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Norfolk County Council

GREAT YARMOUTH THIRD RIVER CROSSING

Social and Distributional Impact Report

PUBLIC

PROJECT NO. 70073317

OUR REF. NO. 70073317

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1 INTRODUCTION

1.1 PURPOSE OF THE REPORT

This report has been prepared as supporting information for the Great Yarmouth Third River Crossing (GYTRC) to be submitted to the Department for Transport (DfT).

The purpose of Social and Distributional Impact (SDI) Analysis is to attempt to identify groups that gain benefits and those that are likely to experience disbenefits of a transport intervention with particular reference to the impact upon equality through identifying the effects upon groups that are disadvantaged both financially and socially.

The report sets out the methodology and outputs of the SDI analysis for the appraisal of the GYTRC and presents a full appraisal undertaken for the identified Distributional (DI) indicators in accordance with WebTAG Units A4.1[1] and A4.2[2]. The report is structured by providing a scheme background before detailing a three-step approach for each indicator:

- Step 1 – Screening Process:

  - Identification of likely impacts for each indicator.

- Step 2 – Assessment:

  - Confirmation of the area impacted by the transport intervention (impact area)
  - Identification of social groups in the impact area; and
  - Identification of amenities in the impact area.

- Step 3 – Appraisal of Impacts:

  - Core analysis of the impacts; and
  - Full appraisal of DIs and input into AST

1.2 SCHEME BACKGROUND

Great Yarmouth currently suffers from high levels of congestion from local, regional and strategic traffic, particularly around Haven Bridge, due to a lack of a direct crossing to the southern part of the peninsula. The Haven Bridge currently experiences moderately high and inappropriate access and egress of Heavy Goods Vehicles (HGV's) travelling to the Peel Ports and Outer Harbour causing delays and making journey times unreliable. The mixture of port-related and local traffic makes it more difficult for people to access the town centre, seafront, and leisure facilities and presents a limitation on future growth in the area.

The lack of a direct river crossing makes Great Yarmouth seem remote and discourages inward investment. Bus users, cyclists and pedestrians have long, indirect journeys into the peninsula, which discourages commuting to work by more sustainable modes.

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[1] WebTAG: TAG unit A4-1 social impact appraisal, December 2017

[2] WebTAG: TAG unit A4-2 distributional impact appraisal, December 2015

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The 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 (Plate 1).

Plate 1 - Great Yarmouth Third River Crossing Location Plan

The Great Yarmouth Enterprise Zone has the potential to create 5,000 new jobs by 2025, and there are plans for 2,000 new homes and 20-30 hectares of employment development. A new river crossing is needed to accommodate the traffic generated by this planned growth, to improve connectivity to the strategic road network, and to avoid making existing problems worse. Without a new crossing, the full potential for growth in the Enterprise Zone and LDO area, including the port and outer harbour, may not be fully realised.

GYTRC is recognised by Norfolk County Council, Norfolk and Suffolk Local Transport Body, New Anglia LEP and the A47 Alliance as a "strategic priority for unlocking future economic growth in the area". It is considered to be necessary to alleviate the existing problems on the highway network and to support the delivery of national and local policy agendas identified for Great Yarmouth.

1.3 SCOPE OF SOCIAL AND DISTRIBUTIONAL IMPACTS

The analysis of distributional impacts is mandatory in the appraisal process and is a key component of the Appraisal Summary Table (AST). The Distributional Impacts Appraisal compares the distribution of benefits arising from a transport intervention against the distributions of different social groups to assess the extent to which benefits are experienced by those groups and compared nationally.

Distributional impacts consider the benefits and disbenefits that transport interventions have across different social groups. For example, people with access to a car may experience less benefits to

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those without a car for an intervention that improves local public transport services. It is important to consider vulnerable groups and that they are not disadvantaged further by receiving a disproportionately low share of the benefits provided the intervention, or a disproportionately high share of the disbenefits.

Within WebTAG unit A4.2, there are eight transport benefit indicators that are assessed as part of the Distributional Impacts Appraisal:

- User benefits;
- Noise;
- Air quality;
- Accidents;
- Security;
- Severance;
- Accessibility; and
- Personal affordability.

The appraisal of SDI focuses on eight specific impacts, as detailed within Table 1.

Table 1 - The Eight Social and Distributional Impacts

TAG Unit	Summary of Importance
User Benefits (TAG Unit A4.2.2)	It is important to gain an understanding of the distribution of user benefits by social group and by area. This analysis assists in understanding how user benefits accrue to different groups in society and across a geographic area. Analysing a wider area outside of the immediate vicinity of the intervention is vital as user benefits are often generated significantly beyond the immediate area of the scheme. Note that SDI analysis is only applicable for individuals and not in-work trips experienced by businesses.
Noise (TAG Unit A4.2.3)	It is important to understand the distributional effects of changes to noise generated by the transport intervention – both in terms of improvements and deterioration. Changes in noise levels resulting from the intervention will be experienced to varying extents in different areas and by different groups of people. It is therefore important to understand the noise-related social and distributional impacts of a scheme
Air Quality (TAG Unit A4.2.4)	Changes in emission levels resulting from the transport intervention will vary by location and social group. It is therefore important to understand the distribution of air quality changes – both in terms of improvements and deteriorations.
Accidents	Transport schemes can have significant impacts on safety and accidents and as

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TAG Unit	Summary of Importance
(TAG Unit A4.2.5)	these issues can have varying impacts on different areas and social groups, it is important to understand the specific impacts of an individual scheme.
Severance (TAG Unit A4.2.6)	Transport interventions can result in changes to levels of severance within the transport network through influencing traffic flows and providing new infrastructure. As severance issues impact on different social groups and areas to differing extents, it is important to analyse how individual scheme will alter levels of severance.
Security (TAG Unit A4.2.7)	Transport schemes can have impacts on personal security (both real and perceived) and these benefits can differ according to area and social group. It is therefore, important to gain an understanding of the social and distributional impacts of the transport intervention from the personal security perspective.
Accessibility (TAG Unit A4.2.8)	Access to services often presents significant difficulties to certain social groups and those living remotely. Transport interventions can have an impact of the ability of people to access services they require.
Personal Affordability (TAG Unit A4.2.9)	Changes in costs (both increases and reductions) need to be assessed in terms of understanding the social and distributional effects. Any changes in transport costs due to changes to the transport network could impact on the lower income groups.

Table 2 sets out the groups of people to be identified in the analysis for each of the indicators listed above.

Table 2 - Social Groups and SDI Indicators

Dataset / Social Group	User Benefits	Noise	Air Quality	Accidents	Severance	Security	Accessibility	Personal Affordability
Income Distribution	✓	✓	✓				✓	✓
Children (proportion of population aged under 16)		✓	✓	✓	✓	✓	✓	
Young Adults (proportion of				✓			✓	

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Dataset / Social Group	User Benefits	Noise	Air Quality	Accidents	Severance	Security	Accessibility	Personal Affordability
population aged 16-25								
Older People (proportion of population aged over 70)		✓		✓	✓	✓	✓	
Proportion of population with a disability					✓	✓	✓	
Proportion of population of Black and Minority Ethnic (BME) origin						✓	✓	
Proportion of households without access to a car					✓		✓	
Carers (proportion of households with dependent children)							✓	

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Table 3 sets out the general scoring method of distributional impacts for identified social groups.

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Table 3 - General System for Grading of Distributional Impacts for each of the Identified Social Groups

Impact	Assessment
Beneficial and the population impacted is significantly greater than the proportion of the group in the total population	Large Beneficial ✓✓✓
Beneficial and the population impacted is broadly in line with the proportion of the group in the total population	Moderate Beneficial ✓✓
Beneficial and the population impacted is smaller than the proportion of the group in the total population	Slight Beneficial ✓
There are no significant benefits or disbenefits experienced by the group for the specified impact	Neutral
Adverse and the population impacted is smaller than the proportion of the group in the total population	Slight Adverse ✗
Adverse and the population impacted is broadly in line with the proportion of the group in the total population	Moderate Adverse ✗✗
Adverse and the population impacted is significantly greater than the proportion of the group in the total population	Large Adverse ✗✗✗

1.4 INITIAL SCREENING

An initial screening assessment has been undertaken to consider the likely positive and negative impacts of the eight DI indicators listed in Table 4.

The findings from the initial screening are presented in the proforma (Appendix B) which identifies which indicators should be appraised in more detail and provides recommendations, where appropriate for further analysis. The screening proforma is summarised in Table 4 below.

The screening process found that no further assessment was required for security as the Scheme is likely to have a neutral impact on security.

Accessibility was also identified for no further assessment because the Scheme is not focussed around changes to public transport and the impact of the Scheme on rerouting of public transport routes, if any, will not be known until closer to scheme opening.

Table 4 - Summary of Proforma

SDI Indicator	Likely SDI Impact	Recommendation
User Benefits	Yes	Proceed to Step 2
Noise	Yes	Proceed to Step 2
Air Quality	Yes	Proceed to Step 2

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SDI Indicator	Likely SDI Impact	Recommendation
Accidents	Yes	Proceed to Step 2
Security	No	No further assessment required
Severance	Yes	Proceed to Step 2
Accessibility	No	No further assessment required
Affordability	Yes	Proceed to Step 2

Following the initial screening process, and prior to undertaking the actual SDI Appraisal, WebTAG Unit A4.2 states that a full screening should be progressed. This is provided for each SDI indicator in the following sections.

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2 USER BENEFITS

2.1 INTRODUCTION

User benefits of transport schemes are experienced by different groups of people in different areas. Although it is not possible to attribute social impacts to user benefits, the analysis of distributional impacts (DI) is more attainable.

2.2 SCREENING (STEP 1)

The proposed scheme is a transport intervention that has been developed for the purpose of generating benefits to users. A user benefit DI analysis should be undertaken, in line with TAG Unit 4.2, where user benefit analysis has been used in the scheme appraisal.

An initial screening proforma was undertaken which assessed the user benefits using the DfT's Transport User Benefit Appraisal (TUBA) software v1.9.13, where they have been quantified in conjunction with a spatially disaggregate transport model.

TUBA calculates user benefits from the differences in travel times, vehicles operating costs (VOCs) and user charges between the Do-Minimum and Do-Something scenarios. The outputs can then be used to spatially identify a benefit per head of the population as a result of the scheme and assess the areas that will have the most significant impacts in relation to income distribution for people living within the impact area.

2.3 ASSESSMENT – AREAS OF IMPACT (STEP 2A)

The impact area for user benefits is defined as the core modelled area within the SATURN transport model, covering all of Great Yarmouth district (Plate 2). The transport model zones were used to define the SDI study area as this would provide a defined area where impacts could be quantified. The area is considered large enough to capture the biggest impacts expected due to the scheme. Areas where impacts are quite likely but are expected to be relatively small such as the city of Norwich and wider Norfolk were all included within 'rest of England and Wales' due to inaccuracies associated with data aggregation at this geographical level.

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Plate 2 – Assessment Impact Area

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Key

User Benefits Assessment Area

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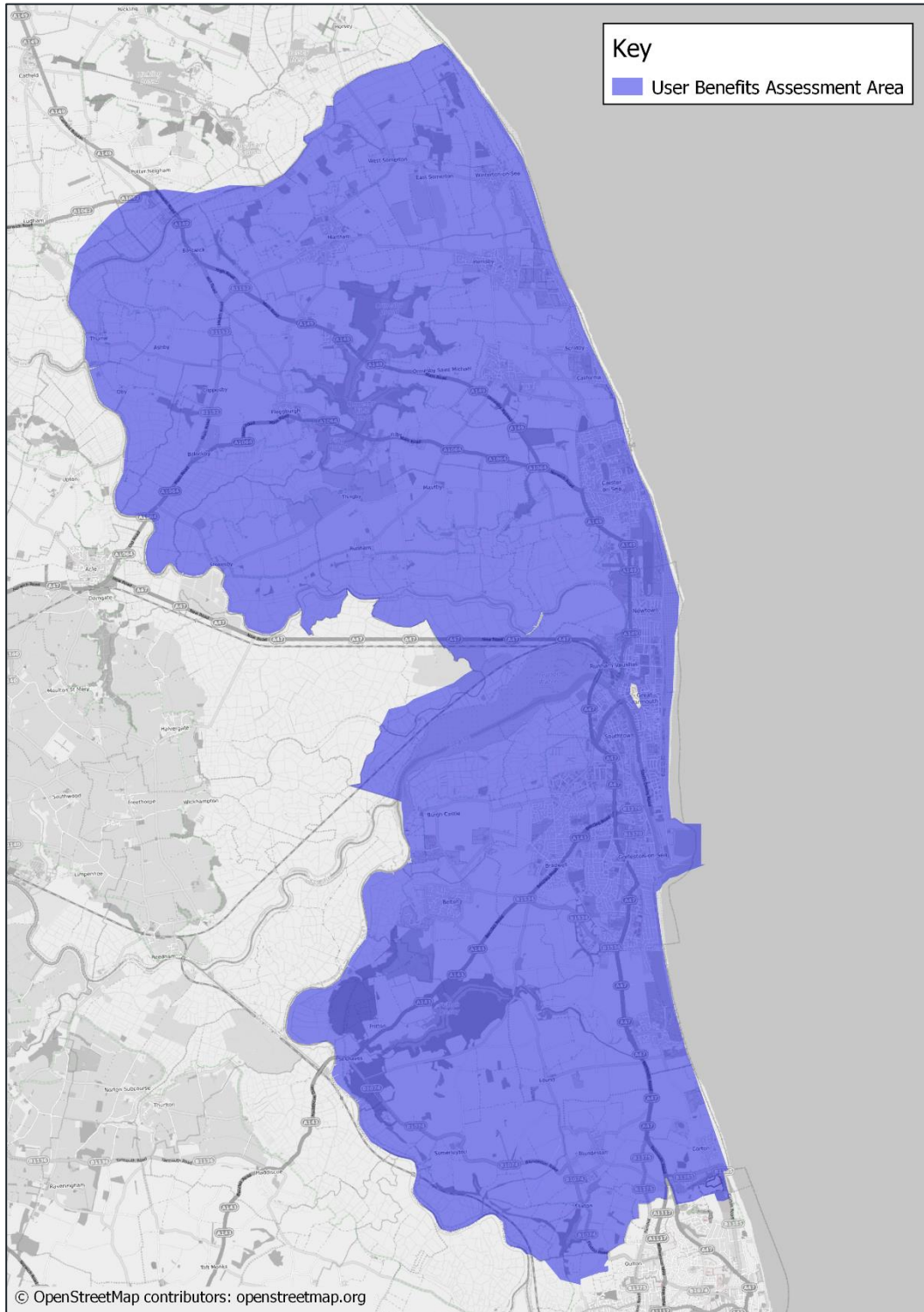
2.4 ASSESSMENT – IDENTIFICATION OF SOCIAL GROUPS IN IMPACT AREA (STEP 2B)

It is important to understand the distribution of user income within the impact area. To achieve this, the income domain from the Index for Multiple Deprivation (IMD) 2019 has been mapped at Lower Super Output Area (LSOA) level throughout the scheme area.

User benefits from the TUBA assessment, for commute and other purposes only (non business), have been converted from model zones to LSOAs to allow for comparison to the IMD income domain data. The conversion of benefits from model zone to LSOA has been undertaken using the Ordnance Survey Codepoints (Postcodes) 2020 dataset to derive proportions for splitting model zone benefits into LSOAs based on population distribution.

The distribution of income groups within the impact area is summarised in Appendix E.

2.5 APPRAISAL OF IMPACTS (STEP 3)

Table 5 shows the distribution of user benefits across the population within the scheme area by national income deprivation quintile. Around 88% of the benefits of the scheme are experienced by the population within the impact area. Further to this, approximately 61% of the benefits within the impact area are accrued by people within the lowest 20% of the IMD income domain. This translates to around 54% when including the rest of England and Wales. 15% of the impact area scheme user benefits were accrued by people within the second income quintile (20<40%). Only 5% of people within the impact area are receiving benefits from the scheme within the highest 20% income domain. No overall disbenefits were observed for any quintile.

Table 5 - Distribution of User Benefit Costs by Income Deprivation Quintile

IMD Income Domain	0%-20%	20%-40%	40%-60%	60%-80%	80%-100%	Rest of England and Wales
Total user benefits of LSOA's within impact area (£M)	73.858	18.101	10.579	12.206	5.852	16.965
Share of user benefits within impact area	61%	15%	9%	10%	5%	-
Share of user benefits within Modelled Area (Inc. rest of England and Wales)	54%	13%	8%	9%	4%	-
Population	36,609	26,126	28,577	12,434	4,444	59,007,610
Share of population in the impact area	34%	24%	26%	11%	4%	-
Assessment	✓✓✓	✓	✓	✓✓	✓✓	-

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Plate 3 presents a visual representation of the income domain quintiles throughout the impact area at LSOA level.

Plate 4 shows the distribution of user benefits from TUBA across the Great Yarmouth population. It can be seen that every LSOA experiences a benefit, with the largest benefits being accrued on the Peninsula and around the town centre. Therefore, the DI appraisal of user benefits has been assessed as **Large Beneficial**.

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Plate 3 - IMD Income Domain

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Key

IMD Income Domain
- Quintile 1 (Most Deprived)
- Quintile 2
- Quintile 3
- Quintile 4
- Quintile 5 (Least Deprived)

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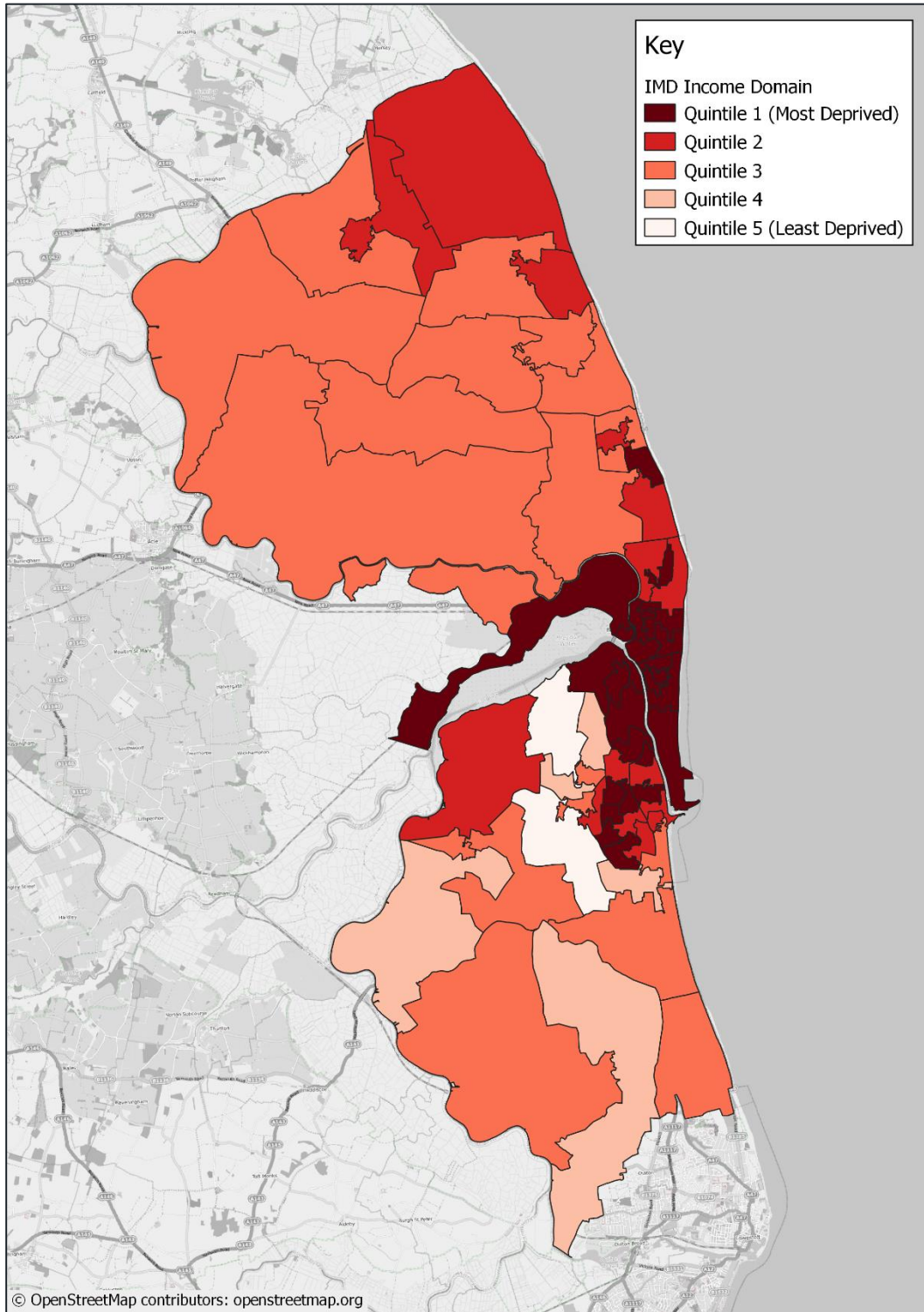
Plate 4 - User Benefits disaggregated at LSOA level

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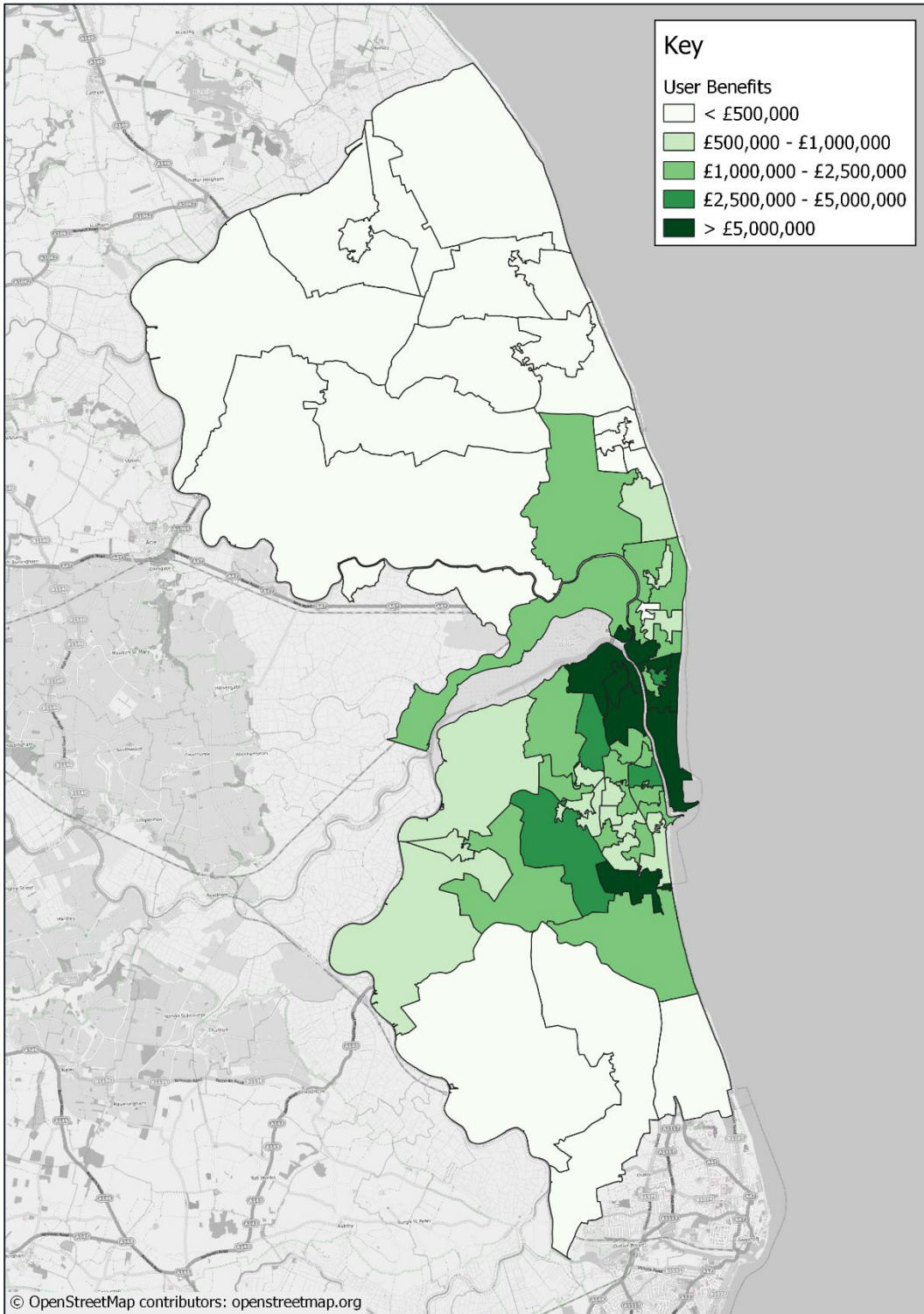
3 NOISE

3.1 INTRODUCTION

The noise analysis for the Distributional Impact (DI) Assessment has been undertaken for the 2038 Design Year (i.e. 'Do Minimum 2038' compared to the 'Do Something 2038') in line with the guidance contained within the Distributional Impact Appraisal TAG Unit A4.2 (TAG A4.2).

3.2 SCREENING (STEP 1)

The TAG DI Assessment for noise is based on the road traffic noise predictions produced for the Environmental Impact Assessment (EIA) and published in the Environmental Statement (ES)[3].

The study area for the noise appraisal and DI screening is the same as used in the EIA and is defined based on guidance given in the Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3, Part 7, HD 213/11 Revision 1 Noise and Vibration (HD 213/11). This guidance was current when the ES was published.

The DMRB document HD 213/11 was replaced by DMRB, LA 111, Noise and Vibration in November 2019[4]. For this appraisal, it is considered appropriate to use the results generated for EIA, but to analyse them following the current LA 111 guidance. It is acknowledged in HD 213/11 that the assessment method (least beneficial change) highlights the adverse impacts. The LA 111 assessment method (greatest magnitude of change) presents a more rounded appraisal.

In the study area there are 10,436 residential properties, based on an average household size of 2.3 people, the estimated population is 24,003. The majority of residential properties in the study area are houses. These receptors are presented in Plate 5.

3.3 ASSESSMENT (STEP 2) AND APPRAISAL OF IMPACT (STEP 3)

TAG A4.2 requires the impacts of noise on the following social groups to be assessed:

- Income Distribution;
- Children: proportion of population aged less than 16 years; and
- Older People: proportion of population aged over 70 years.

Indices of Deprivation (IoD) data are published by the Government at a small local area level, in statistical geographical areas called Lower Layer Super Output Areas (LSOAs)[5]. LSOAs are designed to have an average of 1,500 residents or 650 households.

There are 22 LSOAs either wholly or partially within the operational study area. These areas are categorised into quintiles based on their national IoD ranking and are presented in Plate 5 below.

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[3] Norfolk County Council (April 2019), Great Yarmouth Third River Crossing: Environmental Statement, Document Reference 6.1, Chapter 7: Noise and Vibration.

[4] Revision 2 of DMRB LA 111 (2020).

[5] Ministry of Housing, Communities and Local Government (2020), Lower Super Output Area (LSOA) IMD 2019 (OSGB19360). Available at: http://data-commUnities.opendata.arcgis.com/ (Accessed 30/06/20).

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Plate 5 - LSOA IoD Quintiles
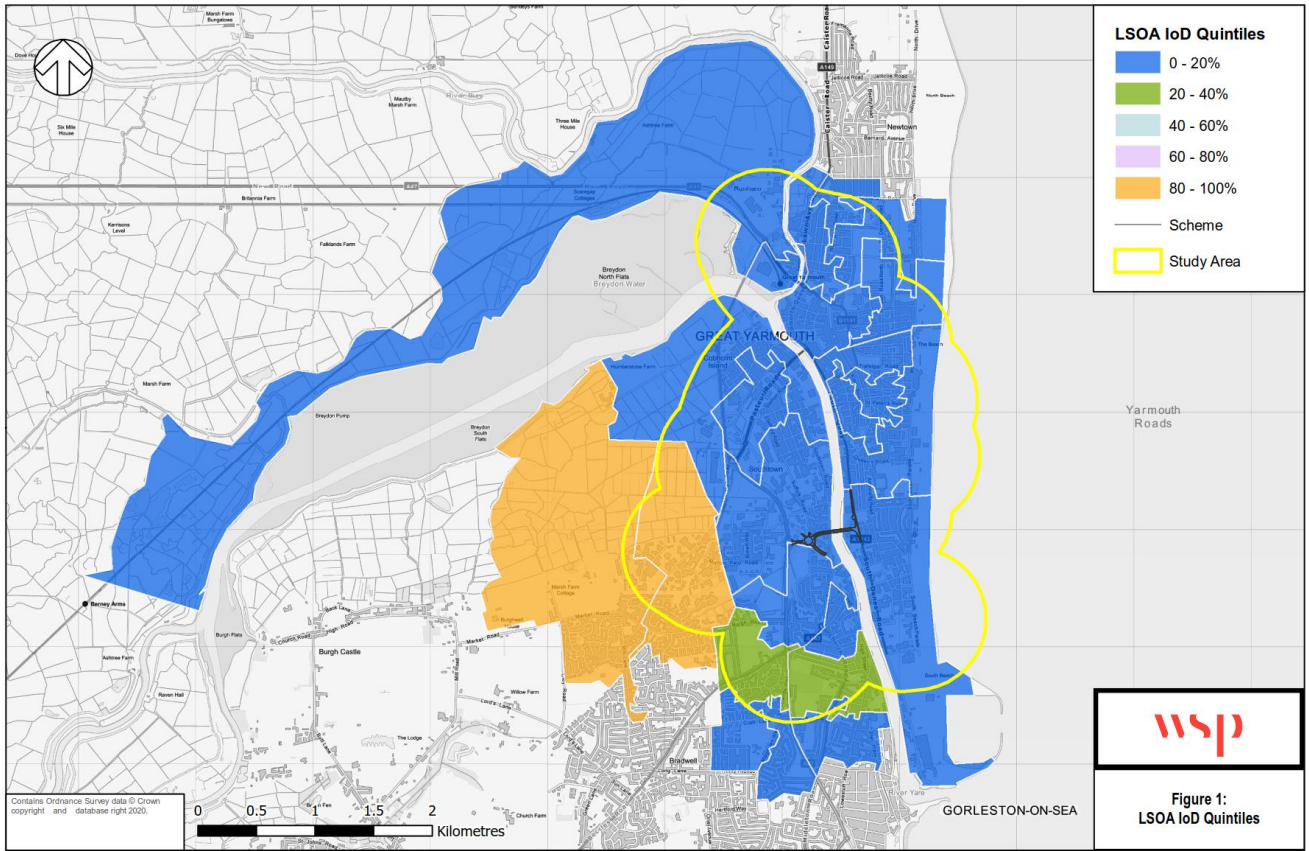
Figure 1:
LSOA IoD Quintiles

The more deprived areas (quintiles 0-20% and 20-40%) are spread across the study area, including the areas east and west of the River Yare. The less deprived areas (quintile 80-100%) are located in the west of the study area. A count of LSOAs in each IoD quintile is given below:

- 0-20%   Most Deprived Group   18 LSOAs;
- 20-40%   Second Most Deprived Group   2 LSOAs;
- 40-60%   Middle Income Group   0 LSOAs;
- 60-80%   Second Least Deprived Group   0 LSOAs;
- 80-100%   Least Deprived Group   2 LSOAs.

Details of the LSOAs are provided in Table 6 with population and noise data. Across the LSOAs that are wholly or partially contained in the operational study area, the average population is 1,790 residents, average percentage of children (aged <16) is 21%, and the average percentage of older people (aged >70) is 12%.

The noise columns are based on a comparison of the 'with scheme' and 'without scheme', in 2038 (fifteenth year after opening). The net number of winners or losers in each LSOA is given in the final column, a positive number is an overall noise benefit, a negative number is an overall noise disbenefit.

The distribution of income groups, proportion of children and older people and amenities within the impact area for this assessment are summarised in Appendix E.

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Table 6 - LSOAs in Great Yarmouth Third River Crossing Study Area

LSOA Code	LSOA Name	Index of Multiple Deprivation (IMD) Rank	Income Deprivation Quintile	Households in study area	Population[6] (residents)	Children (aged <16)	Older people (aged >70)	Households with increased noise[7] (≥+1dB) [A]	Households with decrease noise (≤-1dB) [B]	Net no. of winners / losers [C=A-B]
E01026625	Great Yarmouth 006D	39	0-20%	342	1,875	30%	8%	83	181	-98
E01026597	Great Yarmouth 005C	120	0-20%	673	2,129	22%	10%	0	36	-36
E01026624	Great Yarmouth 006C	184	0-20%	699	2,056	21%	9%	331	13	+318
E01026598	Great Yarmouth 005D	609	0-20%	584	1,997	19%	8%	12	0	+12
E01026626	Great Yarmouth 006E	700	0-20%	696	2,112	19%	9%	276	41	+235
E01026622	Great Yarmouth 006A	767	0-20%	562	1,679	30%	8%	198	0	+198
E01026623	Great Yarmouth 006B	850	0-20%	538	1,847	16%	9%	107	53	+54
E01026604	Great Yarmouth 009D	949	0-20%	93	1,628	21%	13%	0	0	0
E01026603	Great Yarmouth 009C	976	0-20%	9	1,606	23%	10%	0	0	0
E01026635	Great Yarmouth 007D	1,733	0-20%	826	2,396	24%	8%	0	232	-232

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[6] Population data is taken from the Office for National Statistics dataset 'Lower layer Super Output Area population estimates (supporting information)' release date 25 October 2019 and is quoted for the full LSOA.

[7] Noise data from the road traffic noise predictions produced for the environmental impact assessment and published in the Environmental Statement have been analysed and are presented for households in the study area.

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LSOA Code	LSOA Name	Index of Multiple Deprivation (IMD) Rank	Income Deprivation Quintile	Households in study area	Population[6] (residents)	Children (aged <16)	Older people (aged >70)	Households with increased noise[7] (≥+1dB) [A]	Households with decrease noise (≤-1dB) [B]	Net no. of winners / losers [C=A-B]
E01026595	Great Yarmouth 005A	1,990	0-20%	593	1,833	20%	14%	0	0	0
E01026599	Great Yarmouth 004A	2,604	0-20%	158	1,351	22%	9%	0	0	0
E01026600	Great Yarmouth 007A	4,007	0-20%	605	1,514	22%	15%	78	1	+77
E01026633	Great Yarmouth 007B	4,728	0-20%	630	1,945	24%	8%	66	310	-244
E01026634	Great Yarmouth 007C	4,868	0-20%	641	1,654	24%	9%	0	450	-450
E01026601	Great Yarmouth 009A	5,710	0-20%	690	1,441	20%	13%	40	0	+40
E01026596	Great Yarmouth 005B	5,927	0-20%	638	1,688	18%	14%	0	0	0
E01026630	Great Yarmouth 010D	6,453	0-20%	56	1,680	24%	11%	0	0	0
E01026632	Great Yarmouth 009E	7,582	20-40%	582	1,785	18%	19%	5	0	+5
E01026602	Great Yarmouth 009B	8,119	20-40%	555	1,489	17%	23%	6	0	+6
E01026582	Great Yarmouth 008B	26,301	80-100%	14	2,070	15%	20%	0	0	0
E01026581	Great Yarmouth 008A	26,682	80-100%	252	1,600	18%	15%	0	0	0

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The geographic distribution of noise change at residential properties is presented in Plate 6. Noise increases occur in the area immediately surrounding the Scheme and along routes to the north east, at receptors on and around Nelson Road Central, Nelson Road South and Blackfriars' Road. Noise increases also occur at receptors on Beccles Road south of the Scheme. Noise decreases are concentrated in the residential areas to the east and west of the existing Haven Bridge.

Plate 6 - Noise Change (2038)

Figure 2:
Noise Change (2038)
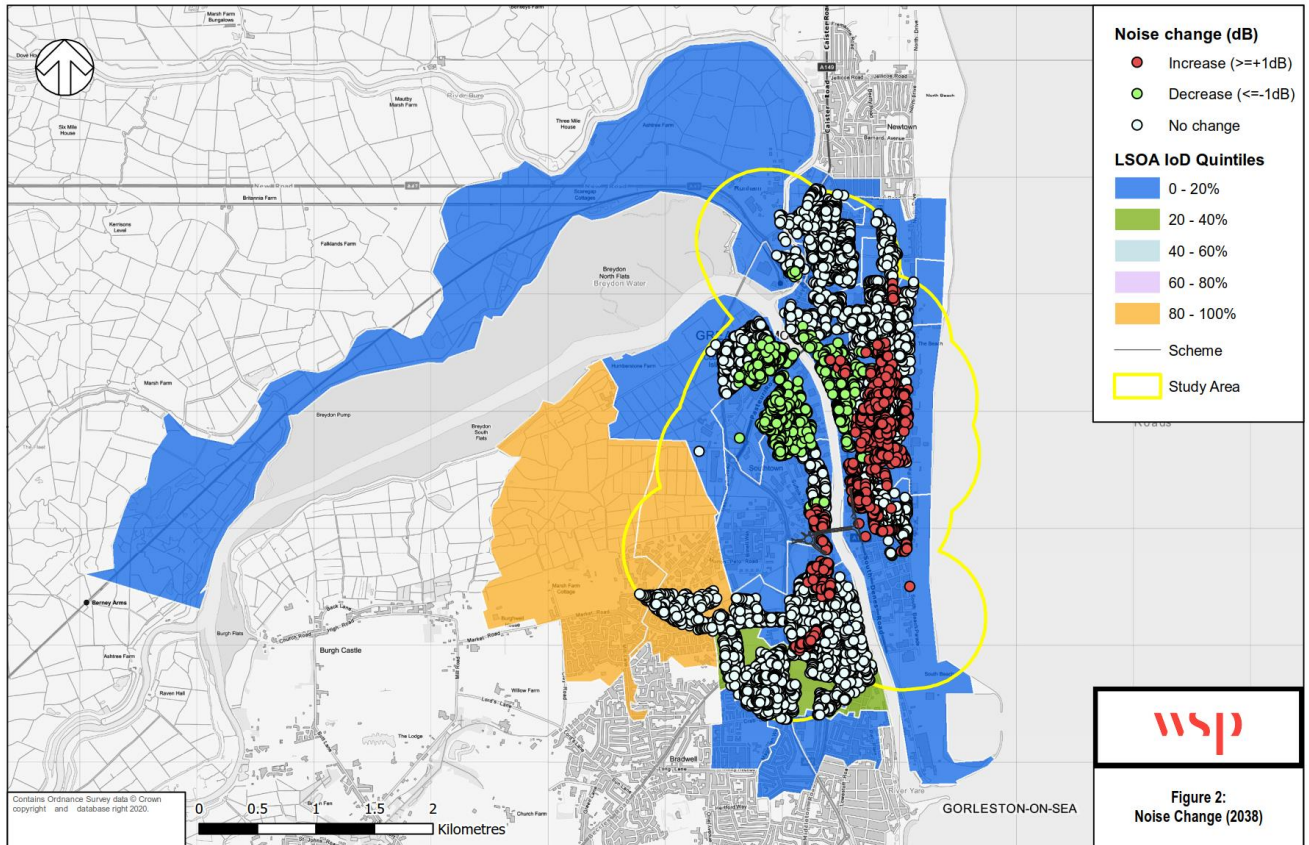
In line with TAG 4.2, the results are collated into IoD quintiles, these are presented below in Table 7.

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Table 7 - Noise Distributional Impact Analysis

Analysis and Assessment	IoD 0-20%	IoD 20-40%	IoD 40-60%	IoD 60-80%	IoD 80-100%	Total
Households with increased noise [A]	1,191	11	-	-	0	1,202
Households with decreased noise [B]	1,317	0	-	-	0	1,317
Households with no change in noise level [C]	6,525	1126	-	-	266	2,709
Net number of winners / losers in each group [D] = [B] – [A]	126	-11	-	-	0	-
Total number of winners / losers across all groups [E] = ∑[D]	-	-	-	-	-	115
Net winners / losers as percentage of total [F] = [D] / [E]	110%	-10%	-		0%	100%
Share of total households in study area	87%	11%	-	-	3%	100%
Assessment	Large Beneficial	Moderate Adverse	-	-	Neutral	-

Table 7 shows that the most deprived income quintile 0-20%, contains 87% of the households in the study area and 110% of the net benefits. As the net benefits are greater than the share of households, the assessment score is Large Beneficial.

The 20-40% quintile contains 11% of the households in the study area and 10% of the net disbenefits. There is an overall adverse impact, as the net disbenefits are broadly in line with the share of households, the assessment score is Moderate Adverse.

There are no LSOAs in the 40-60% and 60-80% quintiles.

The least deprived quintile 80-100% contains 3% of the households in the study area, all noise changes are less than 1dB; the assessment score is Neutral.

TAG A4.2 requires that consideration be given to the impact of the Scheme on children (aged <16) and older people (aged >70). As detailed in Table 6, the LSOAs with the largest proportion of children are generally those in the more deprived areas (quintile 0-20%); the LSOAs with the largest proportion of older people (aged >70) are generally those in the less deprived areas (quintile 80-100%).

In order to quantify the effect on children, the TAG A4.2 directs that the change in noise levels predicted at education facilities (e.g. schools and nurseries) within the study area should be presented, this appraisal is reported in Table 8.

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Table 8 - Noise Impact at Education Facilities in the Study Area

Education Receptor	Noise Level, dB(A), $L_{A10,18h}$ DM 2038	Noise Level, dB(A), $L_{A10,18h}$ DS 2038	Noise change	Magnitude of Change[8]
Cobholm Primary Academy	51.0	50.7	-0.3	Negligible Beneficial
Edward Worlledge Ormiston Academy	64.3	63.1	-1.2	Minor Beneficial
Great Yarmouth Primary Academy	53.5	54.3	0.8	Negligible Adverse
Northgate Primary School	58.2	58.3	0.1	Negligible Adverse
Southtown Primary School	63.8	61.2	-2.6	Minor Beneficial
St. George's Primary and Nursery School	46.4	47.1	0.7	Negligible Adverse
St. Mary and St Peter Catholic Primary School	50.4	50.8	0.4	Negligible Adverse
St. Nicholas Priory Primary School	63.4	62.7	-0.7	Negligible Beneficial
Trafalgar College	58.0	55.9	-2.1	Minor Beneficial
Wroughton Infant Academy	60.9	60.8	-0.1	Negligible Beneficial
Wroughton Junior Academy	60.2	60.4	0.2	Negligible Adverse

There are 11 education receptors buildings identified in the study area. Where an education facility has more than one building on the same site the worst-case change is reported. Table 8 shows that as a result of the Scheme:

- Five education buildings receive a Negligible Adverse noise change;
- Three education buildings receive a Negligible Beneficial noise change; and
- Three education buildings receive a Minor Beneficial noise change.

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[8] Categorised in accordance with LA 111 Table 3.54a *Magnitude of change - short term*.

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TAG A4.2 also requires that consideration be given to the impact of the Scheme on the elderly as they are a key sensitive receptor, no care homes are identified in the study area based on the OS address layer data (AddressBase Plus).

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4 AIR QUALITY

4.1 INTRODUCTION

The air quality analysis for the Distributional Impact (DI) assessment has been completed for the 2023 Opening Year (i.e. 'Do Minimum (DM) 2023' compared to the 'Do Something (DS) 2023') and 2038 Forecast Year (i.e. 'DM 2038' compared to the 'DS 2038') in consideration of the guidance contained within the Distributional Impact Appraisal TAG Unit A4.2 (TAG A4.2)[9].

4.2 STEP 1: SCREENING

The TAG DI Assessment for air quality is derived from the road vehicle exhausts assessment produced for the Environmental Impact Assessment (EIA), as published in the Environmental Statement (ES)[10].

The study area for the air quality DI screening is the same as used in the EIA and is defined based on guidance given in the Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3, Part 1, HA 207/07[11] (DMRB HA 207/07). This guidance was current when the ES was published[10]. DMRB HA207/07 has since been replaced by DMRB LA 105 Air Quality in November 2019[12].

In total, there are 10,787 sensitive receptor locations identified in the air quality study area, with an estimated population of 36,937, based on the mid-2018 population estimates[13] for each Lower-Level Super Output Area (LSOA)[14]. The vast majority of these sensitive receptors are residential dwellings.

Figure 1 of Appendix D (separate document) presents the air quality study area incorporated in the assessment.

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[9] Department for Transport (DfT) (2020) *Transport Analysis Guidance (TAG) Unit A4.2 Distributional Impact Appraisal* [online] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/888337/tag-unit-4.2-distribution-impact-appraisal.pdf

[10] Great Yarmouth Third River Crossing Environmental Statement Document Reference 6.1, Chapter 6, Air Quality [online] https://www.norfolk.gov.uk/-/media/norfolk/downloads/roads-and-transport/3rd-river-crossing/development-consent-order/6-1-environmental-statement-vol-i-written-statement.pdf

[11] Highways Agency (2007) *Design Manual for Roads and Bridges Vol.11 Section 3, Part 1 (Air Quality)* [online] https://www.standardsforhighways.co.uk/dmrb/archive/search/df0c77ed-887b-4c84-be0e-000fe18545ae

[12] Highways England (2019) *Design Manual for Roads and Bridges Sustainability & Environment Appraisal LA 105 (Air Quality)* [online] https://www.standardsforhighways.co.uk/prod/attachments/10191621-07df-44a3-892e-c1d5c7a28d90

[13] Office for National Statistics (2020) *Lower Layer Super Output Area Population Estimates* [online] https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/lowersuperoutputareamidyearpopulationestimates

[14] The index of multiple deprivation data and LSOA geographical location is published in the Ministry of Housing, Communities and Local Government dataset, 'Lower Super Output Area (LSOA) IMD 2019 (OSGB19360).

Downloaded from: https://www.gov.uk/guidance/english-indices-of-deprivation-2019-mapping-resources and http://data-communities.opendata.arcgis.com/datasets/d4b79be994ac4820ad44e10ded313df3_0

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4.3 STEP 2: ASSESSMENT

WebTAG Unit A3[15] requires the impacts of air quality on the following social groups to be assessed:

- Income Distribution; and
- Children: proportion of population aged less than 16 years.

IDENTIFICATION OF SOCIAL GROUPS IN THE IMPACT AREA

There are 21 LSOAs either wholly or partially which cover the air quality study area. These areas are categorised into quintiles based on their national Index of Multiple Deprivation (IMD) ranking and are presented in Figure 1 of Appendix D (separate document).

The more deprived areas (quintiles 0-20% and 20-40%) are spread across the study area, including the areas east and west of the River Yare. The less deprived areas (quintile 80-100%) are located in the west of the study area. A count of LSOAs in each IMD quintile is given in Table 9 below:

Table 9 – Air Quality Study Area: LSOA Distribution

Quintile	Description	LSOAs
0-20%	Most deprived group	15
20-40%	Second most deprived group	3
40-60%	Middle group	1
60-80%	Second least deprived group	0
80-100%	Least deprived group	2

A detailed breakdown of each LSOA, including the IMD rank, the estimated population and the number of young people contained in the air quality study area is presented in Table 10.

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[15]   DfT (2019) *TAG Unit A3 Environmental Impact Appraisal* [online]
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/825064/tag-unit-a3-environmental-impact-appraisal.pdf

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Table 10 – Air Quality Study Area: LSOA Breakdown

LSOA Code	LSOA Name	IMD Rank	IMD Rank %	Deprivation Quintile	Population (residents)	Young (aged <16)	% Young
E01026625	Great Yarmouth 006D	39	0.1%	0-20%	1,875	592	31.6%
E01026597	Great Yarmouth 005C	120	0.4%	0-20%	2,129	498	23.4%
E01026624	Great Yarmouth 006C	184	0.6%	0-20%	2,056	454	22.1%
E01026598	Great Yarmouth 005D	609	1.9%	0-20%	1,997	387	19.4%
E01026626	Great Yarmouth 006E	700	2.1%	0-20%	2,112	424	20.1%
E01026622	Great Yarmouth 006A	767	2.3%	0-20%	1,679	535	31.9%
E01026623	Great Yarmouth 006B	850	2.6%	0-20%	1,847	316	17.1%
E01026603	Great Yarmouth 009C	976	3.0%	0-20%	1,606	389	24.2%
E01026635	Great Yarmouth 007D	1733	5.3%	0-20%	2,396	595	24.8%
E01026600	Great Yarmouth 007A	4007	12.2%	0-20%	1,514	349	23.1%
E01026633	Great Yarmouth 007B	4728	14.4%	0-20%	1,945	493	25.3%
E01026634	Great Yarmouth 007C	4868	14.8%	0-20%	1,654	423	25.6%
E01026601	Great Yarmouth 009A	5710	17.4%	0-20%	1,441	310	21.5%
E01026596	Great Yarmouth 005B	5927	18.0%	0-20%	1,688	314	18.6%
E01026630	Great Yarmouth 010D	6453	19.6%	0-20%	1,680	431	25.7%
E01026632	Great Yarmouth 009E	7582	23.1%	20-40%	1,785	336	18.8%
E01026586	Great Yarmouth 013B	7946	24.2%	20-40%	1,031	190	18.4%
E01026602	Great Yarmouth 009B	8119	24.7%	20-40%	1,489	271	18.2%
E01026583	Great Yarmouth 008C	13640	41.5%	40-60%	1,343	224	16.7%
E01026582	Great Yarmouth 008B	26301	80.1%	80-100%	2,070	347	16.8%
E01026581	Great Yarmouth 008A	26682	81.2%	80-100%	1,600	314	19.6%

IDENTIFICATION OF AMENITIES IN THE IMPACT AREA

Table 11 shows the quantities of various amenities considered within the air quality study area as required by TAG Unit A4.29. The spatial location of these amenities are illustrated in Figure 1 of Appendix D (separate document).

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Table 11 – Local Amenities within the Air Quality Study Area

Amenity	Quantity
Schools/nurseries	11
Playgrounds	31
Parks and open spaces	11
Hospitals	0
Care homes / day centres	14
Community centres	1

The distribution of income groups, proportion of children and amenities within the impact area for this assessment are summarised in Appendix E.

4.4 STEP 3: APPRAISAL

Using a Geographic Information System (GIS), the number of sensitive receptor locations experiencing an improvement, deterioration or no change in concentrations of nitrogen dioxide (NO_2) and particulate matter with an aerodynamic diameter of 10µm (PM_{10}) and 2.5µm ($PM_{2.5}$) because of the Scheme in the opening year of 2023 and forecast year of 2038 has been joined to the LSOA dataset.

The results are based on the property banded concentration outputs from the associated Local Air Quality workbooks, as produced for the Local Air Quality WebTAG Appraisal.

OPENING YEAR (2023)

Table 12 shows the impact from concentrations of NO_2 resulting from the Scheme for each quintile, extrapolated from the England Index of Multiple Deprivation (IMD)[14] in the opening year of assessment (2023). Figure 2 of Appendix D (separate document) presents an illustration of the opening year NO_2 DI analysis.

Table 12 – NO_2 DI Analysis: Opening Year (2023)

NO₂ DI Analysis - 2023	IMD 0-20%	IMD 20-40%	IMD 40-60%	IMD 60-80%	IMD 80-100%	Total
No. Properties with Improved Air Quality [A]	4,005	0	4	0	383	4,392
No. Properties with No Change in Air Quality [B]	559	161	39	0	12	771
No. Properties with Deteriorating Air Quality [C]	4,709	898	16	0	1	5,624
No. Net Winners / Losers [D] = [A] – [C]	-704	-898	-12	0	382	
Total No. of Winners / Losers Across All Groups [E] = ∑[D]						-1,232

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NO$_2$ DI Analysis - 2023	IMD 0-20%	IMD 20-40%	IMD 40-60%	IMD 60-80%	IMD 80-100%	Total
Net Winners/Losers in Each Area as Percentage of Total [F] = [D] / [E]	57.1%	72.9%	1.0%	0.0%	-31.0%	100.0%
Share of Total Population of Study Area	86.0%	9.8%	0.5%	0.0%	3.7%	100.0%
Assessment Score	XX	XXX	X	Neutral	√√√	

Table 12 presents adverse conditions for three quintiles, including the lowest (0-20%) quintile, which accounts for approximately 86.0% of all considered receptors in this DI analysis. It is predicted that 4,392 properties will experience an improvement in annual mean NO$_2$ concentrations whilst 5,624 properties will experience a deterioration. Approximately 7.1% of properties are predicted to experience no change in annual mean NO$_2$ concentrations in the opening year (2023).

Table 13 shows the impact from concentrations of PM$_{10}$ resulting from the Scheme for each quintile, extrapolated from the England IMD14 in the opening year of assessment (2023). Figure 3 of Appendix D (separate document) presents an illustration of the opening year PM$_{10}$ DI analysis.

Table 13 – PM$_{10}$ DI Analysis: Opening Year (2023)

PM$_{10}$ DI Analysis - 2023	IMD 0-20%	IMD 20-40%	IMD 40-60%	IMD 60-80%	IMD 80-100%	Total
No. Properties with Improved Air Quality [A]	3,358	0	0	0	65	3,423
No. Properties with No Change in Air Quality [B]	2,796	518	51	0	331	3,696
No. Properties with Deteriorating Air Quality [C]	3,119	541	8	0	0	3,668
No. Net Winners / Losers [D] = [A] – [C]	239	-541	-8	0	65	
Total No. Of Winners / Losers Across All Groups [E] = ∑[D]						-245
Net Winners / Losers in Each Area as Percentage of Total [F] = [D] / [E]	-97.6%	220.8%	3.3%	0.0%	-26.5%	100.0%
Share of Total Population of Study Area	86.0%	9.8%	0.5%	0.0%	3.7%	100.0%
Assessment Score	√√√	XXX	X	Neutral	√√√	

Table 13 presents a beneficial impact for the 0-20% and 80-100% quintiles whilst showing adverse conditions for the other two considered quintiles (20-40% and 40-60%). It is predicted that 3,423 properties will experience an improvement in PM$_{10}$ concentrations whilst 3,668 properties will experience a deterioration. Approximately 34.3% are predicted to experience no change in annual mean PM$_{10}$ concentration in the opening year of assessment (2023).

Table 14 shows the impact from concentrations of PM$_{2.5}$ resulting from the Scheme for each quintile extrapolated from the England IMD[14] in the opening year of assessment (2023). Figure 4 of Appendix D (separate document) presents an illustration of the opening year PM$_{2.5}$ DI analysis.

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Table 14 – PM$_{2.5}$ DI Analysis: Opening Year (2023)

PM$_{2.5}$ DI Analysis - 2023	IMD 0-20%	IMD 20-40%	IMD 40-60%	IMD 60-80%	IMD 80-100%	Total
No. Properties with Improved Air Quality [A]	1,641	0	0	0	54	1,695
No. Properties with No Change in Air Quality [B]	5,476	861	57	0	342	6,736
No. Properties with Deteriorating Air Quality [C]	2,156	198	2	0	0	2,356
No. Net Winners / Losers [D] = [A] – [C]	-515	-198	-2	0	54	
Total No. of Winners / Losers Across All Groups [E] = ∑[D]						-661
Net Winners / Losers in Each Area as Percentage of Total [F] = [D] / [E]	77.9%	30.0%	0.3%	0.0%	-8.2%	100.0%
Share of Total Population of Study Area	86.0%	9.8%	0.5%	0.0%	3.7%	100.0%
Assessment Score	XX	XXX	X	Neutral	✓	

Table 14 shows a beneficial impact for the 80-100% quintile, whilst predicting adverse impacts for the other three considered quintiles. It is predicted that 1,695 properties will experience an improvement in PM$_{2.5}$ concentrations whilst 2,356 properties will experience a deterioration. The majority of properties (62.4%) are predicted to experience no change in annual mean PM$_{2.5}$ concentrations in the opening year.

FORECAST YEAR (2038)

Table 15 shows the impact from concentrations of NO$_2$ resulting from the Scheme for each quintile, extrapolated from the England IMD[14] in the forecast year of assessment (2038). Figure 5 of Appendix D (separate document) presents an illustration of the forecast year NO2 DI analysis.

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Table 15 – NO$_2$ DI Analysis: Forecast Year (2038)

NO$_2$ DI Analysis - 2038	IMD 0-20%	IMD 20-40%	IMD 40-60%	IMD 60-80%	IMD 80-100%	Total
No. Properties with Improved Air Quality [A]	3,688	0	4	0	383	3,688
No. Properties with No Change in Air Quality [B]	981	286	47	0	13	981
No. Properties with Deteriorating Air Quality [C]	4,604	773	8	0	0	4,604
No. Net Winners / Losers [D] = [A] – [C]	-916	-773	-4	0	383	
Total No. Of Winners / Losers Across All Groups [E] = ∑[D]						-1,310
Net Winners / Losers in Each Area as Percentage of Total [F] = [D] / [E]	69.9%	59.0%	0.3%	0.0%	-29.2%	100.0%
Share of Total Population of Study Area	86.0%	9.8%	0.5%	0.0%	3.7%	100.0%
Assessment Score	XX	XXX	X	Neutral	✓✓✓	

Table 15 shows that adverse conditions are predicted across three of the five quintiles. A benefit is predicted for the least deprived quintile (80-100%). It is predicted that 3,688 properties will experience an improvement in annual mean NO$_2$ concentrations whilst 4,604 properties will experience a deterioration. Approximately 12.3% of properties are predicted to experience no change in NO$_2$ concentrations in the forecast year of assessment.

Table 16 shows the impact from concentrations of PM$_{10}$ resulting from the Scheme for each quintile, extrapolated from England IMD[14] in the forecast year of assessment (2038). Figure 6 of Appendix D (separate document) presents an illustration of the forecast year PM$_{10}$ DI analysis.

Table 16 – PM$_{10}$ DI Analysis: Forecast Year (2038)

PM$_{10}$ DI Analysis - 2038	IMD 0-20%	IMD 20-40%	IMD 40-60%	IMD 60-80%	IMD 80-100%	Total
No. Properties with Improved Air Quality [A]	2,915	0	0	0	32	2,947
No. Properties with No Change in Air Quality [B]	2,770	365	45	0	364	3,544
No. Properties with Deteriorating Air Quality [C]	3,588	694	14	0	0	4,296
No. Net Winners / Losers [D] = [A] – [C]	-673	-694	-14	0	32	
Total No. of Winners / Losers Across All Groups [E] = ∑[D]						-1,349
Net Winners / Losers in Each Area as Percentage of Total [F] = [D] / [E]	49.9%	51.4%	1.0%	0.0%	-2.4%	100.0%
Share of Total Population of Study Area	86.0%	9.8%	0.5%	0.0%	3.7%	100.0%

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PM$_{10}$ DI Analysis - 2038	IMD 0-20%	IMD 20-40%	IMD 40-60%	IMD 60-80%	IMD 80-100%	Total
Assessment Score	XX	XXX	X	Neutral	✓	

Table 16 presents adverse impacts across for three of the five quintiles. It is predicted that 2,947 properties will experience an improvement in PM$_{10}$ concentrations whilst 4,296 properties will experience a deterioration. Approximately 32.9% of properties are predicted to experience no change in annual mean PM$_{10}$ concentrations in the forecast year.

Table 17 shows the impact from concentrations of PM$_{2.5}$ resulting from the Scheme for each quintile, extrapolated from the England IMD[14] in the forecast year of assessment (2038). Figure 7 of Appendix D presents an illustration of the forecast year PM$_{2.5}$ DI analysis.

Table 17 – PM$_{2.5}$ DI Analysis: Forecast Year (2038)

PM$_{2.5}$ DI Analysis - 2038	IMD 0-20%	IMD 20-40%	IMD 40-60%	IMD 60-80%	IMD 80-100%	Total
No. Properties with Improved Air Quality [A]	2,179	0	0	0	66	2,245
No. Properties with No Change in Air Quality [B]	4,332	649	59	0	330	5,370
No. Properties with Deteriorating Air Quality [C]	2,762	410	0	0	0	3,172
No. Net Winners / Losers [D] = [A] – [C]	-583	-410	0	0	66	
Total No. of Winners / Losers Across All Groups [E] = ∑[D]						-927
Net Winners / Losers in Each Area as Percentage of Total [F] = [D] / [E]	62.9%	44.2%	0.0%	0.0%	-7.1%	100.0%
Share of Total Population of Study Area	86.0%	9.8%	0.5%	0.0%	3.7%	100.0%
Assessment Score	XX	XXX	Neutral	Neutral	✓	

Table 17 presents adverse impacts for the 0-20% and 20-40% quintiles and beneficial conditions for the least deprived (80-100%) quintile. It is predicted that 2,245 properties will experience an improvement in annual mean PM$_{2.5}$ concentrations whilst 3,172 properties will experience a deterioration. The majority of properties (49.8%) are predicted to experience no change in annual mean PM$_{2.5}$ concentrations.

SCHOOLS (INCLUDING NURSERIES)

TAG Unit A4.2[9] requires that consideration be given to the impact of the Scheme on the young (aged under 16 years old).

As detailed in Table 10, the LSOAs with the largest proportion of children are generally those in the more deprived areas (quintile 0-20%). In order to quantify the effect on young people, TAG guidance[9] directs that the change in local air quality predicted at education facilities (e.g. schools and nurseries) within the study area should be presented.

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As such, Table 18, Table 19 and Table 20 below present the predicted results in regard to annual mean NO_2, PM_{10} and $PM_{2.5}$ for those education facilities situated within the air quality study area, based on the local air quality workbook outputs.

Table 18 – DI Analysis: Schools in Air Quality Study Area – Annual Mean NO_2

UPRN	Name	X	Y	NO_2 DM 2023	NO_2 DS 2023	NO_2 Ch 2023	NO_2 DM 2038	NO_2 DS 2038	NO_2 Ch 2038
10023463893	Great Yarmouth Day Services	652288	305775	15.4	16.0	0.6	12.3	12.8	0.5
10023465074	Great Yarmouth Primary Academy	652958	306204	13.2	13.6	0.4	11.3	11.6	0.3
100091565049	Cobholm Primary Academy	651549	307616	14.1	13.8	-0.3	11.3	11.1	-0.2
100091566334	Wroughton Infant Academy	651964	305009	14.2	14.4	0.2	11.8	11.9	0.1
10023465725	Southtown PS	651801	306937	13.5	12.6	-0.9	10.7	10.2	-0.5
10012180736	St. Nicholas Priory PS	652502	307839	17.9	17.0	-0.9	14.7	13.9	-0.8
200001062904	Wroughton Junior School	651968	305130	14.2	14.4	0.2	11.8	11.9	0.1
10023465732	St. Georges PS	652930	307066	14.0	14.3	0.3	11.8	11.9	0.1
100091566146	Lynn Grove Academy	651380	304823	10.1	10.2	0.1	8.6	8.6	0.0
200004451016	St. Mary & St. Peter Catholic PS	652421	304692	13.1	13.4	0.3	10.3	10.6	0.3
10093370734	Trafalgar College	651675	306629	16.9	15.4	-1.5	12.8	12.0	-0.8

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Table 19 – DI Analysis: Schools in Air Quality Study Area – Annual Mean PM$_{10}$

UPRN	Name	X	Y	PM$_{10}$ DM 2023	PM$_{10}$ DS 2023	PM$_{10}$ Ch 2023	PM$_{10}$ DM 2038	PM$_{10}$ DS 2038	PM$_{10}$ Ch 2038
10023463893	Great Yarmouth Day Services	652288	305775	16.0	16.2	0.2	16	16.1	0.1
10023465074	Great Yarmouth Primary Academy	652958	306204	17.4	17.5	0.1	17.2	17.3	0.1
100091565049	Cobholm Primary Academy	651549	307616	16.0	15.9	-0.1	15.9	15.8	-0.1
100091566334	Wroughton Infant Academy	651964	305009	14.5	14.5	0.0	14.4	14.5	0.1
10023465725	Southtown PS	651801	306937	14.9	14.6	-0.3	14.9	14.6	-0.3
10012180736	St. Nicholas Priory PS	652502	307839	19.2	19.1	-0.1	19.2	19.0	-0.2
200001062904	Wroughton Junior School	651968	305130	14.5	14.5	0.0	14.4	14.5	0.1
10023465732	St. Georges PS	652930	307066	18.3	18.4	0.1	18.2	18.2	0.0
100091566146	Lynn Grove Academy	651380	304823	15.0	15.0	0.0	14.8	14.8	0.0
200004451016	St. Mary & St. Peter Catholic PS	652421	304692	16.8	16.9	0.1	16.7	16.8	0.1
10093370734	Trafalgar College	651675	306629	15.7	15.3	-0.4	15.7	15.3	-0.4

Table 20 – DI Analysis: Schools in Air Quality Study Area – Annual Mean PM$_{2.5}$

UPRN	Name	X	Y	PM$_{2.5}$ DM 2023	PM$_{2.5}$ DS 2023	PM$_{2.5}$ Ch 2023	PM$_{2.5}$ DM 2038	PM$_{2.5}$ DS 2038	PM$_{2.5}$ Ch 2038
10023463893	Great Yarmouth Day Services	652288	305775	11.2	11.2	0.0	11.0	11.1	0.1
10023465074	Great Yarmouth Primary Academy	652958	306204	12.8	12.8	0.0	12.6	12.6	0.0
100091565049	Cobholm Primary Academy	651549	307616	11.4	11.4	0.0	11.3	11.2	-0.1
100091566334	Wroughton Infant Academy	651964	305009	9.9	9.9	0.0	9.8	9.8	0.0
10023465725	Southtown PS	651801	306937	10.3	10.1	-0.2	10.2	10.0	-0.2
10012180736	St. Nicholas Priory PS	652502	307839	14.3	14.2	-0.1	14.1	14.0	-0.1
200001062904	Wroughton Junior School	651968	305130	9.9	9.9	0.0	9.8	9.8	0.0
10023465732	St. Georges PS	652930	307066	13.6	13.7	0.1	13.4	13.5	0.1
100091566146	Lynn Grove Academy	651380	304823	10.8	10.8	0.0	10.6	10.6	0.0

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UPRN	Name	X	Y	PM$_{2.5}$ DM 2023	PM$_{2.5}$ DS 2023	PM$_{2.5}$ Ch 2023	PM$_{2.5}$ DM 2038	PM$_{2.5}$ DS 2038	PM$_{2.5}$ Ch 2038
200004451016	St. Mary & St. Peter Catholic PS	652421	304692	12.2	12.2	0.0	12.0	12.1	0.1
10093370734	Trafalgar College	651675	306629	10.7	10.5	-0.2	10.6	10.4	-0.2

Table 18, Table 19 and Table 20 show that there are no predicted exceedances of the annual mean NO$_2$, PM$_{10}$ or PM$_{2.5}$ air quality objectives at any of the 11 identified educational receptor locations considered within the air quality study area.

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5 ACCIDENTS

Changes in accident rates are often attributed to the integration of transport schemes which result in changes in traffic flows. Most accidents related to transport occur on the road network where there is a strong link between both vulnerable groups and deprivation. Further to this, it is noted that a child from a more deprived area is more likely to be involved in a fatal road accident than a child from a higher social class.

Any intervention that results in increases to traffic levels and speeds or reduces physical separation between people and traffic can give rise to increases in accidents. The approach for the DI appraisal of accidents uses data from the COBA-LT accident assessment as well as STATS 19 data from the DfT's Road Casualties online database for 2014 to 2018.

The approach identifies the screening process (Step 1) before identifying the accident locations (Step 2a). Step 2b assesses any impacts on vulnerable groups while Step 2c identifies any amenities within the impact area that are likely to be used by these vulnerable groups.

A full appraisal is carried out in Step 3 to determine the impacts.

5.1 SCREENING (STEP 1)

The scheme is expected to impact on vehicle flow, speed and HDV use in addition to a shift in the number of pedestrians and cyclists (+/- 10%) using the local road network. The scheme also includes changes to road alignments around the landings of the bridge on either side of the river and therefore a full distributional accident assessment is appropriate.

5.2 ASSESSMENT – AREAS OF IMPACT (STEP 2A)

The impact area has been defined from the COBALT analysis and includes key modelled network links within 1km of the scheme that will be directly affected.

Forecast changes in accidents from the COBALT assessment were analysed to identify all links within the impact area with a change in accident rate of +/- 10%, as shown in Plate 8. All links that changed by 10% or more were displayed within GIS along with the observed accident locations categorised by severity (2014-2018).

5.3 ASSESSMENT - IDENTIFICATION OF VULNERABLE GROUPS IN IMPACT AREA (STEP 2B)

Within the impact area, there are a number of vulnerable groups including children and older people. In addition, vulnerable users including pedestrians, cyclists and motorcyclists are assessed along with young male drivers and those living within the IMD most 5% deprived areas.

Table 21 details the proportion of the population under 16 and 70+ in the impact area. This analysis indicates that there is a higher than national and regional (Norfolk) proportion of children living in the impact area and a lower proportion of older people.

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Table 21 - Proportion of Vulnerable Groups in Population of Impact Area

Proportion of Population	Impact Area	Norfolk	England and Wales
Proportion of Population under 16	23%	17%	19%
Proportion of Population over 70	9%	15%	12%

5.4 ASSESSMENT – AMENITIES IN THE IMPACT AREA (STEP 2C)

The concentration of vulnerable groups is not only dependant on the resident population but also on local amenities within the impact area that may attract visitors from vulnerable groups.

A number of amenities including schools, health facilities and local attractions have been identified within 1km of the scheme. The locations of amenities in the impact area are shown in Plate 8.

The proportion of children, young adults and older people in the impact area, and amenities within the impact area for this assessment are summarised in Appendix E.

5.5 APPRAISAL OF IMPACT: CORE ANALYSIS (STEP 3A)

The distributional impact appraisal of accidents uses STATS 19 data from the DfT's Road Casualties online database for the five-year period between July 2013 and May 2018.

The number of casualties on the main roads in the impact area are shown in Table 22. As there were over 50 casualties recorded in the impact area from 2014-2018, a detailed appraisal will be conducted. This appraisal will involve consideration of the impact of the Scheme on each vulnerable group, identified in Step 2b, for each main road in the impact area where there were recorded accidents 2014-2018.

It should be noted that conducting a road by road analysis will inevitably lead to small numbers of casualties on the individual links, meaning that the proportion of casualties from each vulnerable group may not be statistically strong or indicate a particular issue in that area due to small sample sizes. Where total casualty numbers on individual links are small (<5), these links have been presented for completeness but are indicated in italics.

Table 22 - 2014-2018 Casualties in Impact Area by Road

Roads in Impact Area	Total Casualties
A47	39
A143	16
A1243	9
B1370	1
Local Roads	45
Location Not Included in Model Network	43
All	153

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The roads included in the accident assessment, including a breakdown of local roads considered, is shown in Plate 7. As the plan shows, not all accident locations in the impact area were included in the analysis. This is due to some accidents occurring in off-road locations such as car parks and on small residential streets that were not included in the traffic model and therefore could not be included in the COBALT assessment.

Plate 7 - Roads in Accident Distributional Impact Assessment
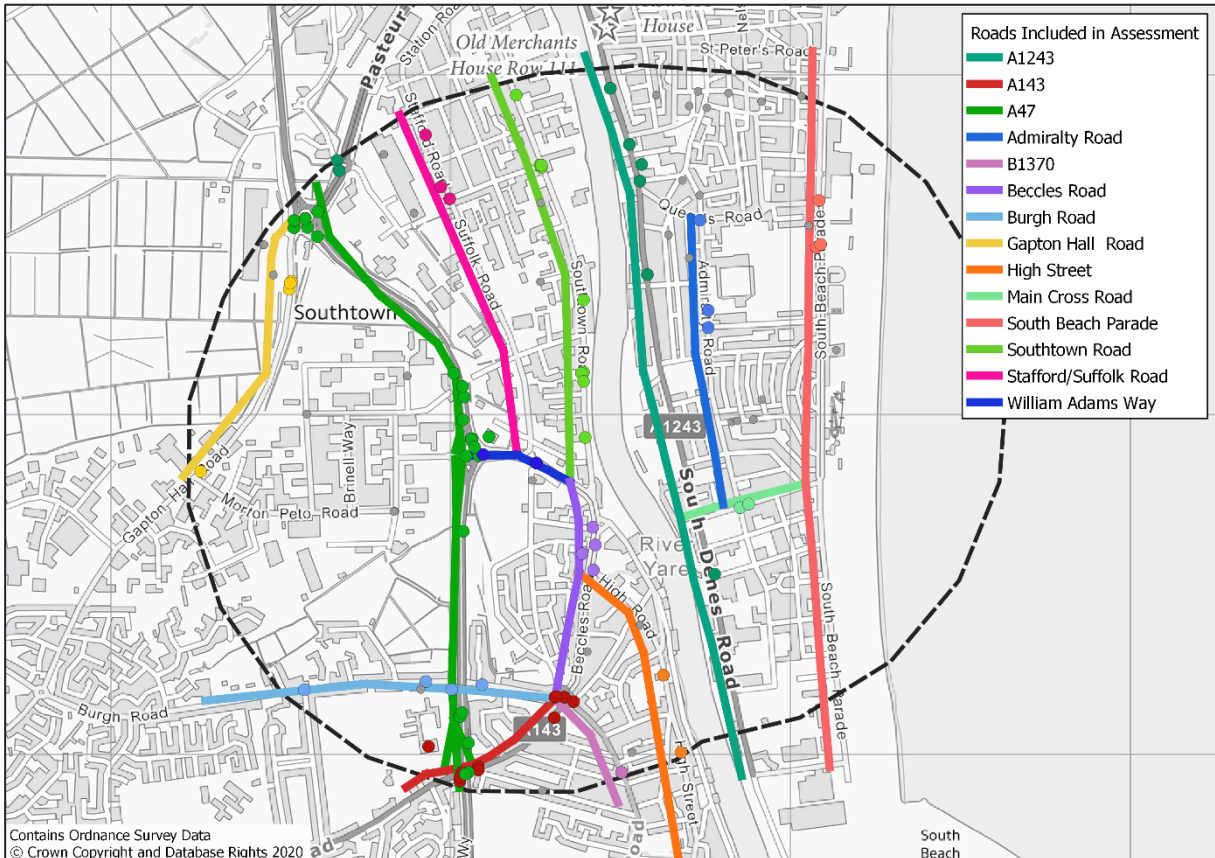
As discussed in Step 2a, accident locations have been plotted on a map by severity alongside the links that experience a -/+10% change in accident rates based on the COBA-LT analysis (Plate 8). This information will be combined with 2011 census data and further casualty data from STATS19 to understand the potential impact of the Scheme on each vulnerable group in the following sections.

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Plate 8 - Links with +/-10% Change in Accident Rates and STATS19 Data 2013-2018 by Severity
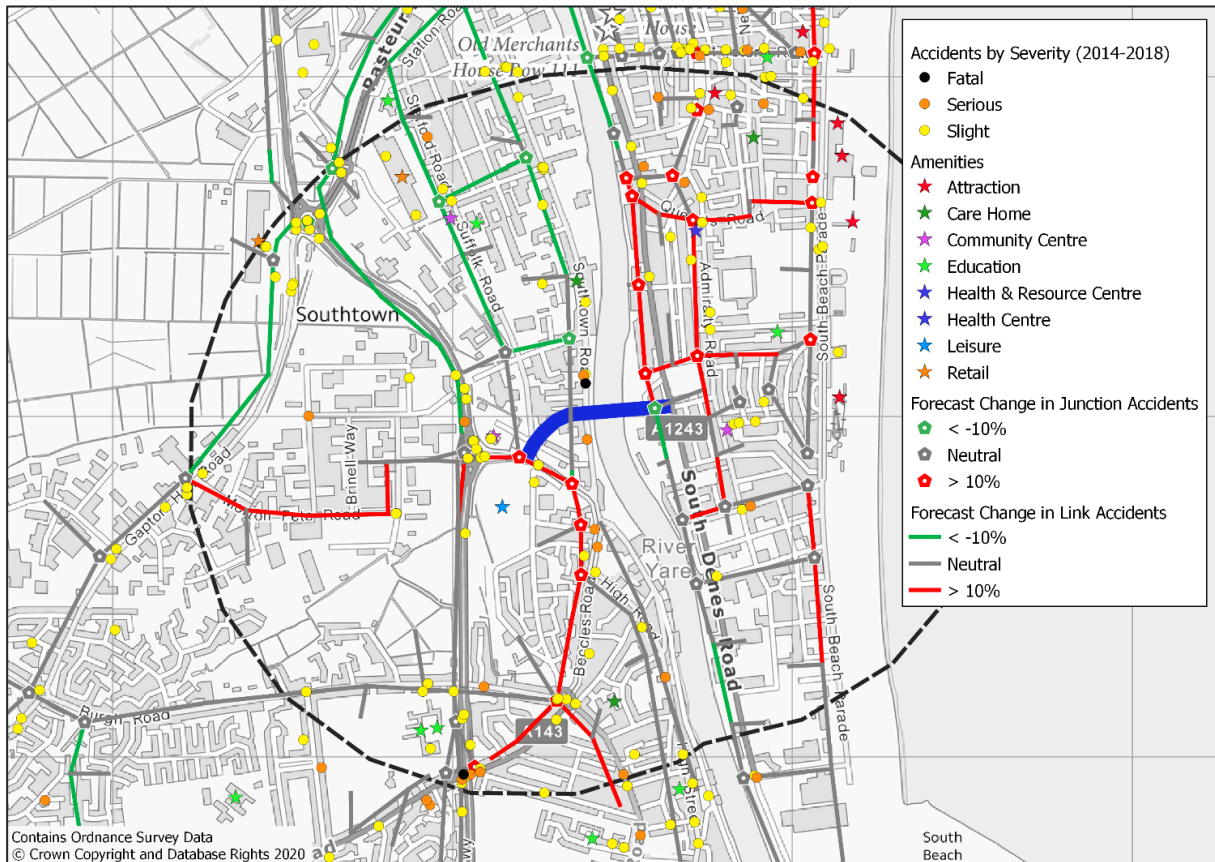
IMPACT ON AREAS OF DEPRIVATION

Plate 9 shows the observed distribution of accidents and forecast change in accidents in the impact area alongside the Index of Multiple Deprivation (2019) ranking for each LSOA in the area. As can be seen in the figure, most of the impact area falls within the lowest quintile of the rankings. The COBALT results indicate that the Scheme has a varying impact on accidents across the impact area, with some links forecast to experience a reduction in accidents and some an increase.

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Plate 9 - Accidents Distributional Analysis - Index of Multiple Deprivation
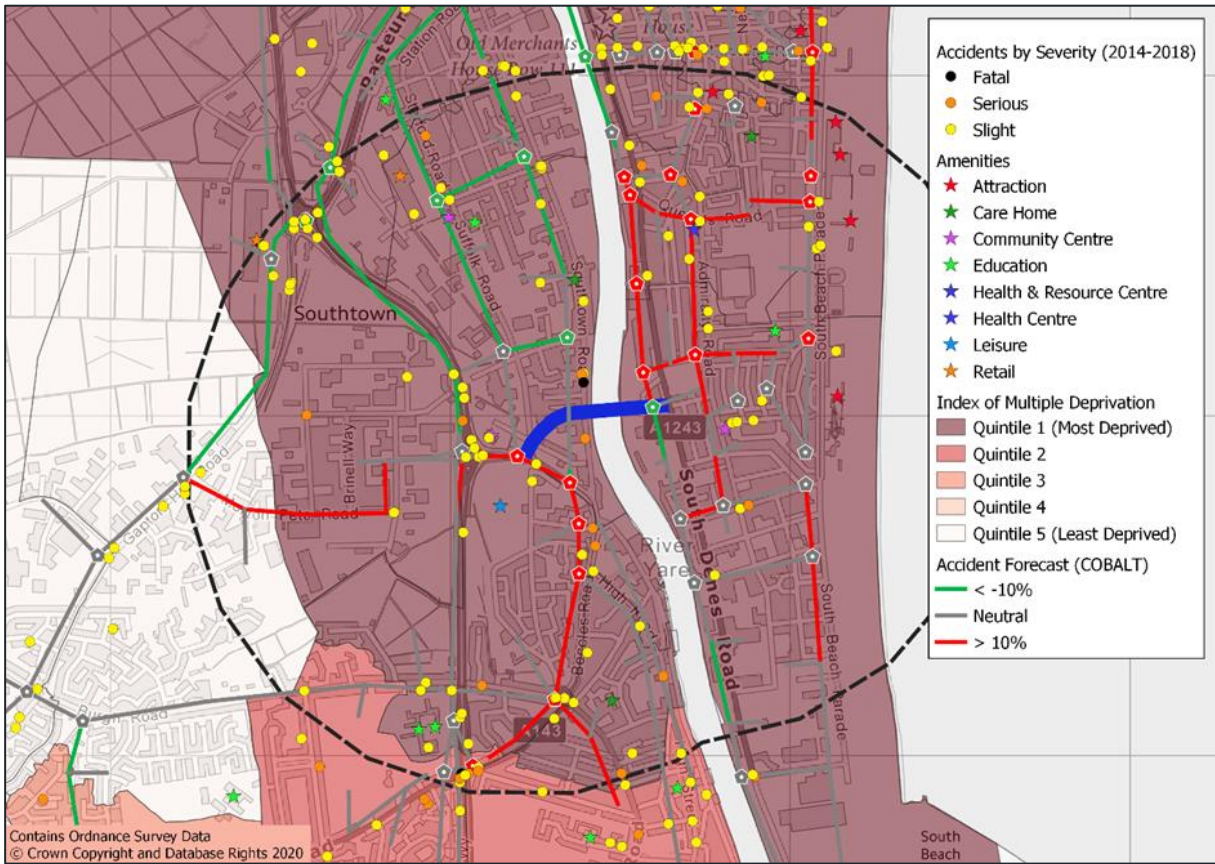
IMPACT ON CHILDREN

The distribution of accidents involving casualties under 16 is shown in Plate 10 alongside amenities used by children, such as schools. Highlighted areas on the figure show LSOAs with a higher than national average proportion of children in the population (>19%). The figure shows that the majority of the impact area has a higher than average proportion of children in the population and that amenities likely to be used by children are spread throughout the area.

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Plate 10 – Accidents Distributional Analysis - Casualties under 16

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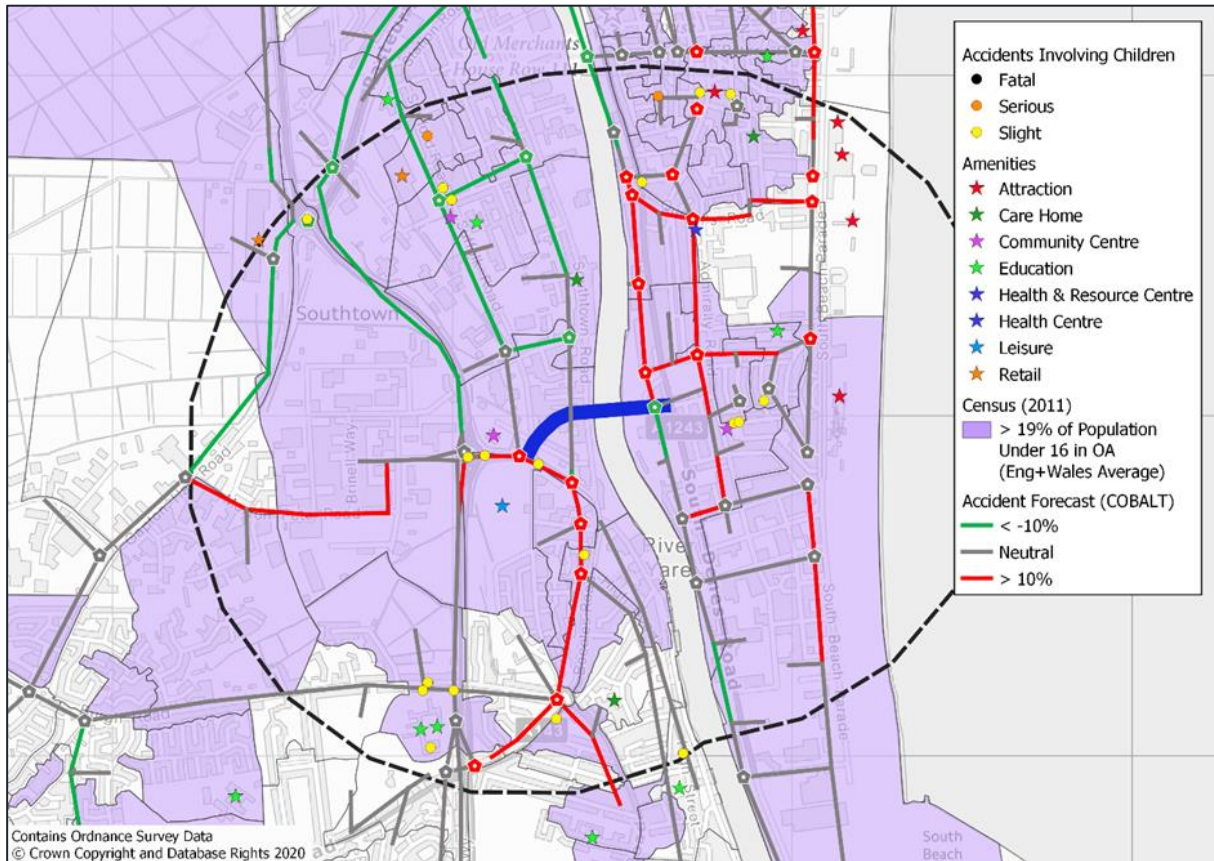
Table 23 shows the calculations undertaken to derive an assessment score for the impact of the Scheme on accidents involving children. The proportion of casualties under 16 on the main roads in the impact area is compared with national average to understand if children are significantly affected by accidents at any location. The casualty proportions are used in combination with the forecast change in accidents, derived from the COBALT assessment, to assign a score to each road. The scoring is undertaken using the criteria set out in Table 11 of TAG Unit A4-2.

Over all accidents in the impact area 2014-2018, 14% of casualties were under 16. This is slightly higher than the national average of 10%.

An accident cluster was identified on Stafford/Suffolk Road where there were 3 casualties under 16, all as either pedestrians or cyclists. There are amenities in the area of the accidents and a higher than average proportion of children living in the area which could contribute to the increased number of casualties. The Scheme is forecast to result in a reduction in accidents along this road.

The individual link assessments resulted in a range of scores, the most common being **Moderate Adverse**. When calculated using the mean, the average score across all links assessed was **Slight Adverse**.

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Table 23 - Scheme Assessment – Casualties under 16

Roads in Impact Area	Total Casualties	% Casualties <16 - Impact Area	% Casualties <16 - National	COBALT Forecast Change in Accidents	Assessment
A47	39	3%	8%	> 10% reduction in accidents north of Harfreys Roundabout, neutral south of Harfreys	Slight Beneficial
A143	16	19%	8%	> 10% increase in accidents	Large Adverse
A1243	9	11%	8%	> 10% increase in accidents south of Queens Road, > 10% decrease in accidents north of Queens Road	Neutral
B1370	*1*	*0%*	*10%*	*> 10% increase in accidents*	*Moderate Adverse*
Local Roads	45	18%	14%	See **Local Roads Detailed Analysis**	
Not Modelled	43	21%	14%	N/A	N/A
All	**153**	**14%**	**10%**		

Local Roads Detailed Analysis	Total Casualties	% Casualties <16 - Impact Area	% Casualties <16 - National	COBALT Forecast Change in Accidents	Assessment
Admiralty Road	6	0%	14%	> 10% increase in accidents	Moderate Adverse
Beccles Road	*3*	*0%*	*14%*	*> 10% increase in accidents*	*Moderate Adverse*
Burgh Road	5	40%	14%	Neutral impact on accidents	Neutral
Gapton Hall Road	6	0%	14%	> 10% reduction in accidents	Moderate Beneficial
High Street	*2*	*50%*	*14%*	*Neutral impact on accidents*	*Neutral*

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Roads in Impact Area	Total Casualties	% Casualties <16 - Impact Area	% Casualties <16 - National	COBALT Forecast Change in Accidents	Assessment
Main Cross Road	*2*	*0%*	*14%*	*> 10% increase in accidents*	*Moderate Adverse*
South Beach Parade	*3*	*0%*	*14%*	*> 10% increase in accidents*	*Moderate Adverse*
Southtown Road	11	0%	14%	> 10% reduction in accidents	Moderate Beneficial
Stafford/Suffolk Road	*3*	*100%*	*14%*	*> 10% reduction in accidents*	*Large Beneficial*
William Adams Way	*4*	*50%*	*14%*	*> 10% increase in accidents*	*Large Adverse*

Italic text indicates road with low casualty sample size

IMPACT ON OLDER PEOPLE

The distribution of accidents involving casualties 70 and over is shown in Plate 11 alongside amenities likely to attract people, such as health centres and retail areas. Highlighted areas on the figure show LSOAs with a higher than national average proportion of children in the population (>12%). The figure shows that LSOAs in the south of the impact area have higher than average proportions of older people whilst LSOAs to the north have lower than average.

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Plate 11 - Accidents Distributional Analysis - Casualties 70 and over

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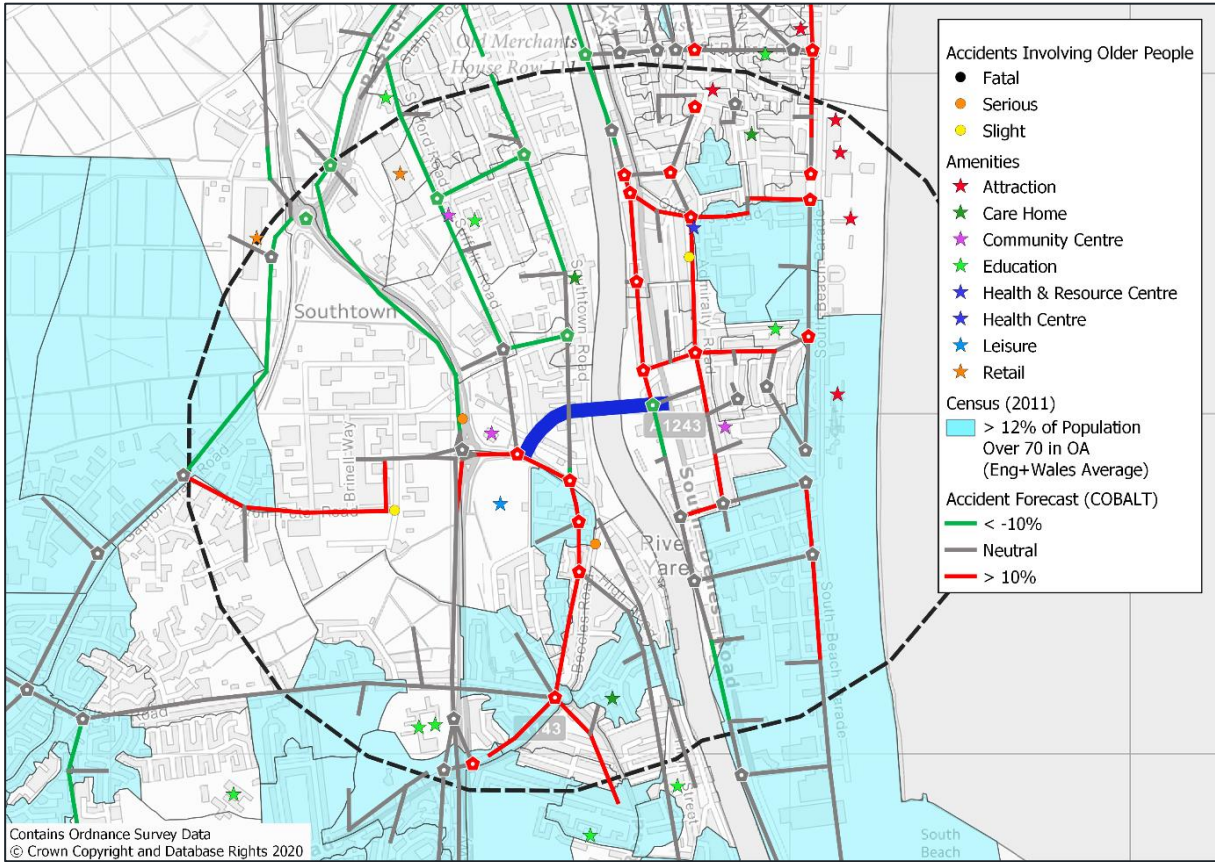
Table 24 shows the calculations undertaken to derive an assessment score for the impact of the Scheme on accidents involving older people. The proportion of casualties 70 and over on the main roads in the impact area is compared with national average to understand if older people are significantly affected by accidents at any location. Using the scoring criteria set out in Table 11 of TAG Unit A4-2, an assessment is made on the impact of the Scheme on accidents involving older people.

Across all accidents in the assessment period, 3% of all casualties in the impact area were 70 and over which is less than the national average of 7%.

From 2014-2018 there were 4 accidents involving older people across the impact area. These accidents occurred on different links across the area and do not suggest a common localised issue.

The individual link assessments resulted in a range of scores, the most common being **Moderate Adverse**. When calculated using the mean, the average score across all links assessed was **Slight Adverse**.

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Table 24 - Scheme Assessment – Casualties 70+

Roads in Impact Area	Total Casualties	% Casualties 70+ - Impact Area	% Casualties 70+ - National	COBALT Forecast Change in Accidents	Assessment
A47	39	3%	6%	> 10% reduction in accidents north of Harfreys Roundabout, neutral south of Harfreys	Slight Beneficial
A143	16	0%	6%	> 10% increase in accidents	Moderate Adverse
A1243	9	0%	6%	> 10% increase in accidents south of Queens Road, > 10% decrease in accidents north of Queens Road	Neutral
B1370	*1*	*0%*	*7%*	*> 10% increase in accidents*	*Moderate Adverse*
Local Roads	45	2%	7%	See **Local Roads Detailed Analysis**	
Not Modelled	43	5%	7%	N/A	N/A
All	**153**	**3%**	**7%**		

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Local Roads Detailed Analysis	Total Casualties	% Casualties 70+ - Impact Area	% Casualties 70+ - National	COBALT Forecast Change in Accidents	Assessment
Admiralty Road	6	0%	7%	> 10% increase in accidents	Moderate Adverse
Beccles Road	*3*	*33%*	*7%*	*> 10% increase in accidents*	*Large Adverse*
Burgh Road	5	0%	7%	Neutral impact on accidents	Neutral
Gapton Hall Road	6	0%	7%	> 10% reduction in accidents	Moderate Beneficial
High Street	*2*	*0%*	*7%*	*Neutral impact on accidents*	*Neutral*
Main Cross Road	*2*	*0%*	*7%*	*> 10% increase in accidents*	*Moderate Adverse*
South Beach Parade	*3*	*0%*	*7%*	*> 10% increase in accidents*	*Moderate Adverse*
Southtown Road	11	0%	7%	> 10% reduction in accidents	Moderate Beneficial
Stafford/Suffolk Road	*3*	*0%*	*7%*	*> 10% reduction in accidents*	Moderate Beneficial
William Adams Way	*4*	*0%*	*7%*	*> 10% increase in accidents*	*Moderate Adverse*

Italic text indicates road with low casualty sample size

IMPACT ON PEDESTRIANS

Recorded accidents involving pedestrian casualties from 2014-2018 are shown in Plate 12 alongside amenities that may generate pedestrian trips. The forecast change in accidents, calculated using COBALT accident analysis software, is also included at an individual link level.

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Plate 12 - Accidents Distributional Analysis - Pedestrian Casualties
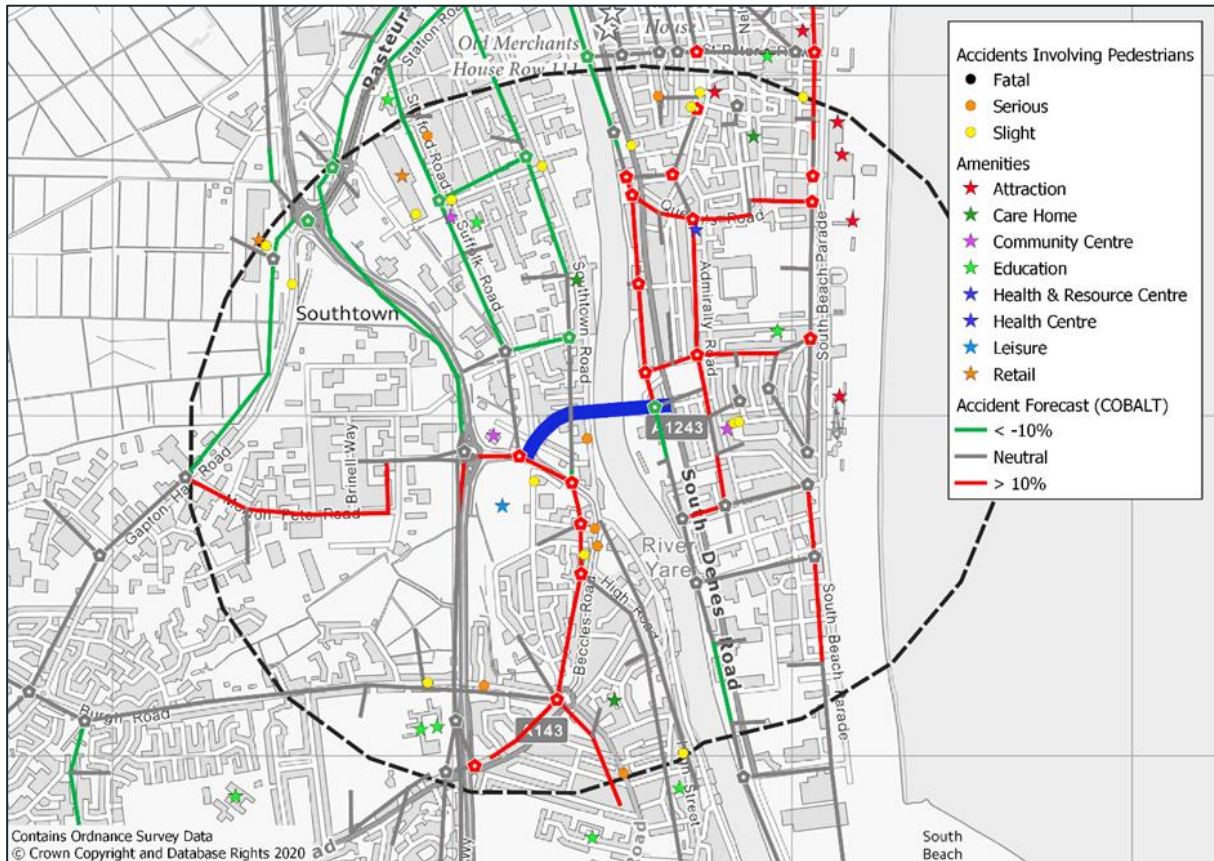
Table 25 presents the data used to inform the assessment of the impact of the Scheme on pedestrian casualties in road accidents. The proportion of pedestrian casualties is compared to the national average by road type to aid in the identification of any local issues. The final column in the table shows the assessment score for the road, derived using the scoring criteria in Table 11 of TAG Unit A4-2.

The proportion of casualties that are pedestrians in the impact area is in line with the national average at 14%.

The previously identified accident cluster on Stafford/Suffolk Road involves pedestrian casualties, which is forecast to benefit from reduced traffic as a result of the Scheme. There were two serious pedestrian casualties recorded on Beccles Road, where an increase in accidents is forecast.

The individual link assessments resulted in a range of scores, the most common being **Moderate Adverse**. When calculated using the mean, the average score across all links assessed was **Slight Adverse**.

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Table 25 - Scheme Assessment – Pedestrian Casualties

Roads in Impact Area	Total Casualties	% Pedestrian Casualties - Impact Area	% Pedestrian Casualties - National	COBALT Forecast Change in Accidents	Assessment
A47	39	0%	10%	> 10% reduction in accidents north of Harfreys Roundabout, neutral south of Harfreys	Slight Beneficial
A143	16	6%	10%	> 10% increase in accidents	Moderate Adverse
A1243	9	11%	10%	> 10% increase in accidents south of Queens Road, > 10% decrease in accidents north of Queens Road	Neutral
B1370	*1*	*100%*	*12%*	*> 10% increase in accidents*	*Large Adverse*
Local Roads	45	22%	20%	See **Local Roads Detailed Analysis**	
Not Modelled	43	21%	20%	N/A	N/A
All	**153**	**14%**	**13%**		

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Local Roads Detailed Analysis	Total Casualties	% Pedestrian Casualties - Impact Area	% Pedestrian Casualties - National	COBALT Forecast Change in Accidents	Assessment
Admiralty Road	6	0%	20%	> 10% increase in accidents	Moderate Adverse
Beccles Road	*3*	*67%*	*20%*	*> 10% increase in accidents*	*Large Adverse*
Burgh Road	5	40%	20%	Neutral impact on accidents	Neutral
Gapton Hall Road	6	17%	20%	> 10% reduction in accidents	Moderate Beneficial
High Street	*2*	*50%*	*20%*	*Neutral impact on accidents*	*Neutral*
Main Cross Road	*2*	*0%*	*20%*	*> 10% increase in accidents*	*Moderate Adverse*
South Beach Parade	*3*	*0%*	*20%*	*> 10% increase in accidents*	*Moderate Adverse*
Southtown Road	11	18%	20%	> 10% reduction in accidents	Moderate Beneficial
Stafford/Suffolk Road	*3*	*67%*	*20%*	*> 10% reduction in accidents*	*Large Beneficial*
William Adams Way	*4*	*0%*	*20%*	*> 10% increase in accidents*	*Moderate Adverse*

Italic text indicates road with low casualty sample size

IMPACT ON CYCLISTS

Recorded accidents involving casualties on bicycles from 2014-2018 are shown in Plate 13 alongside amenities that may generate cycle trips. The forecast change in accidents, calculated using COBALT accident analysis software, is also included at an individual link level.

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Plate 13 - Accidents Distributional Analysis - Cyclist Casualties

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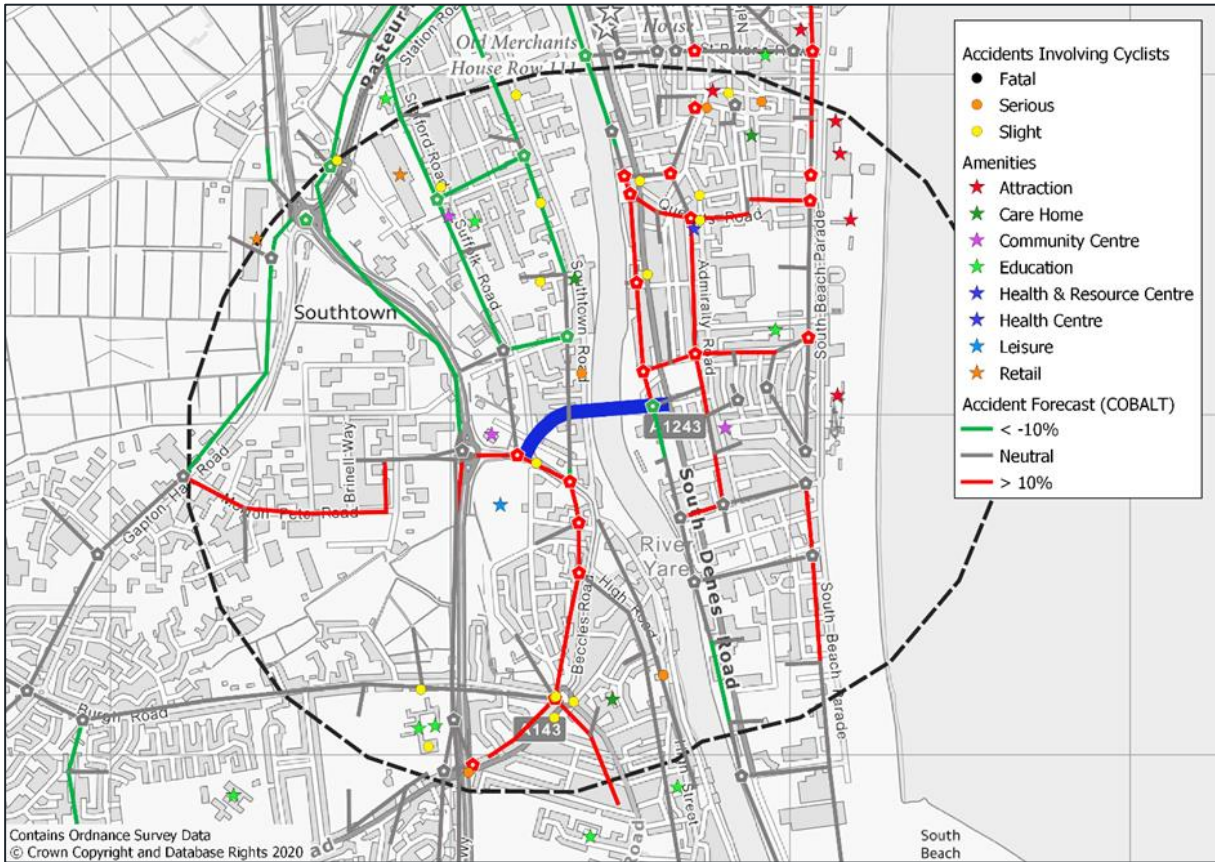
Table 26 presents the analysis undertaken to assess the impact of the Scheme on accidents involving cyclists. The proportion of casualties using bicycles in the impact area is compared to national levels by road type to identify any potential issues in the local area. Scoring criteria from Table 11 of TAG Unit A4-2 is used to assess the impact of the Scheme at a link level.

The proportion of casualties on bicycles in the impact area is slightly higher than national average, at 15% compared to 11%.

There is a cluster of accidents involving cyclists of slight severity around the A143/Burgh Road roundabout, where an increase in accidents is forecast.

The individual link assessments resulted in a range of scores, the most common being **Moderate Adverse**. When calculated using the mean, the average score across all links assessed was **Slight Adverse**.

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Table 26 - Scheme Assessment – Cyclist Casualties

Roads in Impact Area	Total Casualties	% Cyclist Casualties - Impact Area	% Cyclist Casualties - National	COBALT Forecast Change in Accidents	Assessment
A47	39	3%	10%	> 10% reduction in accidents north of Harfreys Roundabout, neutral south of Harfreys	Slight Beneficial
A143	16	31%	10%	> 10% increase in accidents	Large Adverse
A1243	9	33%	10%	> 10% increase in accidents south of Queens Road, > 10% decrease in accidents north of Queens Road	Neutral
B1370	*1*	*0%*	*11%*	*> 10% increase in accidents*	*Moderate Adverse*
Local Roads	45	13%	13%	See **Local Roads Detailed Analysis**	
Not Modelled	43	19%	13%	N/A	N/A
All	**153**	**15%**	**11%**		

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Local Roads Detailed Analysis	Total Casualties	% Cyclist Casualties - Impact Area	% Cyclist Casualties - National	COBALT Forecast Change in Accidents	Assessment
Admiralty Road	6	17%	13%	> 10% increase in accidents	Moderate Adverse
Beccles Road	*3*	*0%*	*13%*	*> 10% increase in accidents*	*Moderate Adverse*
Burgh Road	5	0%	13%	Neutral impact on accidents	Neutral
Gapton Hall Road	6	0%	13%	> 10% reduction in accidents	Moderate Beneficial
High Street	*2*	*50%*	*13%*	*Neutral impact on accidents*	*Neutral*
Main Cross Road	*2*	*0%*	*13%*	*> 10% increase in accidents*	*Moderate Adverse*
South Beach Parade	*3*	*0%*	*13%*	*> 10% increase in accidents*	*Moderate Adverse*
Southtown Road	11	18%	13%	> 10% reduction in accidents	Moderate Beneficial
Stafford/Suffolk Road	*3*	*33%*	*13%*	*> 10% reduction in accidents*	*Large Beneficial*
William Adams Way	*4*	*25%*	*13%*	*> 10% increase in accidents*	*Large Adverse*

Italic text indicates road with low casualty sample size

IMPACT ON MOTORCYCLISTS

Plate 14 shows the recorded accidents 2014-2018 involving motorcycles and amenities that attract people within the local area. The forecast change in accidents is also shown for links within the impact area.

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Plate 14 - Accidents Distributional Analysis - Motorcyclist Casualties
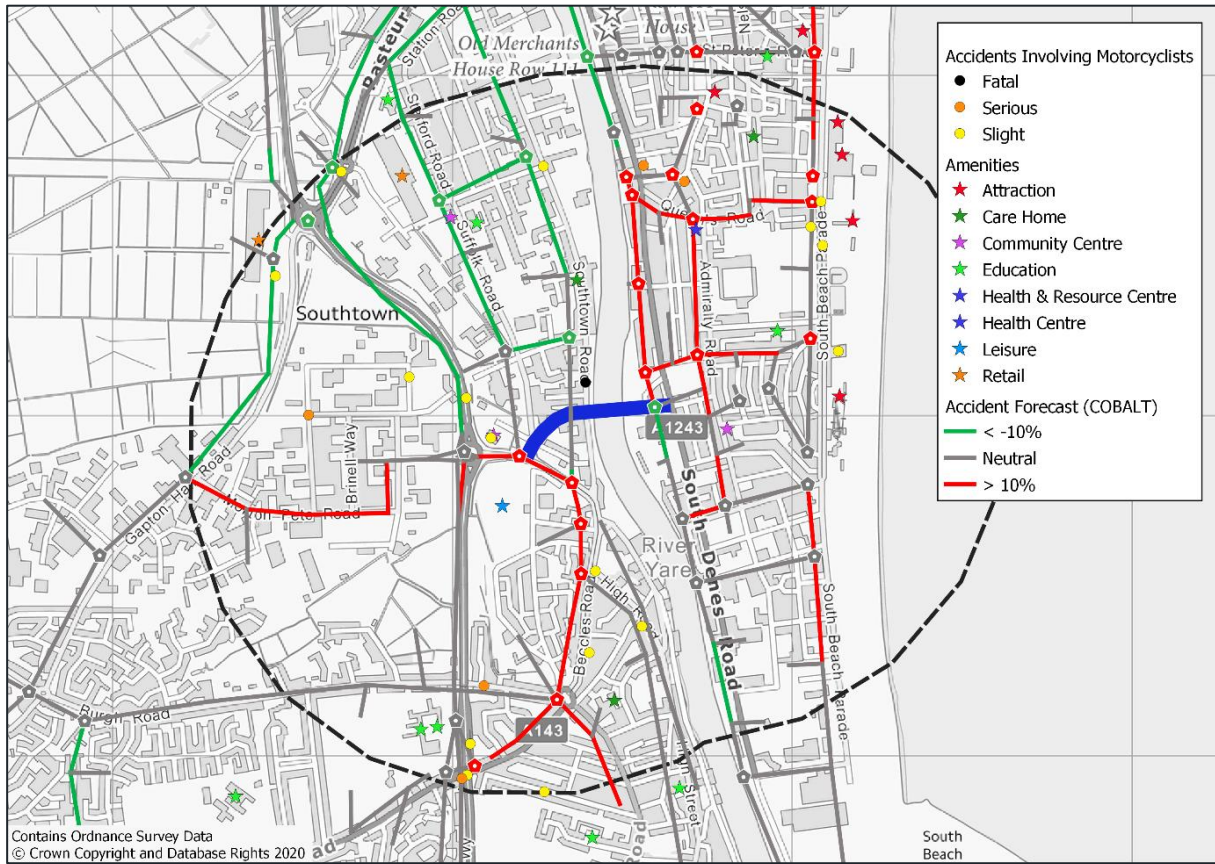
Table 27 compares the proportion of casualties on motorcycles for accidents in the impact area and nationally, in order to identify any locations with significantly high values. This information is used in combination with the forecast change in accidents from COBALT to calculate an assessment score for each road, based on the criteria in Table 11 of TAG Unit A4-2.

The overall proportion of casualties on motorcycles in the impact area is slightly above national average at 16%.

A motorcyclist was involved in a fatal accident on Southtown Road in 2018, the cause of which was found to be dangerous driving by another road user.

The individual link assessments resulted in a range of scores, the most common being **Moderate Adverse**. When calculated using the mean, the average score across all links assessed was **Slight Adverse**.

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Table 27 - Scheme Assessment – Motorcyclist Casualties

Roads in Impact Area	Total Casualties	% Motorcyclist Casualties - Impact Area	% Motorcyclist Casualties - National	COBALT Forecast Change in Accidents	Assessment
A47	39	13%	12%	> 10% reduction in accidents north of Harfreys Roundabout, neutral south of Harfreys	Slight Beneficial
A143	16	6%	12%	> 10% increase in accidents	Moderate Adverse
A1243	9	22%	12%	> 10% increase in accidents south of Queens Road, > 10% decrease in accidents north of Queens Road	Neutral
B1370	*1*	*0%*	*11%*	*> 10% increase in accidents*	*Moderate Adverse*
Local Roads	45	13%	9%	See **Local Roads Detailed Analysis**	
Not Modelled	43	23%	9%	N/A	N/A
All	**153**	**16%**	**11%**		

Local Roads Detailed Analysis	Total Casualties	% Motorcyclist Casualties - Impact Area	% Motorcyclist Casualties - National	COBALT Forecast Change in Accidents	Assessment
Admiralty Road	6	0%	9%	> 10% increase in accidents	Moderate Adverse
Beccles Road	*3*	*33%*	*9%*	*> 10% increase in accidents*	*Large Adverse*
Burgh Road	5	20%	9%	Neutral impact on accidents	Neutral
Gapton Hall Road	6	0%	9%	> 10% reduction in accidents	Moderate Beneficial

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Local Roads Detailed Analysis	Total Casualties	% Motorcyclist Casualties - Impact Area	% Motorcyclist Casualties - National	COBALT Forecast Change in Accidents	Assessment
High Street	*2*	*0%*	*9%*	*Neutral impact on accidents*	*Neutral*
Main Cross Road	*2*	*0%*	*9%*	*> 10% increase in accidents*	*Moderate Adverse*
South Beach Parade	*3*	*67%*	*9%*	*> 10% increase in accidents*	*Large Adverse*
Southtown Road	11	18%	9%	> 10% reduction in accidents	Large Beneficial
Stafford/Suffolk Road	*3*	*0%*	*9%*	*> 10% reduction in accidents*	*Moderate Beneficial*
William Adams Way	*4*	*0%*	*9%*	*> 10% increase in accidents*	*Moderate Adverse*

Italic text indicates road with low casualty sample size

IMPACT ON YOUNG MALE DRIVERS

The locations of accidents involving young male drivers from 2014-2018 are displayed in Plate 15 with local amenities and the forecast change in accidents for links in the impact area.

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Plate 15 - Accidents Distributional Analysis - Young Male Driver Casualties
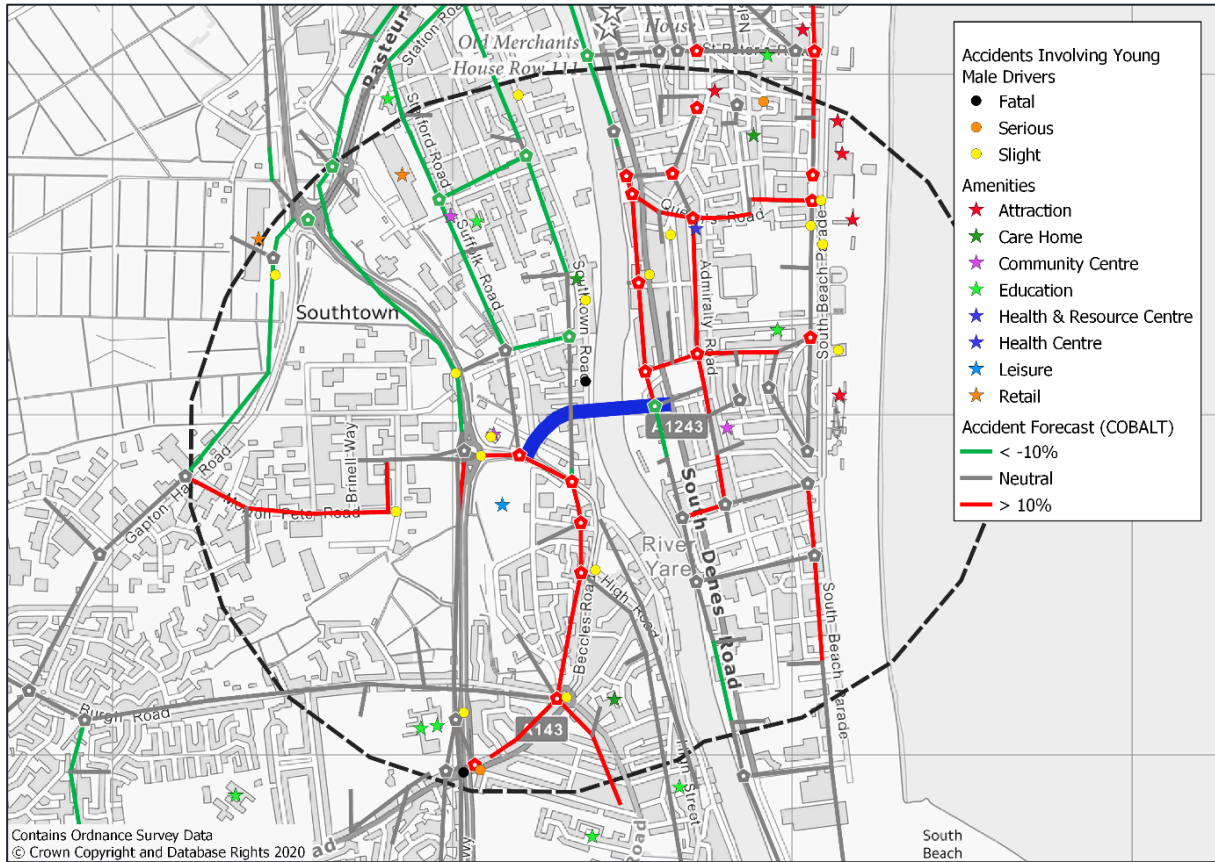
The calculations undertaken to score the impact of the Scheme on accidents involving young male driver casualties are shown in Table 28. The proportion of casualties that are young male drivers for accidents within the impact area is compared to the national average by road type to aid in the identification of local issues for particular vulnerable groups. This comparison is used in combination with the results of the COBALT assessment to determine a score for the road based on the criteria in Table 11 of TAG Unit A4-2.

The overall proportion of young male driver casualties in the area is slightly above national average, 13% compared to 10%.

As noted in the motorcyclist section above, there was a fatal casualty of a young male driver on Southtown Road as a result of dangerous driving by another road user. Another young male driver also suffered a fatal collision on the A143 which was recorded as a suicide.

The individual link assessments resulted in a range of scores, the most common being **Moderate Adverse**. When calculated using the mean, the average score across all links assessed was **Slight Adverse**.

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Table 28 - Scheme Assessment – Young Male Driver Casualties

Roads in Impact Area	Total Casualties	% Young Male Driver Casualties - Impact Area	% Young Male Driver Casualties - National	COBALT Forecast Change in Accidents	Assessment
A47	39	10%	10%	> 10% reduction in accidents north of Harfreys Roundabout, neutral south of Harfreys	Slight Beneficial
A143	16	19%	10%	> 10% increase in accidents	Large Adverse
A1243	9	11%	10%	> 10% increase in accidents south of Queens Road, > 10% decrease in accidents north of Queens Road	Neutral
B1370	*1*	*0%*	*11%*	*> 10% increase in accidents*	*Moderate Adverse*
Local Roads	45	13%	11%	See **Local Roads Detailed Analysis**	
Not Modelled	43	14%	11%	N/A	N/A
All	**153**	**13%**	**10%**		

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Local Roads Detailed Analysis	Total Casualties	% Young Male Driver Casualties - Impact Area	% Young Male Driver Casualties - National	COBALT Forecast Change in Accidents	Assessment
Admiralty Road	6	0%	11%	> 10% increase in accidents	Moderate Adverse
Beccles Road	*3*	*33%*	*11%*	*> 10% increase in accidents*	*Large Adverse*
Burgh Road	5	0%	11%	Neutral impact on accidents	Neutral
Gapton Hall Road	6	0%	11%	> 10% reduction in accidents	Moderate Beneficial
High Street	*2*	*0%*	*11%*	*Neutral impact on accidents*	*Neutral*
Main Cross Road	*2*	*0%*	*11%*	*> 10% increase in accidents*	*Moderate Adverse*
South Beach Parade	*3*	*67%*	*11%*	*> 10% increase in accidents*	*Large Adverse*
Southtown Road	11	27%	11%	> 10% reduction in accidents	Large Beneficial
Stafford/Suffolk Road	*3*	*0%*	*11%*	*> 10% reduction in accidents*	*Moderate Beneficial*
William Adams Way	*4*	*0%*	*11%*	*> 10% increase in accidents*	*Moderate Adverse*

Italic text indicates road with low casualty sample size

5.6 APPRAISAL OF IMPACT: FULL APPRAISAL AND SUMMARY (STEP 3B)

The results from each of the individual vulnerable group assessments are summarised in Table 29 by road. Overall, each group is expected to experience a Slight Adverse impact as a result of the Scheme, although this varies significantly across the roads in the impact area.

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Table 29 - Accident Distributional Impact Assessment Summary

Road	Children	Older People	Young Male Drivers	Pedestrians	Cyclists	M/cyclists
A47	Slight Beneficial	Slight Beneficial	Slight Beneficial	Slight Beneficial	Slight Beneficial	Slight Beneficial
A143	Large Adverse	Moderate Adverse	Large Adverse	Moderate Adverse	Large Adverse	Moderate Adverse
A1243	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
B1370	*Moderate Adverse*	*Moderate Adverse*	*Moderate Adverse*	*Large Adverse*	*Moderate Adverse*	*Moderate Adverse*
Admiralty Road	Moderate Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse
Beccles Road	*Moderate Adverse*	*Large Adverse*	*Large Adverse*	*Large Adverse*	*Moderate Adverse*	*Large Adverse*
Burgh Road	Neutral	Neutral	*Neutral*	Neutral	*Neutral*	*Neutral*
Gapton Hall Road	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial
High Street	*Neutral*	*Neutral*	*Neutral*	*Neutral*	*Neutral*	*Neutral*
Main Cross Road	*Moderate Adverse*	*Moderate Adverse*	*Moderate Adverse*	*Moderate Adverse*	*Moderate Adverse*	*Moderate Adverse*
South Beach Parade	*Moderate Adverse*	*Moderate Adverse*	*Large Adverse*	*Moderate Adverse*	*Moderate Adverse*	*Large Adverse*
Southtown Road	Moderate Beneficial	Moderate Beneficial	Large Beneficial	Moderate Beneficial	Moderate Beneficial	Large Beneficial
Stafford/Suffolk Road	*Large Beneficial*	Moderate Beneficial	*Moderate Beneficial*	*Large Beneficial*	*Large Beneficial*	*Moderate Beneficial*
William Adams Way	*Large Adverse*	*Moderate Adverse*	*Moderate Adverse*	*Moderate Adverse*	*Large Adverse*	*Moderate Adverse*
Overall	**Slight Adverse**	**Slight Adverse**	**Slight Adverse**	**Slight Adverse**	**Slight Adverse**	**Slight Adverse**

Italic text indicates road with low casualty sample size

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6 SEVERANCE

The severance impacts of a transport scheme are often an unintended consequence and are a measure of the scheme's impact on residents' access to local community facilities and services. An assessment is required of for non-motorised users, particularly pedestrians, as stated in TAG Unit A4.2.

6.1 SCREENING

Severance impacts were assessed by considering the detailed drawings of the scheme and forecast changes in vehicle flow. As the scheme provides new road across over the River Yare, one of Great Yarmouth's largest physical barriers, it is expected that the 'severance' of communities would be reduced. The scheme's design incorporates a new pedestrian footway along with a dedicated off-carriageway cycle lane.

There are some roads within the impact area that would experience potential changes in severance as a result of increases or decreases in traffic volumes. Therefore, it is appropriate to examine these areas further to understand the severance impacts on vulnerable groups.

6.2 ASSESSMENT – AREAS OF IMPACT (STEP 2A)

The impact area has been defined through the severance analysis, described in the social impacts appraisal section in TAG Unit A4.1. A 1km buffer was applied around the scheme alignment within the impact area. Within this 1km buffer, changes in severance as a result of changes to road alignments, road closures, infrastructure and vehicle flow were assessed. Although there are links outside of the 1km buffer that experience significant changes in the above, the assessment only focuses on the local area where the most concentrated impacts are anticipated.

6.3 ASSESSMENT - IDENTIFICATION OF SOCIAL GROUPS IN IMPACT AREA (STEP 2B)

Vulnerable groups are particularly sensitive to the effects of severance. Within these vulnerable groups are children, older people, people with disabilities and households with no access to a car. Table 30 shows the proportion of these vulnerable groups within the scheme area along with regional and national comparisons.

Table 30 – Vulnerable Groups

Vulnerable Group	% Impact Area	% Norfolk	% England
Older People (Aged 70+)	9.2%	15.4%	7.7%
Children (Aged Under 16)	22.7%	16.9%	18.9%
No Car Households	16.8%	18.8%	25.8%
Residents with long-term health problems or disabilities	20.2%	20.1%	7.8%

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6.4   ASSESSMENT – AMENITIES IN THE IMPACT AREA (STEP 2C)

The severance impact area contains a number of local amenities (Plate 16) that are likely to generate trips from the wider area in addition to local residents. These include 2 Primary schools, 1 Junior school, 1 Infant school, 1 College and various hotels and shops. Also within the impact area is the Gapton Hall Retail Park, Southtown Common Recreation Ground, the Sea Life Centre, Pleasure Beach and a number of different attractions along the sea front which are likely to attract high numbers of children.

Plate 16 - Amenities within Impact Area and Traffic Flow Changes
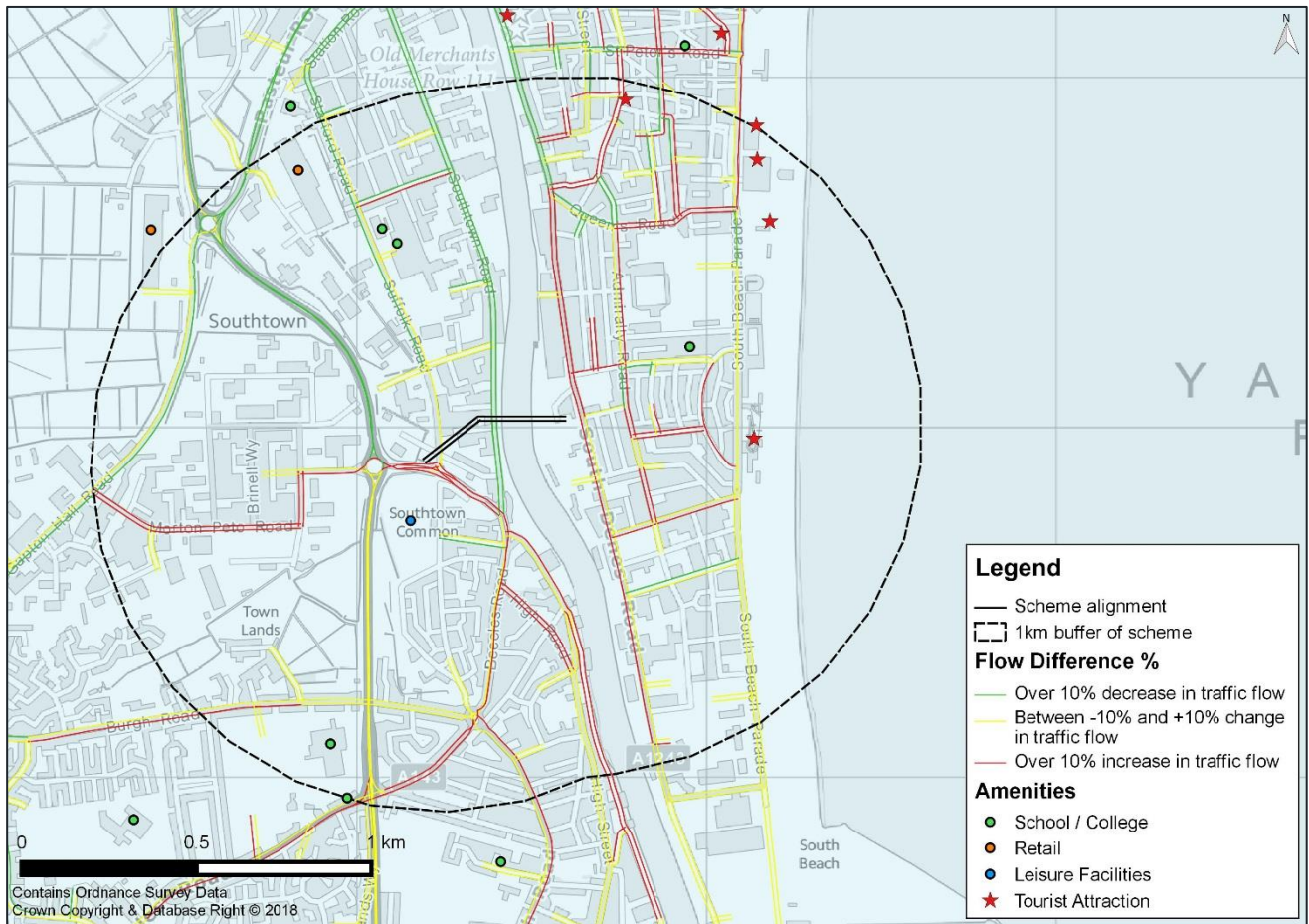
The proportion of children, older people, people with disabilities and households without access to a car in the impact area, and amenities within the impact area for this assessment are summarised in Appendix E.

6.5   APPRAISAL OF IMPACT (STEP 3)

The assessment for severance includes locations within 1km of the scheme where the road network experiences significant changes (>10%) in traffic flows where there are concentrations of vulnerable groups. Changes in vehicle flow have the potential to impact on people's ability to access schools and other amenities in addition to affecting the permeability of roads.

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During the severance assessment, the populations of vulnerable groups at output area level have been examined to identify any areas where there are high concentrations in close proximity to links where vehicle flows are expected to significantly increase of decrease as shown in Plates 11-14.

Plate 17 - Distribution of Traffic Flow Changes against Concentrations of Older People (Aged over 70)

It can be seen that in some areas, the redistribution of traffic across the highway network leads to an increase in directional traffic flows in areas with high concentrations of vulnerable groups. Those links close to the scheme alignment include Beccles Road, Church Road, South Denes Road and Burgh Road amongst other smaller links.

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Plate 18 - Distribution of Traffic Flow Changes against Concentrations of People with a Disability

Legend

— Scheme alignment
⌐ ¬ 1km buffer of scheme
Flow Difference %
— Over 10% decrease in traffic flow
— Between -10% and +10% change in traffic flow
— Over 10% increase in traffic flow
Proportion of Population with a Disability
▨ Over 20%

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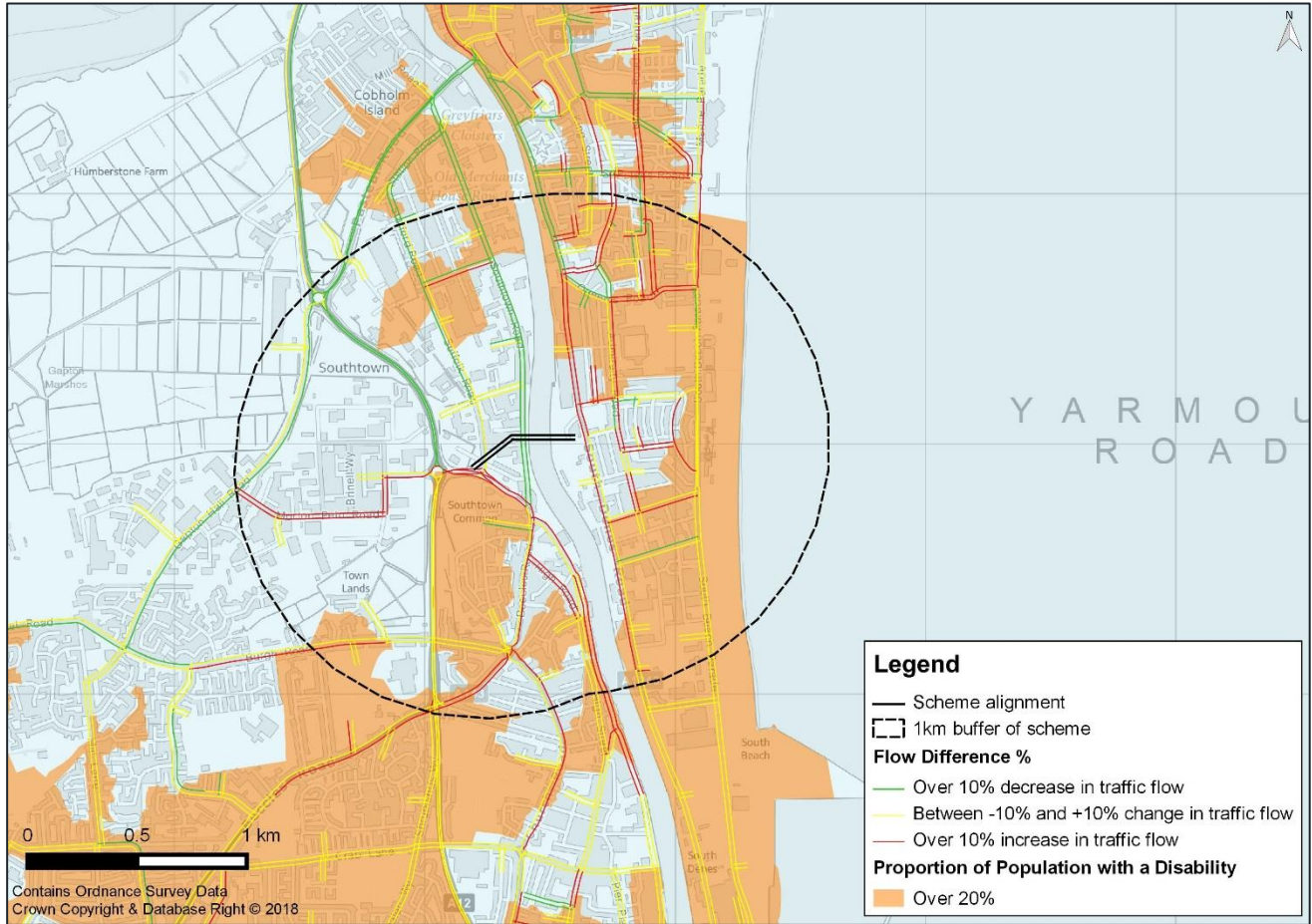
Plate 19 - Distribution of Traffic Flow Changes against Concentrations of Children (Aged under 16)

Legend
— Scheme alignment
[ ] 1km buffer of scheme
Flow Difference %
— Over 10% decrease in traffic flow
— Between -10% and +10% change in traffic flow
— Over 10% increase in traffic flow
Proportion of Population under 16 years old
■ Over 20%

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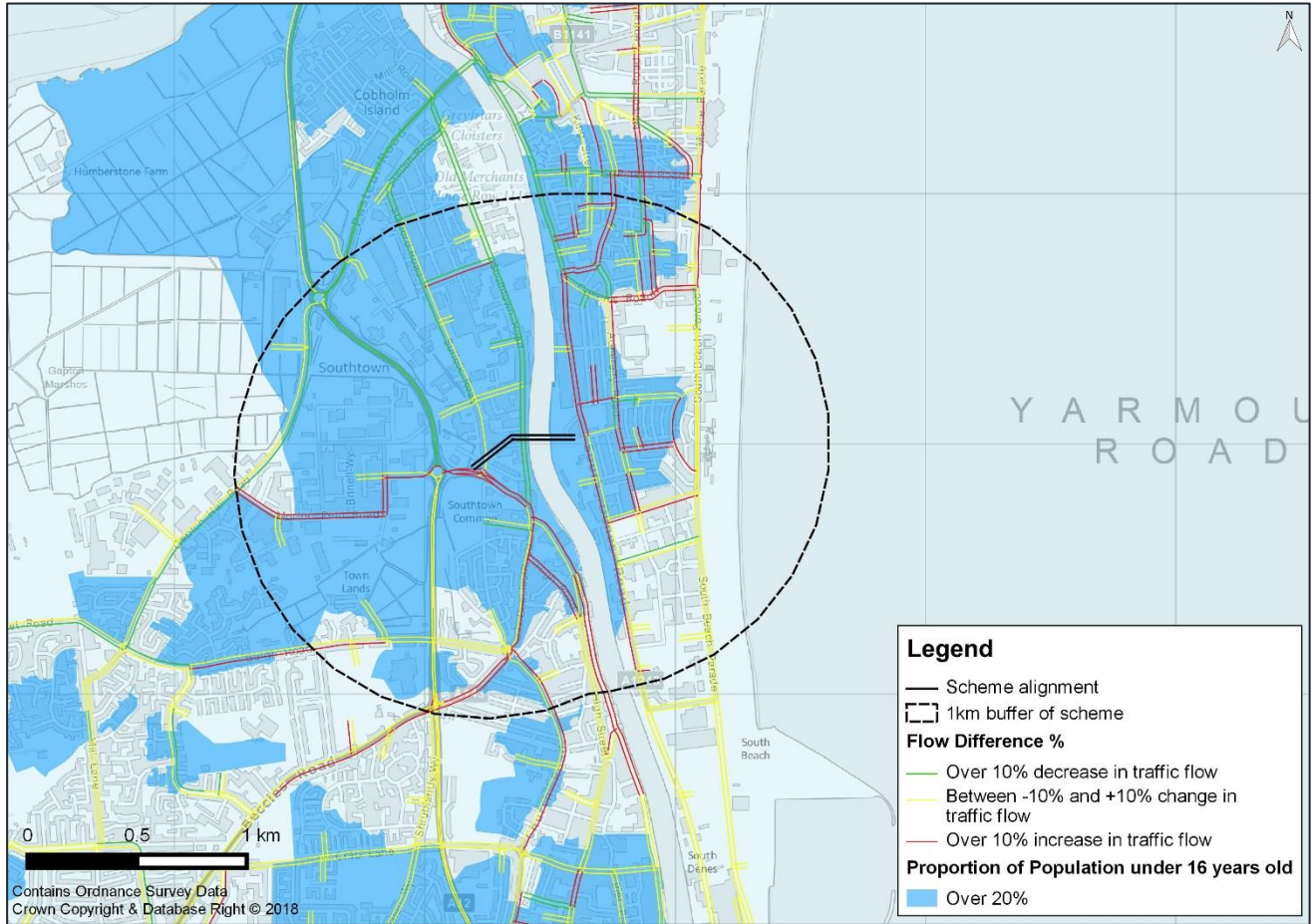September 2020
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Plate 20 - Distribution of Traffic Flow Changes against Concentrations No Car Households
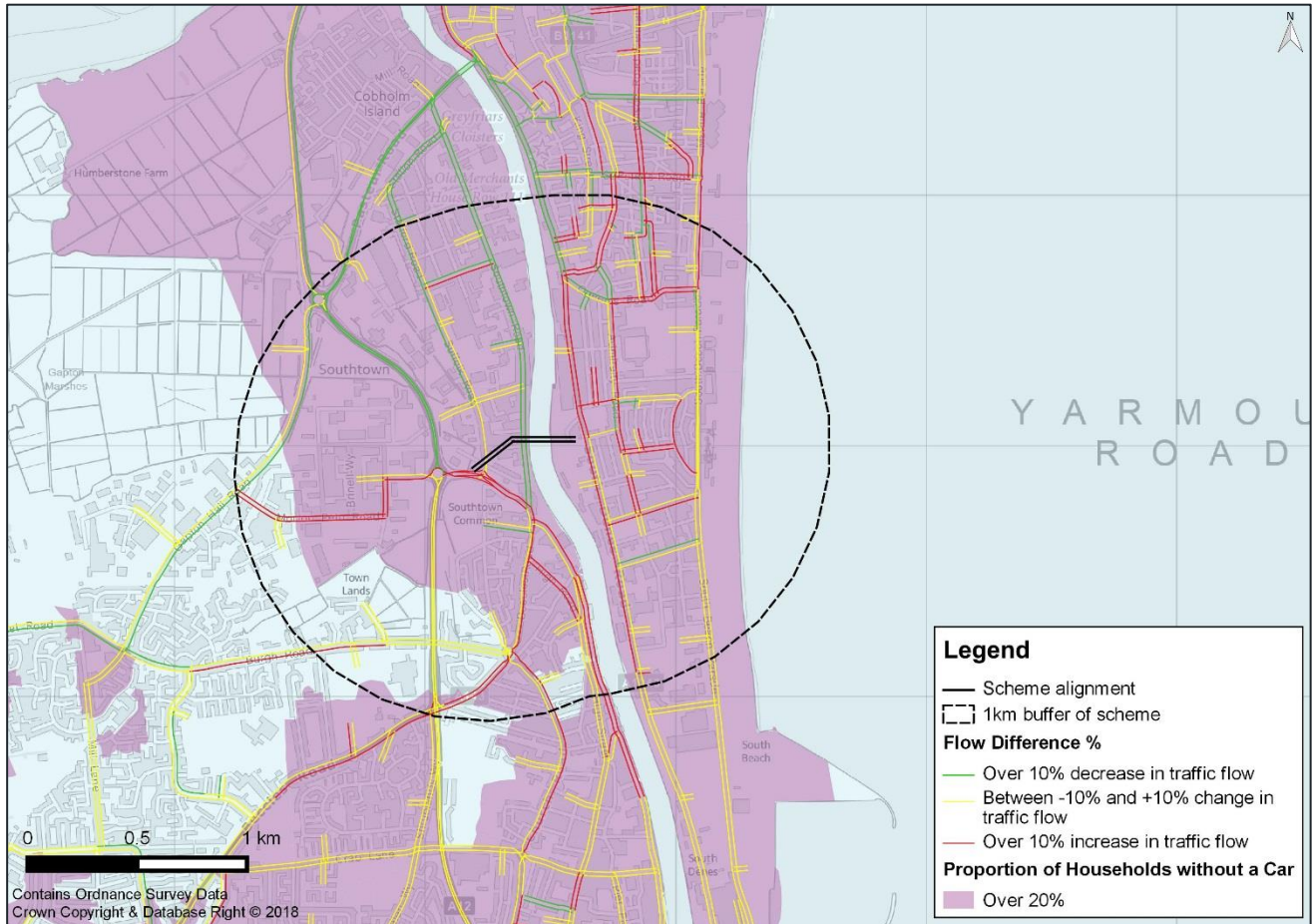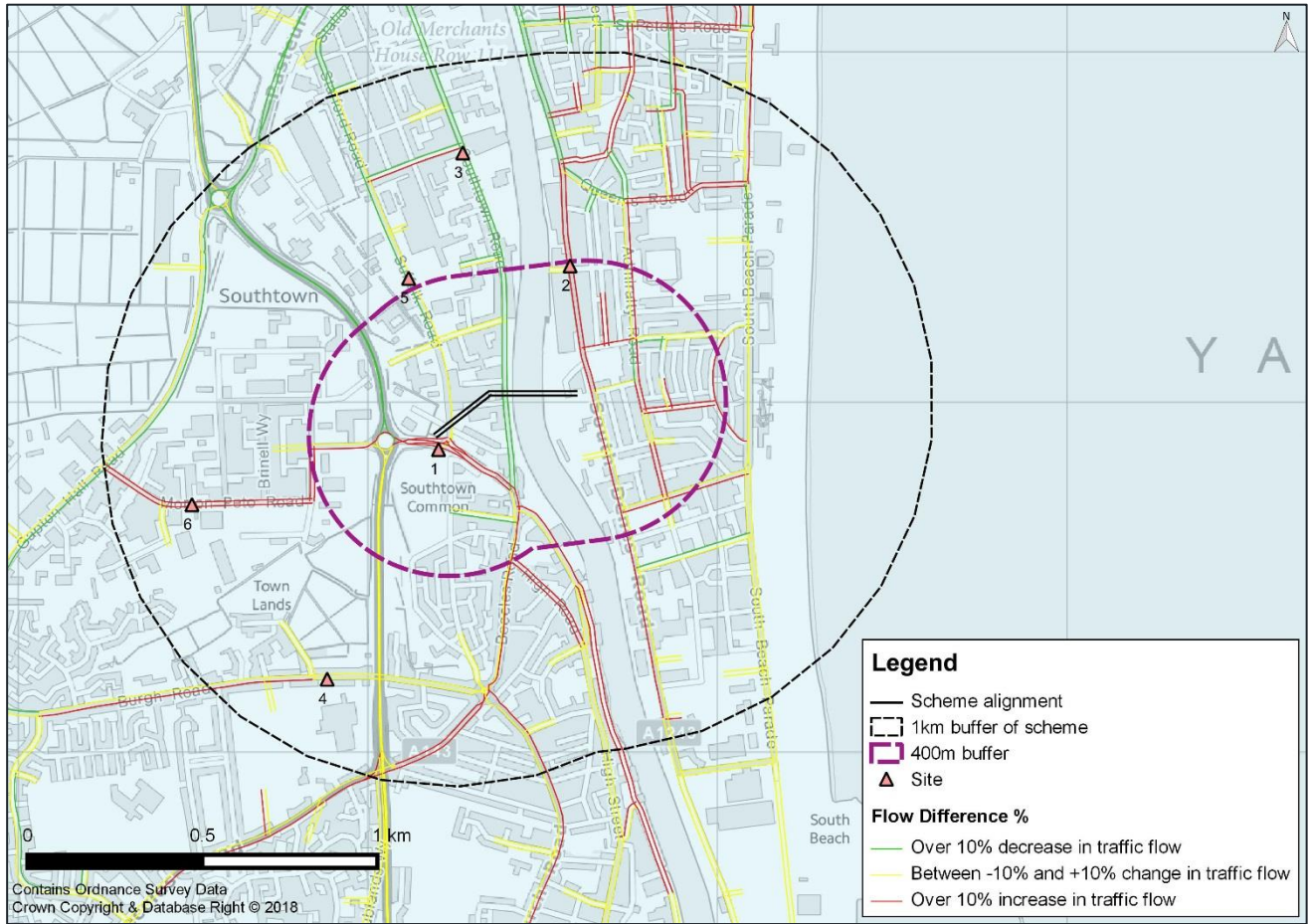

Plate 17 to Plate 20 show that there are significant increased traffic flows on the local road network in areas where there are concentrations of vulnerable groups. As a result, there is a potential impact on these groups' ability to access key amenities and services.

As can be seen in Plate 20, there are many areas where households without a car make up over 20% of the population in proximity to the links likely to be affected by increased traffic flows, and may therefore experience increased severance.

Conversely, there are a number of links that show a reduction in traffic flow, including the A47, Southtown Road, Pasteur Road and Gapton Hall Road which may provide benefits to the community (including vulnerable users) through reduced severance caused by traffic.

Plate 21 shows some of the key pedestrian crossing points on links within 1km of the scheme alignment that are anticipated to experience a 10% change in traffic flow as a result of the scheme. A 400m buffer was applied to each respective crossing point to capture the proportion of vulnerable groups living within a reasonable walking distance in order to assess the potential impact of severance directly caused by increased traffic flows. The severance worksheet in Appendix C details the number of people in vulnerable groups likely to be affected by severance at each crossing location, as a result of the scheme at these particular sites. This was subsequently used to appraise severance DI's.

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Plate 21 - Key Pedestrian Crossing Locations

It should be considered that regardless of vehicle flow changes associated with the redistribution of traffic across the highway network, the provision of a new crossing between two previously poorly connected parts of Great Yarmouth will have a significant positive impact on community severance by offering an alternative central crossing, providing access to the town centre and other key amenities and facilities.

As part of the scheme, there are additional pedestrian facilities being provided on the crossing itself and on William Adams Way (site 1) which aim to reduce the impact on pedestrian movement. Table 31 provides a summary of the severance assessment for vulnerable groups within the impact area.

Table 31 - Benefit Assessment

Impact	Children	Older People	People with a Disability	Older People
Slight Adverse				
Moderate Adverse				
Large Adverse				
Neutral				

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Impact	Children	Older People	People with a Disability	Older People
Slight Beneficial	✓	✓	✓	✓
Moderate Beneficial				
Large Beneficial				

Although a number of links are expected to see a significant change in traffic flow which will result in both benefits and disbenefits to certain vulnerable groups, the overall DI assessment on severance is considered to be **Slight Beneficial** due to the positive impact outweighing the negative impact.

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7 PERSONAL AFFORDABILITY

In line with WebTAG, the personal affordability impacts of the scheme have been considered throughout the appraisal process. Changes in transport costs have the potential to disproportionately affect areas where there are few or no travel alternatives, particularly in areas where income levels preclude car ownership. As a result, impact on travel to work, education and affordable food for example can be expected. These impacts are likely to be exacerbated in areas with low income, low car ownership and a high elderly population.

7.1 SCREENING (STEP 1)

The only element assessed for the affordability impact appraisal was fuel and non-fuel operating costs (TUBA benefit) as shown in Table 32. A full appraisal of fuel and non-fuel costs are need due to the anticipated changes in journey speeds, congestion and rerouting as a result of the scheme.

Table 32 - Screening of personal affordability impact appraisal

Mode	Cost Change	Cost Change Expected	Change Captured in TUBA	Impact
Car	Car fuel and non-fuel cost	Yes	Yes	Changes due to congestion relief and rerouting
Car	Road user charges	No	No	
Car	Public parking charges	No	No	
Car	Other car charge/costs	No	No	
Public Transport	Bus fares	No	No	
Public Transport	Rail fares	No	No	
Public Transport	Rapid transit fares	No	No	
Public Transport	Mode shift between public transport modes due to change in supply	No	No	
Public Transport	Concessionary fares	No	No	
Public Transport	Other public transport charges/costs	No	No	
Non-motorised modes	Walking costs	No	No	

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Mode	Cost Change	Cost Change Expected	Change Captured in TUBA	Impact
Non-motorised modes	Cycling costs	No	No	

As a TUBA assessment has been undertaken for the Scheme, the results of this assessment will be used as the basis for the personal affordability analysis.

7.2 ASSESSMENT – AREAS OF IMPACT (STEP 2A)

The impact area for the personal affordability distributional appraisal is defined as the core modelled area within the SATURN transport model. This impact area covers the area in which passengers' cost of travel is being directly affected by the scheme.

7.3 ASSESSMENT – IDENTIFICATION OF SOCIAL GROUPS IN THE IMPACT AREA (STEP 2B)

In line with WebTAG methodology, the primary group of interest is people on low incomes. The income domain from the Index for Multiple Deprivation (IMD) 2019 has been mapped at Lower Super Output Area (LSOA) level throughout the scheme area.

Vehicle Operating Costs (fuel and non-fuel) from the TUBA assessment, for commute and other purposes only (non business), have been converted from model zones to LSOAs to allow for comparison to the IMD income domain data. The conversion of benefits from model zone to LSOA has been undertaken using the Ordnance Survey Codepoints (Postcodes) 2020 dataset to derive proportions for splitting model zone benefits into LSOAs based on population distribution.

The distribution of income groups in the impact area is summarised in Appendix E.

7.4 APPRAISAL OF IMPACT (STEP 3)

Overall, there would be a benefit of £7.9 million in car fuel and non-fuel costs over the 60 year appraisal period (2010 prices). Table 33 provides a distributional assessment of fuel and non-fuel costs across the five IMD income domains, in line with WebTAG Unit 4.2. The assessment for each group is based on whether the intervention generates an overall benefit or disbenefit and the share of the benefit / disbenefit that a group receives in relation to its proportion of the population. The scoring is the same as that in the user benefit analysis and uses the method of comparing the proportion of benefits/ disbenefits realised by a specific group to the proportion of the population made up by that group (+/- 5%).

Table 33 - Distribution of Personal Affordability Benefits by Income Deprivation Quintile

	IMD 0%<20%	IMD 20%<40%	IMD 40%<60%	IMD 60%<80%	IMD 80%<100%	Rest of England and Wales
Total decrease in VOC for LSOA's within impact area (£M)	4.9	1.0	0.5	0.6	0.4	0.6

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Share of VOC decreases within impact area	67%	14%	7%	8%	6%	-
Share of VOC decreases within Modelled Area (Inc. rest of England and Wales)	62%	13%	6%	7%	5%	-
Population	36,609	26,126	28,577	12,434	4,444	59,007,610
Share of population in the impact area	34%	24%	26%	11%	4%	-
Assessment	✓✓✓	✓	✓	✓✓	✓✓	-

It can be seen from the above table that the two lowest income groups experience the largest share of the benefits, 62% and 13% respectively. No disbenefits were observed across all groups and therefore the personal affordability DI impacts are appraised as **Large Beneficial.**

The personal affordability benefits by LSOA are presented in Plate 22.

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Plate 22 - Personal Affordability Benefits disaggregated at LSOA level

Key

Personal Affordability
- < £50,000
- £50,000 - £100,000
- £100,000 - £250,000
- £250,000 - £500,000
- > £500,000

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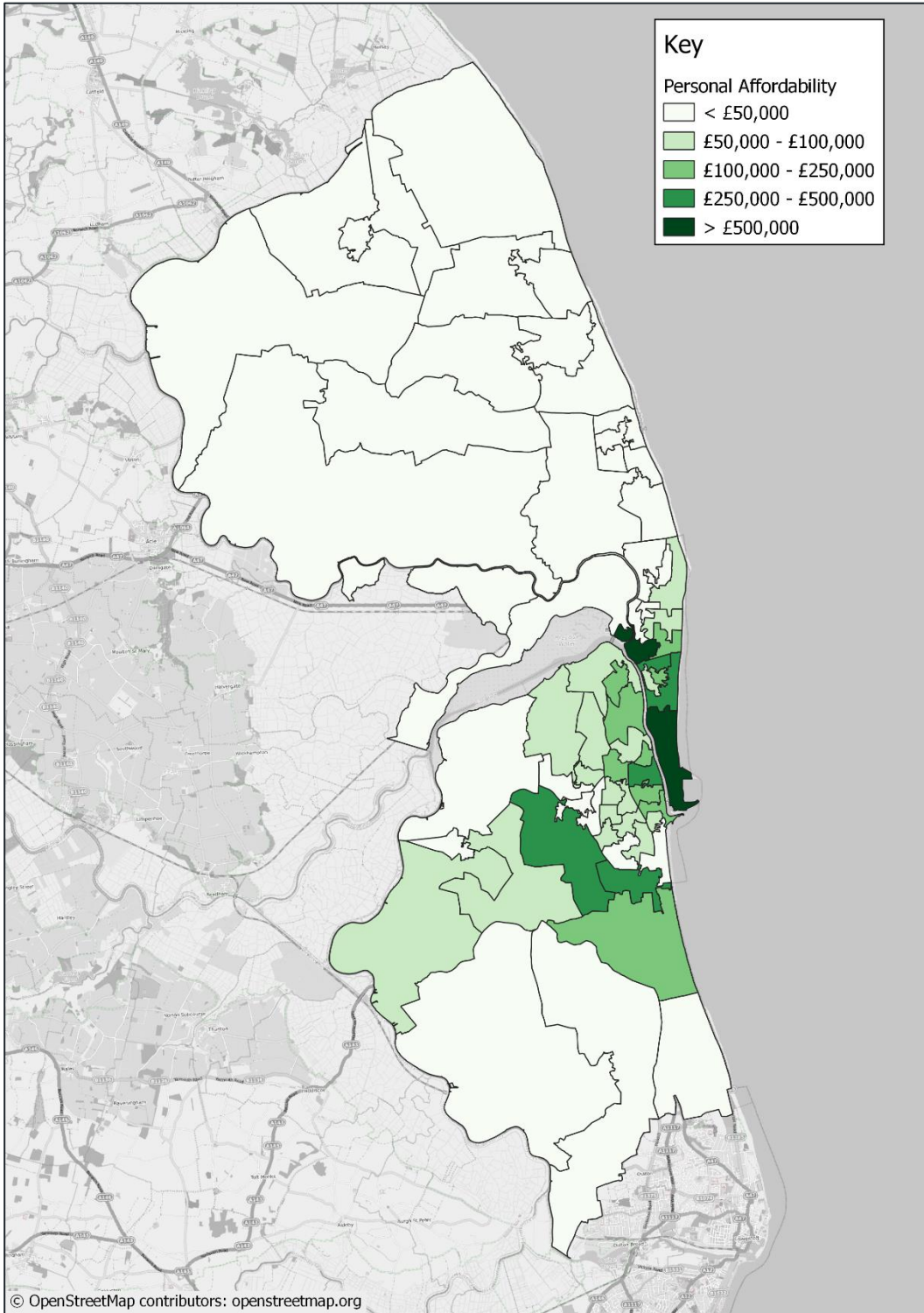
APPENDIX A – TRAFFIC FLOW CHANGE AND IMD QUINTILES

Plate A1 - Traffic flow changes (+/-20%) and IMD income domain
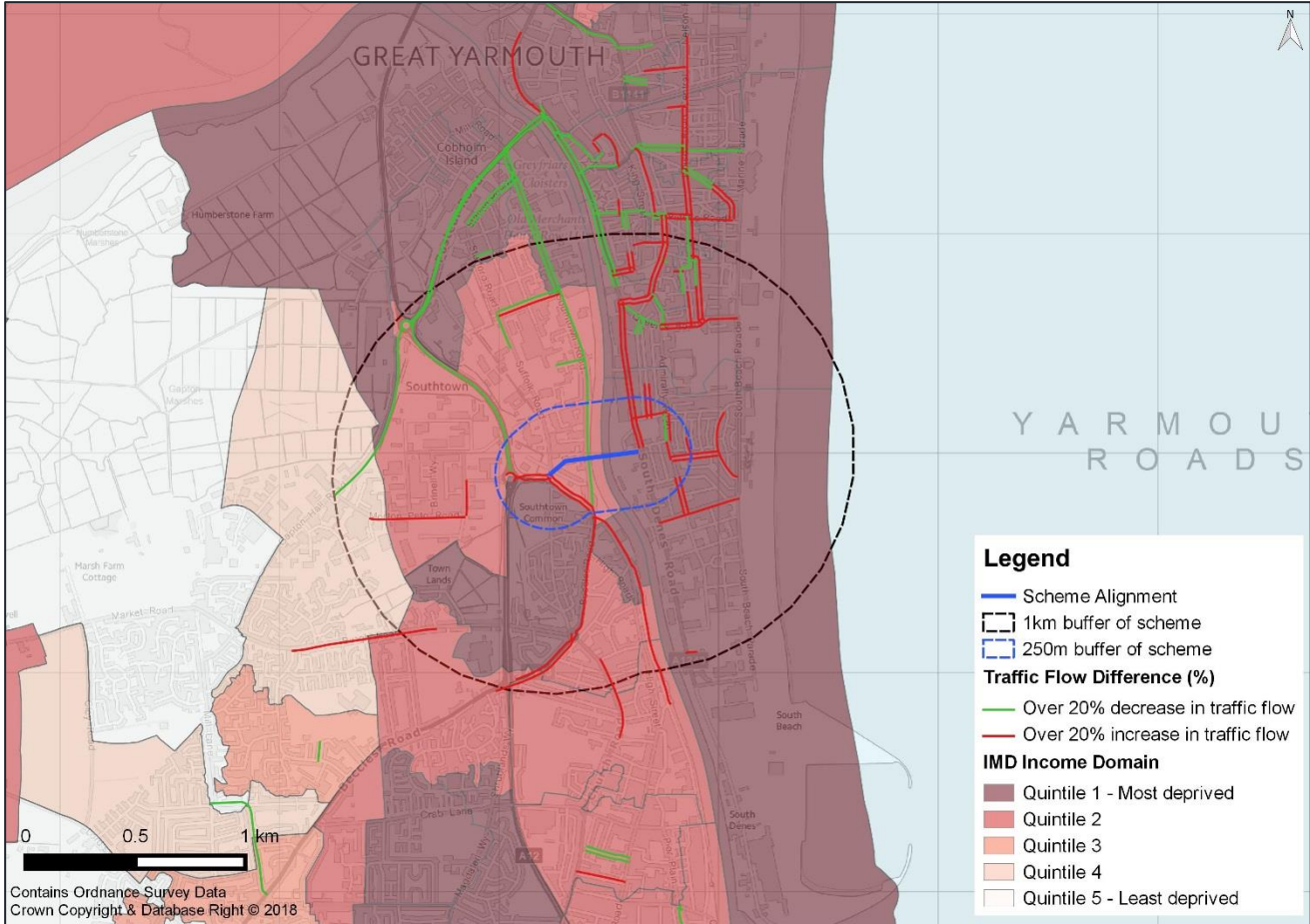
APPENDIX B – SCREENING PROFORMA

Distributional Impact Appraisal Screening Proforma

Indicator	(a) Appraisal Output Criteria	(b) Potential impact (yes / no, positive/negative if known)	(c) Qualitative Comments	(d) Proceed to Step 2
User benefits	The TUBA user benefit analysis software or an equivalent process has been used in the appraisal; and/or the value of user benefits Transport Economic Efficiency (TEE) table is non-zero.	Yes	Total benefit of £138m over the 60-year appraisal period. Benefits to motorised users in relation to journey time benefits as assessed using TUBA where they have been quantified in conjunction with a spatially disaggregate transport model.	Yes. Analysis needs to be undertaken to determine the spread of user benefits amongst income deprivation quintiles.
Noise	Any change in alignment of transport corridor or any links with significant changes (>25% or <-20%) in vehicle flow, speed or %HDV content. Also note comment in TAG Unit A3.	Yes	Noise measurement surveys and modelling undertaken. There will be some positive noise improvements where traffic is taken off the road local road network. Adverse impacts are also expected in some areas where traffic reroutes. Sensitive receptors i.e schools may be affected by increases in noise in these locations.	Yes. Need to examine the noise assessments to ascertain the distribution of noise impacts across income groups and children in the area. Assessment of sensitive receptors also required.
Air quality	Any change in alignment of transport corridor or any links with significant changes in	Yes	There will be some benefits to air quality through reduced road traffic flow, speed and composition. Conversely, in areas where traffic	Yes. Need to examine the outputs from the air quality assessments to

Indicator	(a) Appraisal Output Criteria	(b) Potential impact (yes / no, positive/negative if known)	(c) Qualitative Comments	(d) Proceed to Step 2
	vehicle flow, speed or %HDV content: • Change in 24 hour AADT of 1000 vehicles or more • Change in 24 hour AADT of HDV of 200 HDV vehicles or more • Change in daily average speed of 10kph or more • Change in peak hour speed of 20kph or more • Change in road alignment of 5m or more		flows are expected to increase due to rerouting, negative impacts are likely to be experienced.	ascertain the distribution of impacts cross income groups and children in the impact area. This will involve using Indices of Deprivation 2019 and Census 2011 data.
Accidents	Any change in alignment of transport corridor (or road layout) that may have positive or negative safety impacts, or any links with significant changes in vehicle flow, speed, %HGV content or any significant change (>10%) in the number of pedestrians, cyclists or motorcyclists using road network.	Yes	The new crossing will result in a reduction vehicle kms travelled on the highway network within Great Yarmouth and therefore reduce the number of accidents. However, increased traffic flows in the vicinity of the crossing could result in an increase in collisions locally.	Yes. Analysis should be undertaken for defined areas of deprivation and for defined vulnerable groups and users.
Security	Any change in public transport waiting/interchange facilities	No	New bridges will enhance the security of urban locations by providing additional footfall,	No

Indicator	(a) Appraisal Output Criteria	(b) Potential impact (yes / no, positive/negative if known)	(c) Qualitative Comments	(d) Proceed to Step 2
	including pedestrian access expected to affect user perceptions of personal security.		CCTV, emergency contact points and improved lighting. While there is a general improvement in security of the area, bridges can also attract crime. The scheme is therefore envisaged to have a neutral impact on security.	
Severance	Introduction or removal of barriers to pedestrian movement, either through changes to road crossing provision, or through introduction of new public transport or road corridors. Any areas with significant changes (>10%) in vehicle flow, speed, %HGV content.	Yes	In general, a new bridge will reduce severance by offering an alternative river crossing at a central location within the town. However, increased traffic flows may lead to some adverse impacts to vulnerable groups in close proximity to the scheme.	Yes. Further work is required to assess locations of vulnerable users and key crossing locations within proximity of the scheme.
Accessibility	Changes in routings or timings of current public transport services, any changes to public transport provision, including routing, frequencies, waiting facilities (bus stops / rail stations) and rolling stock, or any indirect impacts on accessibility to services (e.g. demolition & re-location of a school).	No	Changes in routings and timings of current public transport services are anticipated within the impact area, however these are unlikely to be known until closer to the scheme opening date.	No

Indicator	(a) Appraisal Output Criteria	(b) Potential impact (yes / no, positive/negative if known)	(c) Qualitative Comments	(d) Proceed to Step 2
Affordability	In cases where the following charges would occur; Parking charges (including where changes in the allocation of free or reduced fee spaces may occur); Car fuel and non-fuel operating costs (where, for example, rerouting or changes in journey speeds and congestion occur resulting in changes in costs); Road user charges (including discounts and exemptions for different groups of travellers); Public transport fare changes (where, for example premium fares are set on new or existing modes or where multi-modal discounted travel tickets become available due to new ticketing technologies); or Public transport concession availability (where, for example concession arrangements vary as a result of a move in service provision from bus to light rail or heavy rail, where such concession	Yes	Car fuel and non-fuel cost benefits are expected as a result of rerouting, changes in journey speeds and congestion relief and have been assessed in TUBA.	Yes. Analysis needs to be undertaken to determine the spread of car fuel and non-fuel cost benefits amongst income deprivation quintiles.

Indicator	(a) Appraisal Output Criteria	(b) Potential impact (yes / no, positive/negative if known)	(c) Qualitative Comments	(d) Proceed to Step 2
	entitlement is not maintained by the local authority[1]).			

APPENDIX C – TAG WORKSHEETS

User Benefits Worksheet

Item	IMD Income Domains £m Most deprived areas ← 0%<20%	IMD Income Domains £m Most deprived areas ← 20%<40%	IMD Income Domains £m → Least deprived areas 40%<60%	IMD Income Domains £m → Least deprived areas 60%<80%	IMD Income Domains £m → Least deprived areas 80%<100%	Rest of England and Wales
Total user benefits of LSOA's within impact area (£M)	73.86	18.10	10.58	12.21	5.85	16.97
Share of user benefits within impact area	61%	15%	9%	10%	5%	-
Share of user benefits within Modelled Area (Inc. rest of England and Wales)	54%	13%	8%	9%	4%	12%
Population	36,609	26,126	28,577	12,434	4,444	59,007,610
Share of population in the impact area	34%	24%	26%	11%	4%	-
Assessment	✓✓✓	✓	✓	✓✓	✓✓	

![wsp]

Key to individual assessment of each income quintile

Beneficial and 5% greater (or more) than the proportion of the group in the total population	Large Beneficial
Beneficial and in line (+/-5%) with the proportion of the group in the total population	Moderate Beneficial
Beneficial and 5% smaller (or less) than the proportion of the group in the total population	Slight Beneficial
There are no user benefits or dis-benefits experienced by the group	Neutral
A dis-benefit which is 5% smaller (or less) than the proportion of the group in the total population	Slight Adverse
A dis-benefit which is in line (+/-5%) with the proportion of the group in the total population	Moderate Adverse
A dis-benefit which is 5% greater (or more) than the proportion of the group in the total population	Large Adverse

Personal Affordability Worksheet

Item	IMD Income Domains £m Most deprived areas ← 0%<20%	IMD Income Domains £m Most deprived areas ← 20%<40%	IMD Income Domains £m → Least deprived areas 40%<60%	IMD Income Domains £m → Least deprived areas 60%<80%	IMD Income Domains £m → Least deprived areas 80%<100%	Rest of England and Wales
Total decrease in VOC for LSOA's within impact area (£M)	4.88	0.99	0.49	0.56	0.41	0.56
Share of VOC decreases within impact area	67%	14%	7%	8%	6%	-
Share of VOC decreases within Modelled Area (Inc. rest of England and Wales)	62%	13%	6%	7%	5%	7%
Population	36,609	26,126	28,577	12,434	4,444	59,007,610
Share of population in the impact area	34%	24%	26%	11%	4%	-
Assessment	✓✓✓	✓	✓	✓✓	✓✓	

Key to individual assessment of each income quintile

Beneficial and 5% greater (or more) than the proportion of the group in the total population	Large Beneficial
Beneficial and in line (+/-5%) with the proportion of the group in the total population	Moderate Beneficial
Beneficial and 5% smaller (or less) than the proportion of the group in the total population	Slight Beneficial
There are no user benefits or dis-benefits experienced by the group	Neutral
A dis-benefit which is 5% smaller (or less) than the proportion of the group in the total population	Slight Adverse
A dis-benefit which is in line (+/-5%) with the proportion of the group in the total population	Moderate Adverse
A dis-benefit which is 5% greater (or more) than the proportion of the group in the total population	Large Adverse

Severance Worksheet

Item	All social groups Change in severance [A]	All social groups No of people affected [B]	All social groups Overall effect [A]*[B]	No-car households Change in severance [A]	No-car households No of households affected	No-car households Overall effect [A]*[B]	Young people Change in severance [A]	Young people No of people affected [B]	Young people Overall effect [A]*[B]	Older people Change in severance [A]	Older people No of people affected [B]	Older people Overall effect [A]*[B]	People with disabilities Change in severance [A]	People with disabilities No of people affected [B]	People with disabilities Overall effect [A]*[B]
Site 1: William Adams Way	3	818	2454	3	134	402	2	129	258	3	74	222	3	174	522
Site 2: South Denes Road	0	1639	0	0	750	0	0	240	0	-1	158	-158	-1	364	-364
Site 3: Southtown Road	2	1370	2740	2	186	372	2	227	454	2	92	184	2	245	490
Site 4: Burgh Road	-1	1155	-1155	-1	273	-273	-1	145	-145	-1	177	-177	-1	243	-243
Site 5: Suffolk Road	2	806	1612	2	90	180	1	123	123	2	64	128	2	145	290
Site 6: Morton Peto Road	-1	513	-513	-1	151	-151	-1	72	-72	-1	44	-44	-1	75	-75
Total			**5138**			**530**			**618**			**155**			**620**

Distributional Impact Matrix

Item	Distributional impact of income deprivation 0-20%	Distributional impact of income deprivation 20-40%	Distributional impact of income deprivation 40-60%	Distributional impact of income deprivation 60-80%	Distributional impact of income deprivation 80-100%	Are the impacts distributed evenly?	Key impacts - Qualitative statements
User benefits	✓✓✓	✓	✓	✓✓	✓✓	No	There are significant overall net user benefits from the scheme with residents in the most deprived quintile experiencing the largest share of the benefits. No disbenefits were observed.
Noise	✓✓✓	✗✗	-	-	Neutral	No	The most deprived income quintile contains 87% of the households in the study area and 110% of the net benefits. The second most deprived quintile experiences a moderate disbenefit. Higher income quintiles are either absent from the study area or are not significantly affected by the scheme.

Item	Distributional impact of income deprivation 0-20%	Distributional impact of income deprivation 20-40%	Distributional impact of income deprivation 40-60%	Distributional impact of income deprivation 60-80%	Distributional impact of income deprivation 80-100%	Are the impacts distributed evenly?	Key impacts - Qualitative statements
Air Quality: NO_2 2023	✕✕	✕✕✕	✕	Neutral	✓✓✓	No	Higher income quintiles benefit most from the scheme in terms of air quality improvements. The lowest income quintiles experience the greatest disbenefit in terms of air quality impacts from the Scheme.
Air Quality: PM_{10} 2023	✓✓✓	✕✕✕	✕	Neutral	✓✓✓	No	Higher income quintiles benefit most from the scheme in terms of air quality improvements. The lowest income quintiles experience the greatest disbenefit in terms of air quality impacts from the Scheme.
Air Quality: $PM_{2.5}$ 2023	✕✕	✕✕✕	✕	Neutral	✓	No	Higher income quintiles benefit most from the scheme in terms of air quality improvements. The lowest income quintiles experience the greatest disbenefit in terms of air quality impacts from the Scheme.
Air Quality: NO_2 2038	✕✕	✕✕✕	✕	Neutral	✓✓✓	No	Higher income quintiles benefit most from the scheme in terms of air quality improvements. The lowest income quintiles experience the greatest disbenefit in terms of air quality impacts from the Scheme.

Item	Distributional impact of income deprivation 0-20%	Distributional impact of income deprivation 20-40%	Distributional impact of income deprivation 40-60%	Distributional impact of income deprivation 60-80%	Distributional impact of income deprivation 80-100%	Are the impacts distributed evenly?	Key impacts - Qualitative statements
Air Quality: PM$_{10}$ 2038	✗✗	✗✗✗	✗	Neutral	✓	No	Higher income quintiles benefit most from the scheme in terms of air quality improvements. The lowest income quintiles experience the greatest disbenefit in terms of air quality impacts from the Scheme.
Air Quality: PM$_{2.5}$ 2038	✗✗	✗✗✗	Neutral	Neutral	✓	No	Higher income quintiles benefit most from the scheme in terms of air quality improvements. The lowest income quintiles experience the greatest disbenefit in terms of air quality impacts from the Scheme.
Affordability	✓✓✓	✓	✓	✓✓	✓✓	No	There are significant car fuel and non-fuel benefits from the scheme with residents in the most deprived quintile experiencing the largest share of the benefits. No disbenefits were observed.

AST Entry

Impact	Social groups Children	Social groups Older people	Social groups Carers	Social groups Women	Social groups Disabled	Social groups BME	User groups Pedestrians	User groups Cyclists	User groups M\cyclists	User groups Young male drivers	Qualitative statement (including any impact on residential population AND identified amenities)
Noise	Neutral	Neutral									There are 11 education receptors in the identified study area. As a result of the Scheme, 5 receive a negligible adverse noise change, 3 receive a negligible beneficial noise change and 3 receive a minor beneficial noise change.
Air Quality	Neutral										There are no predicted exceedances of annual mean NO_2,

Impact	Social groups Children	Social groups Older people	Social groups Carers	Social groups Women	Social groups Disabled	Social groups BME	User groups Pedestrians	User groups Cyclists	User groups M\cyclists	User groups Young male drivers	Qualitative statement (including any impact on residential population AND identified amenities)
Accidents	✖	✖					✖	✖	✖	✖	Each group is expected to experience a Slight Adverse impact as a result of the Scheme, although this varies significantly across the roads in the impact area.
Security	N/A	N/A		N/A	N/A	N/A					N/A
Severance	✓	✓	✓		✓						The provision of a new crossing between two previously poorly connected parts of Great Yarmouth will have a significant positive impact on community severance by offering an alternative central crossing, providing access to the town centre and other key amenities and facilities. Although a number of links are

Impact	Social groups Children	Social groups Older people	Social groups Carers	Social groups Women	Social groups Disabled	Social groups BME	User groups Pedestrians	User groups Cyclists	User groups M\cyclists	User groups Young male drivers	Qualitative statement (including any impact on residential population AND identified amenities)
											expected to see a significant change in traffic flow which will result in both benefits and disbenefits to certain vulnerable groups, the overall DI assessment on severance is considered to be Slight Beneficial due to the positive impact outweighing the negative impact.
Accessibility	N/A	N/A	N/A	N/A	N/A	N/A					N/A

APPENDIX D – AIR QUALITY FIGURES

Please refer to separate document.

APPENDIX E – OUTPUT SUMMARY

Output Summary Table

Impact Area	Social Group and Amenities Indicators	User Benefits	Noise	Air Quality	Accidents	Security	Severance	Accessibility	Affordability	Local Authority	England
Resident population	Income distribution quintiles 0-20%	34%	82%	75%					34%	34%	20%
Resident population	Income distribution quintiles 20-40%	24%	8%	12%					24%	28%	20%
Resident population	Income distribution quintiles 40-60%	26%	0%	4%					26%	26%	20%
Resident population	Income distribution quintiles 60-80%	11%	0%	0%					11%	8%	20%
Resident population	Income distribution quintiles 80-100%	4%	9%	10%					4%	3%	20%
Resident population	Children (<16)		21%	22%	23%		23%			18%	19%
Resident population	Young people				15%					12%	13%
Resident population	Older people		12%		9%		9%			15%	12%
Resident population	People with a disability						20%			22%	18%

Impact Area	Social Group and Amenities Indicators	User Benefits	Noise	Air Quality	Accidents	Security	Severance	Accessibility	Affordability	Local Authority	England
Resident population	Black Minority Ethnic									N/A	N/A
Resident population	No car households						17%			27%	26%
Resident Population	Households with dependent children									N/A	N/A
Resident Population	Indicator population in the impact area	108,190	39,375	36,937	12,873		12,873		108,190	99,370	59,115,800
Amenities Present	Schools / nurseries		✓	✓	✓		✓			-	-
Amenities Present	Playgrounds		-	✓	✓		✓			-	-
Amenities Present	Parks and open spaces		-	✓	✓		✓			-	-
Amenities Present	Hospitals		-	✗	✗		✗			-	-
Amenities Present	Care homes / day centres		✗	✓	✓		✓			-	-
Amenities Present	Community centre		-	✓	✓		✓			-	-