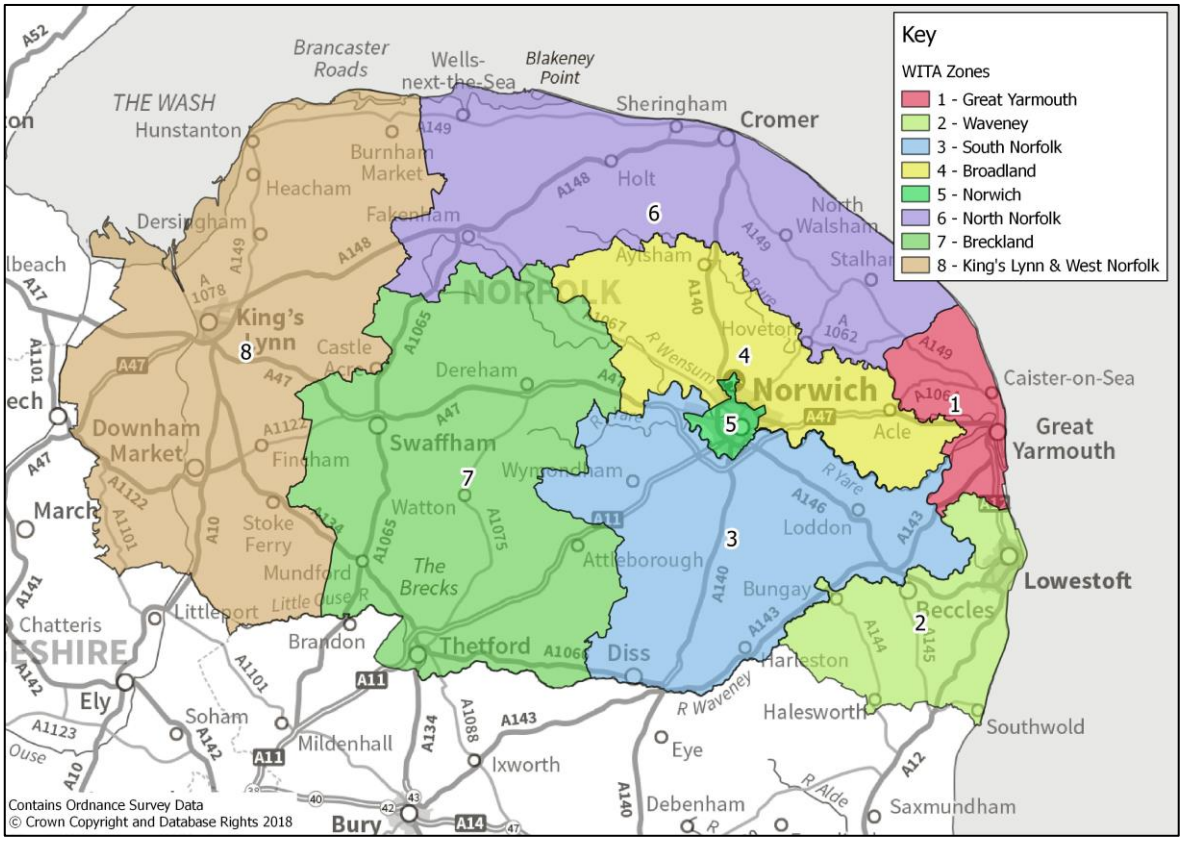
4.2.2 For GYTRC, the assessment area includes all of Norfolk, with a WITA zone for each of the eight LADs. The WITA zoning system is shown in Plate 2 and summarised in Table 1.

4.2.3 The area definition has been constructed so that Sector 1 represents the fully simulated area of the model. WebTAG Unit A2.1 (paragraph 6.1.5) warns against considering too small an area as it is likely to exaggerate the impact of the scheme appraised. Sectors 2-8 have therefore been included in the analysis so that the sectors in the wider impact appraisal cover the area over which wider benefits are expected.

4.2.4 The network within the simulation area (Sector 1) has been calibrated and validated using observed counts and journey time data which provides a sufficient level of confidence in the generalised costs for this area. Further details are given in the Local Model Validation Report (LMVR) 2018 addendum[1].

4.2.5 Sectors 2-8 cover the buffer area of the model, where the network is represented in a more aggregate level to provide accessibility from external zones to the simulation area (Sector 1). The model has not been calibrated and validated to the same level in the buffer area and the generalised costs derived for these sectors may be less accurate. However, these costs are used to provide a baseline of travel costs from surrounding areas to the study area.

Plate 2 - WITA Area Definition



1.1.1

[1] Great Yarmouth Third River Crossing DCO Document 7.2b Transport Assessment Appendix B https://www.norfolk.gov.uk/roads-and-transport/major-projects-and-improvement-plans/great-yarmouth/third-river-crossing/further-information-and-documents/development-consent-application

Table 1 - WITA Area Definition

WITA Zone	Local Authority District	Number of Model Zones in WITA Zone
1	Great Yarmouth	125
2	Waveney	8
3	South Norfolk	43
4	Broadland	38
5	Norwich	1
6	North Norfolk	4
7	Breckland	3
8	King's Lynn & West Norfolk	5

4.3 MODELLED TIME PERIODS & ANNUALISATION FACTORS

4.3.1 For consistency, WITA calculation adopts the same scheme data, modelled periods and annualisation factors that were used for TUBA calculation.

4.3.2 Scheme data for WITA has been obtained from the core scenario variable demand forecasts for the three modelled years: 2023, 2038 and 2051. The horizon year has been defined as 2082, 60 years after the scheme opening year.

4.3.3 The model has three time periods as follows:

- AM peak (0800-09:00)
- Inter-Peak (10:00-15:30 Average hour)
- PM peak (16:30-17:30)

4.3.4 Annualisation factors have been used to expand these modelled time periods to represent a full year, as detailed in Table 2. Note that the Inter-Peak model has been used as a donor model for the weekend time period.

Table 2 - Annualisation Factors

Time Period	Annualisation Factor
AM	1.51 x 253 = 383
Inter-Peak	7.23 x 253 = 1828
PM	2.2 x 253 = 556
Weekend	8.05 x 52 = 418

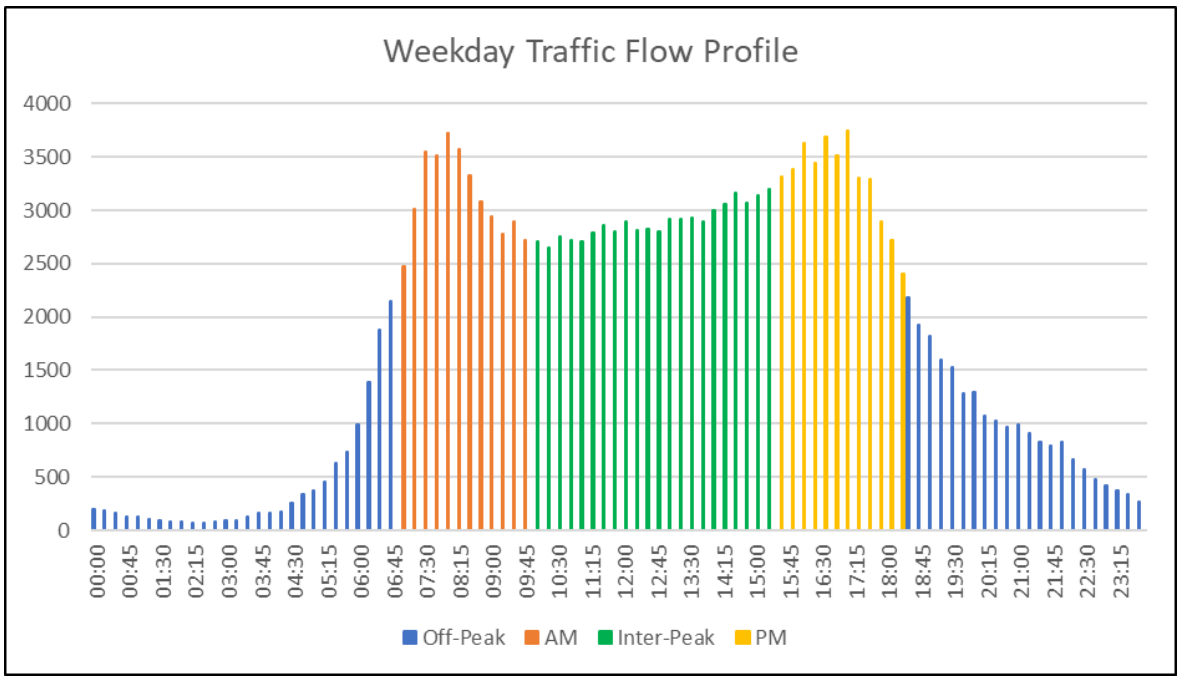
4.3.5 WebTAG Unit A2.1 (paragraph 3.3.1) states that transport models are required to estimate generalised travel costs for input into the wider impacts assessment. These costs are input as 24-hour average costs and as a result, using only the modelled time periods above would likely overestimate the benefits from the scheme.

4.3.6 To accurately produce the 24-hour average costs for WITA calculation, off-peak travel costs and demand would be required to be included in the calculation.

4.3.7 Since no explicit off-peak model has been developed, the average Inter-Peak matrix has been used to create a proxy demand matrix for average Off-Peak (18:00-07:00) demand which has been

assigned to the network using a fixed assignment and included in the WITA assessment. A factor of 0.23219 was used to convert the Inter-Peak matrices into proxy Off-Peak matrices. This factor was derived by comparing local observed traffic flows to calculate a ratio of average Inter-Peak to average Off-Peak traffic. This is a common approach when an off-peak model is not available. The traffic profile for the observed flows used in this calculation is shown in Plate 3.

Plate 3 - ATC Traffic Flow Profile



Source: Automatic Traffic Counts (ATCs) from 9 locations in Great Yarmouth

4.3.8 To expand this average hour Off-Peak matrix to represent a full year, an annualisation factor for the Off-Peak time period has also been applied. This value is detailed in Table 3.

Table 3 - Off-Peak Annualisation Factor

Time Period	Annualisation Factor
Off-Peak	12 x 253 = 3036

4.4 USER CLASSES & MODES

4.4.1 WITA benefits are only calculated for commute and business trips so all 'other' trips have been excluded.

4.4.2 It should be noted that TAG guidance recommends that the results from freight trips are not included in the core assessment of wider impacts as it is not well known how changes in generalised costs for freight trips affect changes in destination choice, time of day or mode (WebTAG Unit A2.4 paragraph 5.1.4).

4.4.3 WITA requires average costs of all travel modes to represent travel costs of the economy (WebTAG Unit A2.4 paragraph 3.2.1), therefore ideally this would require travel costs for highway, PT and slow modes to be included in the calculation.

4.4.4 This assessment has included three modes: Car, Public Transport (Rail/Bus) and Slow Modes (Walking/Cycling).

4.5 DERIVATION OF PT AND SLOW MODE DEMAND

4.5.1 As there were no explicit PT and slow mode models developed, a method of creating a proxy demand and costs for each relevant mode was carried out, as below:

- trip-end databases were extracted from NTEM (TEMPRO) at MSOA level for car, PT (bus+rail) and slow mode (walk+cycle).
- Calculate a factor to convert car trip-ends to PT and Slow mode trip-ends respectively
- Apply the factors to car demand matrices to derive proxy demand matrices for PT and slow mode

4.6 COST INPUTS

4.6.1 To run WITA, generalised cost data is required for all users and modes for a full set of OD pairs.

4.6.2 The SATURN highway model has been used to extract the average travel time and travel distance between each Origin-Destination pair for car trips. Intra-zonal trip costs have been calculated as half the minimum inter-zonal trip cost for each zone, following guidance given in Appendix A of WebTAG Unit M2.

4.6.3 To determine a formula for estimating public transport costs, evidence was collated on bus fares in Great Yarmouth and surrounding areas. This evidence showed that that a standard service within Great Yarmouth of around 4km would charge £1.50 for a single trip. After deflation to 2010 prices, the following calculation was used to derive public transport travel costs for input into the calculation of wider impact benefits:

$$Public\ Transport\ Cost = £1 + 10p\ per\ kilometre\ travelled.$$

4.6.4 For the travel time of public transport modes, the time has been taken from the highway model with a factor of 1.2 applied to account for public transport trips taking longer than car trips and an additional 30 minutes added to account for access and egress time (time taken to get to and from the bus stop/train station).

4.6.5 Slow mode (walking and cycling) travel times have been defined using the highway model network with a travel speed of 5kph.

4.7 PRODUCTION ATTRACTION MATRICES

4.7.1 The WITA assessment requires 24-hour commute Production-Attraction (PA) matrices to be input for each modelled year for the Do Something scenario. The PA matrices should be a representation of all workers living in each zone and working in each zone.

4.7.2 PA matrices for car trips were extracted directly from the Variable Demand Model (VDM). For public transport and slow mode trips, the PA demand for commuting trips were produced by applying adjustment factors to car PA demand that was derived from TEMPro data at MSOA level at 24-hour level for each relevant PT and slow mode.

5 RESULTS

5.1 INITIAL WITA ASSESSMENT

5.1.1 To aid in understanding the impacts of the different elements used in the wider impacts assessment, the WITA assessment for GYTRC has been carried out for the following tests, with each iteration including additional elements:

- The first WITA run consisted of a highway only assessment using the annualisation factors from TUBA which included four time periods: AM, Inter-Peak, PM and Weekend.

- The second WITA run also comprised of a highway only assessment but this iteration included the four time periods above as well as the Off-Peak model data.
- The third assessment added in public transport data alongside the highway model information along with the five time periods of the previous run (AM, Inter-Peak, PM, Weekend and Off-Peak).
- The final run of WITA included public transport, slow modes and highway data for all five time periods (AM, Inter-Peak, PM, Weekend and Off-Peak).

5.1.2 The results of these assessments by wider impact are detailed in Table 4 for the full 60-year appraisal period.

Table 4 - WITA Results Summary, 60 Year Appraisal Period

Wider Impact	**Test 1: 4 Time Periods**	**Test 2: 5 Time Periods**	**Test 3: 5 Time Periods + PT**	**Test 4: 5 Time Periods + PT + Slow Modes**
Agglomeration	123,100	118,531	91,579	89,350
Output changes in imperfectly competitive markets	1,473	1,473	1,473	1,473
Tax revenues arising from labour supply impacts	1,527	1,374	4,449	5,668
Total	**126,100**	**121,377**	**97,501**	**96,490**

All values are in £000s, expressed in 2010 market prices and values

5.1.3 It can be seen that each step in the process makes adjustments to the wider impacts produced by the scheme. This is the case for all except the change in imperfectly competitive markets benefits which remain the same throughout as they are calculated as 10% of Business User benefits from TUBA.

5.1.4 For the first test, changes in costs between Do Minimum and Do Something are only considered for the AM, Inter-Peak, PM and weekend. This results in an overall value of £126.1m with £123.1m of the benefits from agglomeration, equivalent to 57% of TUBA User Benefits (£215.2m).

5.1.5 In the 2nd test, the changes in cost between Do Minimum and Do Something in the Off-Peak are now considered. In the Off-Peak, the scheme has a smaller impact on traffic than in the peak hours due to less congestion which causes a moderate reduction in benefits of £4.7m when the Off-Peak period is included in the assessment. This occurs as the change in average costs over 24-hours between Do Minimum and Do Something is reduced through the addition of the Off-Peak. The overall benefits for the test 2 are £121.4m, of which £118.5m is from agglomeration, which equates to 55% of the TUBA User Benefits.

5.1.6 A similar pattern occurs through the addition of public transport trips to the assessment. Public transport trips (particularly rail) are less impacted by changes to the highway network than car trips so the change in costs is less significant between the Do Minimum and Do Something scenarios for public transport trips. Adding in the public transport trips therefore reduces the total difference in costs between the with and without scheme scenarios and reduces the overall benefits to £97.5m. Of these benefits, £91.6m is from agglomeration benefits which is equivalent to 43% of TUBA User Benefits.

5.1.7 The final input into the assessment was the addition of 'slow mode' (walking and cycling) trips. The inclusion of these trips provided another slight reduction in benefits as costs of slow mode trips are not affected by changes to the highway network as significantly as car trips. This assessment resulted

in total benefits of £96.5m, of which £89.4m are from agglomeration which is equates to 42% of TUBA User Benefits.

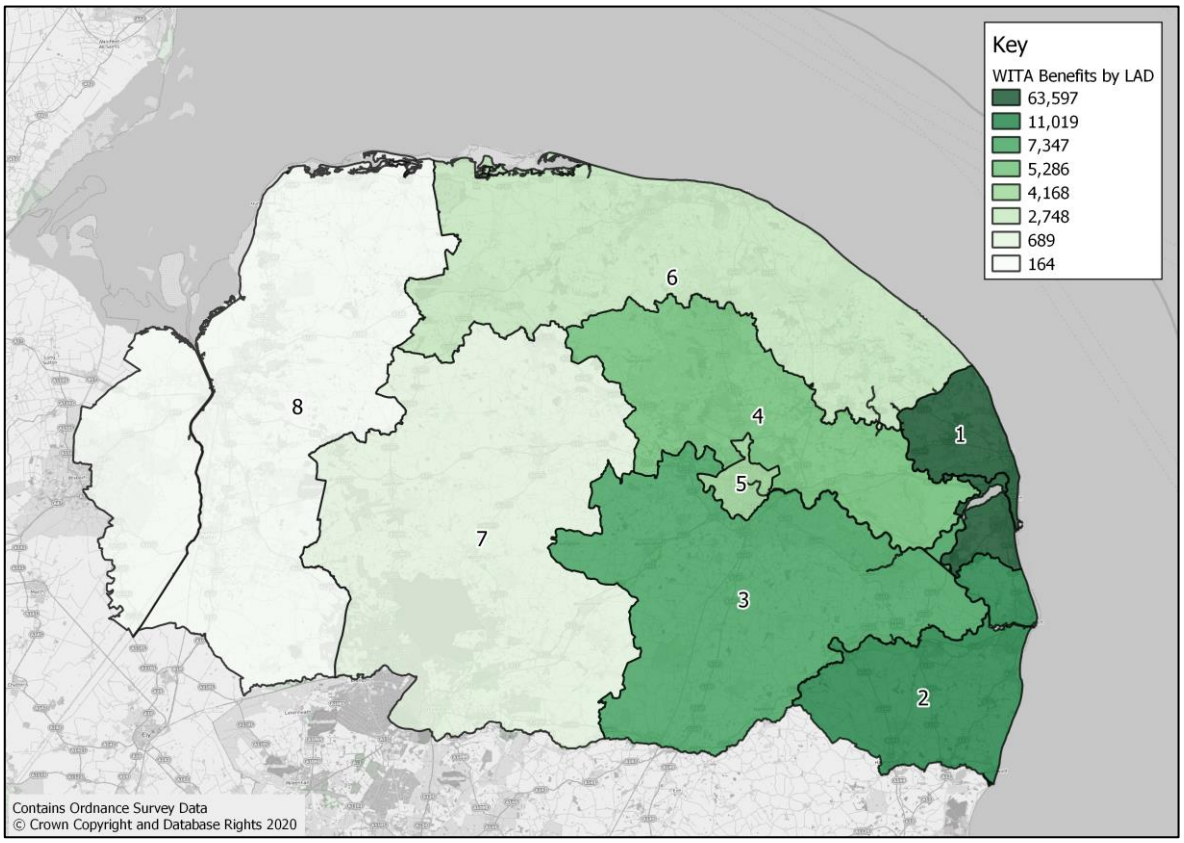
5.1.8 The initial wider impact results show an overall benefit of £96.5m which takes into account scheme impacts over all time periods, across three modes of transport and a suitable geographical area. Table 5 and Plate 4 present the wider impact benefits of the scheme at Local Authority District (LAD) level. This summary shows that the scheme has significant wider impact benefits for Great Yarmouth which receives £63.6m in benefits. Districts neighbouring Great Yarmouth receive the majority of the remaining wider impact benefits, with smaller benefits for Breckland and King's Lynn & West Norfolk.

Table 5 - WITA Benefits Summary (without Output change in imperfectly competitive market)

LAD	Agglomeration impacts	Labour Supply Impacts	Total
1. Great Yarmouth	59,053	4,544	63,597
2. Waveney	10,513	506	11,019
3. South Norfolk	7,226	121	7,347
4. Broadland	5,134	152	5,286
5. Norwich	3,924	244	4,168
6. North Norfolk	2,675	73	2,748
7. Breckland	674	15	689
8. King's Lynn & West Norfolk	151	12	164
Total	**89,350**	**5,668**	**95,018**

All values are in £000s, expressed in 2010 market prices and values (total values not including benefits from output change in imperfectly competitive markets)

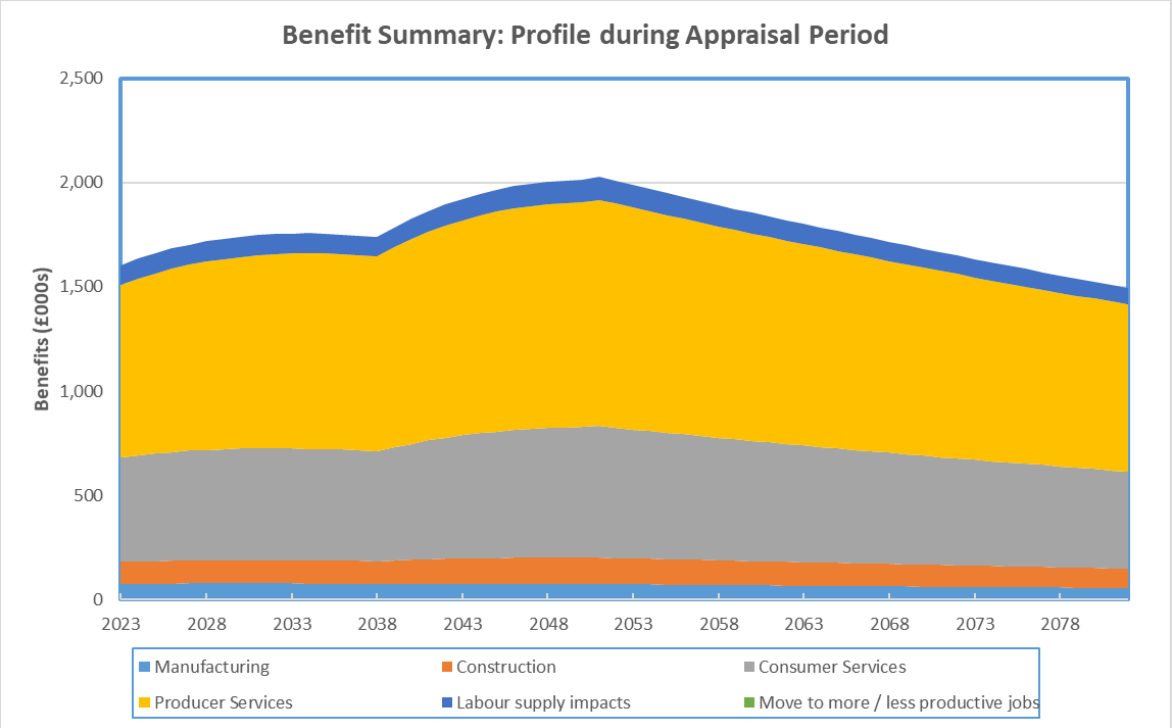
Plate 4 - WITA Benefits by LAD



All values are in £000s, expressed in 2010 market prices and values (total values not including benefits from output change in imperfectly competitive markets)

5.1.9 The 60-year benefit profile for the final WITA run is shown in Plate 5.

Plate 5 - WITA Benefits Profile - Highway, Public Transport and Slow Modes, 5 Time Periods



5.2 FURTHER ANALYSIS

5.2.1 It is noted that the travel costs derived from the traffic model for the calculation of wider impact benefits were used to produce travel costs across the wider network and the calculation of the wider impact benefits were based on all employment within each local authority regardless of whether or not any employment is affected by the proposed scheme.

5.2.2 To capture the more accurately the wider benefits for only trips that are affected by the scheme, additional analysis has been undertaken using 2011 Census Journey to Work data at a local authority level to establish the proportion of work related trips in each district that start or end in Great Yarmouth.

5.2.3 The total number of people travelling to or from each district for work was calculated along with the number of people that either live or work in each district that work or live in Great Yarmouth. These values were then used to calculate the proportion of commute trips for each district that have an origin or destination in Great Yarmouth. The results of this analysis are shown in **Table 6**.

Table 6 - Journey to Work Data Summary

District	Total Commute Trips To/From District	Commute Trips To/ From Great Yarmouth	Percentage of Trips with O/D in Great Yarmouth
Great Yarmouth	42,526	42,526	100.00%
Waveney	47,818	6,929	14.50%
South Norfolk	69,986	1,696	2.40%
Broadland	68,553	3,001	4.40%
Norwich	101,766	2,879	2.80%
North Norfolk	40,556	1,591	3.90%
Breckland	61,297	388	0.60%
King's Lynn and West Norfolk	64,596	463	0.70%

5.2.7 The proportions developed in this analysis have been used to scale the agglomeration part of the wider impact benefits, found through WSP WITA tool, to reflect the proportion of commute trips from each local authority that would reasonably be affected by the Great Yarmouth Third River Crossing scheme. Using this method, the adjusted wider impact benefits for the scheme are presented in **Table 7**.

Table 7 - Wider Impact Benefits Summary with Commute Trip Proportion Adjustment (without Output change in imperfectly competitive market)

LAD	Agglomeration impacts	Labour Supply Impacts	Total
1. Great Yarmouth	59,053	4,544	63,597
2. Waveney	1,523	506	2,029
3. South Norfolk	175	121	297
4. Broadland	225	152	376
5. Norwich	111	244	355
6. North Norfolk	105	73	178
7. Breckland	4	15	20
8. King's Lynn & West Norfolk	1	12	14
Total	**61,198**	**5,668**	**66,866**

All values are in £000s, expressed in 2010 market prices and values (total values not including benefits from output change in imperfectly competitive markets)

5.2.8 It is noted that the labour supply impacts remain unchanged as the PA commuting data that was used for the calculation has been derived directly from the traffic model therefore already taking into account the commuting trips that are affected by the scheme.

5.2.9 With the addition of benefits due to output change in imperfectly competitive markets, the adjusted total wider impact benefits for the scheme are £68.3m. The adjusted agglomeration benefits account for £61.2m of this total, which is equivalent to 28% of TUBA user benefits.

6 SUMMARY

6.1.1 The Wider Impacts for the scheme have been calculated using WSP's Wider Impacts in Transport Appraisal (WITA) emulation tool. The emulation tool is a macro-embedded spreadsheet that applies the methodology set out in WebTAG A2.1.

6.1.2 The initial wider impact results show an overall benefit of £96.5m which takes into account scheme impacts over all time periods, across three modes of transport and a suitable geographical area.

6.1.3 Further analysis incorporated Census Journey to Work data to ensure that only trips with either an origin or destination within Great Yarmouth district were included in the final analysis. This reflects the proportion of commute trips from each local authority that would reasonably be affected by the Great Yarmouth Third River Crossing scheme.

6.1.4 With the addition of benefits due to output change in imperfectly competitive markets, the adjusted total wider impact benefits for the scheme are £68.3m. The adjusted agglomeration benefits account for £61.2m of this total, which is equivalent to 28% of TUBA user benefits.

ANNEX A

EMPLOYMENT IN EACH SECTOR BY LOCAL AUTHORITY

LAD	LAD Name	Sector	2016	2021	2026	2031	2036	2041
E07000143	Breckland	Manufacturing	11,663	10,395	10,015	9,622	9,242	8,853
E07000143	Breckland	Construction	4,816	5,238	5,311	5,376	5,466	5,552
E07000143	Breckland	Consumer services	19,325	20,283	20,864	21,362	21,937	22,518
E07000143	Breckland	Producer services	9,048	9,933	10,091	10,236	10,416	10,605
E07000144	Broadland	Manufacturing	6,345	5,636	5,355	5,073	4,800	4,531
E07000144	Broadland	Construction	5,095	5,764	5,952	6,162	6,440	6,718
E07000144	Broadland	Consumer services	17,171	17,448	17,819	18,093	18,398	18,694
E07000144	Broadland	Producer services	11,873	12,631	12,787	12,926	13,107	13,305
E07000145	Great Yarmouth	Manufacturing	4,294	4,020	3,889	3,757	3,629	3,497
E07000145	Great Yarmouth	Construction	3,033	3,170	3,180	3,185	3,203	3,219
E07000145	Great Yarmouth	Consumer services	18,280	18,524	18,984	19,365	19,811	20,257
E07000145	Great Yarmouth	Producer services	6,048	6,432	6,471	6,504	6,562	6,622
E07000146	King's Lynn and West Norfolk	Manufacturing	9,191	8,680	8,293	7,911	7,541	7,166
E07000146	King's Lynn and West Norfolk	Construction	5,742	6,287	6,413	6,546	6,727	6,906
E07000146	King's Lynn and West Norfolk	Consumer services	27,618	28,389	29,183	29,855	30,632	31,425
E07000146	King's Lynn and West Norfolk	Producer services	9,205	9,866	10,001	10,119	10,264	10,414
E07000147	North Norfolk	Manufacturing	5,407	5,210	5,047	4,879	4,718	4,552
E07000147	North Norfolk	Construction	3,408	3,804	3,889	3,981	4,108	4,233
E07000147	North Norfolk	Consumer services	18,846	19,124	19,685	20,161	20,708	21,261
E07000147	North Norfolk	Producer services	5,167	5,476	5,498	5,504	5,520	5,535
E07000148	Norwich	Manufacturing	6,867	7,058	6,853	6,609	6,363	6,109
E07000148	Norwich	Construction	4,722	5,121	5,213	5,310	5,444	5,576
E07000148	Norwich	Consumer services	43,351	44,074	44,996	45,741	46,631	47,530
E07000148	Norwich	Producer services	22,465	22,886	22,829	22,751	22,751	22,769
E07000149	South Norfolk	Manufacturing	6,892	6,025	5,746	5,462	5,193	4,931

LAD	LAD Name	Sector	2016	2021	2026	2031	2036	2041
E07000149	South Norfolk	Construction	5,033	5,457	5,486	5,525	5,603	5,679
E07000149	South Norfolk	Consumer services	18,714	18,947	19,191	19,359	19,590	19,822
E07000149	South Norfolk	Producer services	8,818	9,472	9,540	9,594	9,677	9,770
E07000206	Waveney	Manufacturing	8,326	8,024	7,723	7,411	7,112	6,803
E07000206	Waveney	Construction	3,663	3,837	3,879	3,910	3,957	4,001
E07000206	Waveney	Consumer services	20,134	20,734	21,137	21,459	21,837	22,201
E07000206	Waveney	Producer services	6,990	7,582	7,743	7,890	8,066	8,250

GDP PER WORKER BY LOCAL AUTHORITY

LAD	LAD Name	Sector	2016	2021	2026	2031	2036	2041	2046	2051	2056
E07000143	Breckland	Manufacturing	81,252	98,433	110,923	127,771	148,294	172,459	190,375	210,163	231,996
E07000143	Breckland	Construction	50,085	51,238	53,939	58,586	63,945	69,697	76,937	84,934	93,758
E07000143	Breckland	Consumer services	45,399	48,262	51,326	56,026	61,596	67,789	74,831	82,609	91,191
E07000143	Breckland	Producer services	51,862	52,460	55,178	59,287	63,966	68,928	76,088	83,997	92,723
E07000144	Broadland	Manufacturing	65,987	77,530	85,503	96,401	109,454	124,359	137,278	151,546	167,290
E07000144	Broadland	Construction	50,085	51,238	53,939	58,586	63,945	69,697	76,937	84,934	93,758
E07000144	Broadland	Consumer services	46,910	50,017	53,451	58,607	64,714	71,529	78,960	87,167	96,223
E07000144	Broadland	Producer services	70,734	76,038	81,877	90,082	99,546	109,900	121,317	133,927	147,840
E07000145	Great Yarmouth	Manufacturing	68,460	78,494	86,901	98,344	112,116	128,080	141,386	156,081	172,296
E07000145	Great Yarmouth	Construction	50,085	51,238	53,939	58,586	63,945	69,697	76,937	84,934	93,758
E07000145	Great Yarmouth	Consumer services	41,688	44,663	47,638	52,147	57,497	63,460	70,052	77,333	85,367
E07000145	Great Yarmouth	Producer services	68,708	70,344	74,586	80,656	87,430	94,721	104,561	115,429	127,421
E07000146	King's Lynn and West Norfolk	Manufacturing	72,160	84,245	94,085	107,249	123,131	141,597	156,306	172,553	190,479
E07000146	King's Lynn and West Norfolk	Construction	50,085	51,238	53,939	58,586	63,945	69,697	76,937	84,934	93,758
E07000146	King's Lynn and West Norfolk	Consumer services	44,914	47,950	51,068	55,846	61,526	67,868	74,918	82,705	91,297

LAD	LAD Name	Sector	2016	2021	2026	2031	2036	2041	2046	2051	2056
E07000146	King's Lynn and West Norfolk	Producer services	58,331	60,611	64,439	69,958	76,215	82,893	91,504	101,015	111,509
E07000147	North Norfolk	Manufacturing	67,821	79,078	87,600	99,188	113,149	129,235	142,660	157,488	173,849
E07000147	North Norfolk	Construction	50,085	51,238	53,939	58,586	63,945	69,697	76,937	84,934	93,758
E07000147	North Norfolk	Consumer services	43,895	47,234	50,312	55,019	60,599	66,817	73,758	81,425	89,884
E07000147	North Norfolk	Producer services	58,455	59,503	62,874	67,929	73,708	79,904	88,205	97,373	107,489
E07000148	Norwich	Manufacturing	62,009	65,209	71,370	80,118	90,594	102,433	113,074	124,827	137,795
E07000148	Norwich	Construction	50,085	51,238	53,939	58,586	63,945	69,697	76,937	84,934	93,758
E07000148	Norwich	Consumer services	45,773	48,978	52,301	57,346	63,336	70,035	77,311	85,346	94,213
E07000148	Norwich	Producer services	58,721	60,004	63,487	68,625	74,475	80,694	89,077	98,336	108,552
E07000149	South Norfolk	Manufacturing	65,132	75,822	82,288	91,325	102,021	113,992	125,834	138,913	153,345
E07000149	South Norfolk	Construction	50,085	51,238	53,939	58,586	63,945	69,697	76,937	84,934	93,758
E07000149	South Norfolk	Consumer services	46,705	49,735	53,166	58,277	64,318	71,051	78,432	86,584	95,579
E07000149	South Norfolk	Producer services	60,111	60,317	63,419	68,233	73,791	79,792	88,081	97,236	107,338
E07000206	Waveney	Manufacturing	74,378	82,948	91,617	103,417	117,505	133,553	147,427	162,750	179,658
E07000206	Waveney	Construction	50,085	51,238	53,939	58,586	63,945	69,697	76,937	84,934	93,758
E07000206	Waveney	Consumer services	44,785	47,781	50,905	55,653	61,274	67,518	74,532	82,278	90,826
E07000206	Waveney	Producer services	56,663	57,062	59,884	64,303	69,396	74,857	82,633	91,222	100,699

INDEX OF PRODUCTIVITY PER WORKER

LAD	LAD Name	Index
33UB	Breckland	0.8857
33UC	Broadland	0.9380
33UD	Great Yarmouth	0.9336
33UE	King's Lynn and West Norfolk	0.9581
33UF	North Norfolk	0.7683
33UG	Norwich	0.8976
33UH	South Norfolk	0.9872
42UH	Waveney	0.8595