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Tyne & Wear Passenger Transport Authority

New Tyne Crossing

Site Selection

APPENDICES

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GOMMMS Appraisal

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Site Selection

1. INTRODUCTION

Since the mid 1980's the Tyne and Wear local authorities and their partners have had concerns regarding the capacity of the River Tyne crossings and their ability to accommodate future travel and traffic patterns consequent to future economic development in the region. Several studies have been undertaken since that time to identify the issues and problems related to cross Tyne movement, which have resulted in the current New Tyne Crossing proposal in the form of an immersed tube tunnel adjacent to the existing Tyne Tunnel at St Bede's.

Since the time of the initial studies Government policy and guidance relating to transport schemes and their appraisal has changed. In light of the new Guidance on the Methodology for Multi- Modal Studies (GOMMMS) the location and type of crossing has been reviewed.

In a Multi-Modal Study, the appraisal of impacts is carried out against the Government's five overarching criteria of environment, economy, accessibility, integration and safety. Additionally the scheme is appraised against the project specific local objectives.

A Multi Modal Study generally follows the procedure:

- Identification of local scheme objectives (eg increase cross Tyne capacity), which would be in addition to the national Government objectives outlined in GOMMMS for the five areas of appraisal (environmental, economic, transport, integration (planning policy) and safety impacts)
- Review of baseline data and future trends (eg travel demands, planning policies, environmental constraints etc)
- Consultation with statutory authorities and public
- Development of options
- Option testing
- Distillation of options

Two kinds of approach to a GOMMMS assessment have developed which are described in more detail below:

Strategy Level multi modal studies are objective-led. They identify problems by assessing the extent to which current or predicted future conditions, in the absence of new policy measures, fail to meet new objectives (eg improving accessibility). This approach examines broad scale, perhaps area wide, policies aimed at dealing with a number of problems. Strategy level studies are also referred to as 'top-down' approaches that examine ways of achieving objectives through integration of strategy components.

Plan Level multi modal studies are problem-orientated. They identify types of problems (eg the nearest medical facilities being 50 minutes away) and conduct a detailed analysis of the current and future scenarios to predict when and where the problems occur. This type of approach is dependant on developing a full list of potential problems at the outset. Plan level studies are also referred to as 'bottom-up' approaches in which particular attention is paid to the detailed analysis of problems and their solutions.

Given the preliminary nature of some of the schemes/options to be appraised, a strategy level approach is considered the more appropriate methodology in most cases.

The Tyne & Wear Passenger Transport Authorities (TWPTA) project specific local objectives of the New Tyne Crossing are summarised as:

- to solve the problems of congestion in the tunnel at the entrances and it's approaches
- to improve safety and lower the risk to the travelling public in the tunnel
- to improve public transport access through the tunnel and in the vicinity
- to promote wider economic benefits in the region

This review will appraise the extent to which each of the options addresses the Government's five overarching objectives, the local objectives and the identified problems.

2. BACKGROUND

2.1 Cross-Tyne Phase 1

In April 1986, Newcastle City Council became the lead authority for the Countywide Modelling Team (CMT). In July 1987, the Countywide Modelling Team produced the "The Cross Tyne Traffic Study Proposal". This document was considered in detail by the five district authorities of Tyne and Wear and as a result, in March 1988, the CMT produced the "Cross Tyne Study Design", which was accepted as the basis for undertaking the work. The Study Design stated the following as its main objectives:

- to provide a full understanding of present-day person movements by all modes crossing the river
- to appraise the benefits of providing additional capacity across the river, and identify to whom the benefits would most likely accrue
- to provide a full understanding of present-day car and commercial vehicle movements in Newcastle city centre and Gateshead central area
- to undertake appraisal of highway schemes proposed in these areas
- to upgrade the team's model of the County Computerised Highway Network
- by using the large volumes of data collected and the "Matrix Updating Techniques" being developed by the team, to provide an upgrade of the County Travel Matrix which could then be used as a backcloth for studies across the County

Phase 1 of the Study concluded that, without the provision of at least one further river crossing, there would be a shortfall of highway capacity by the late 1990's, and as a consequence identified three potential crossings of the River Tyne in addition to the existing ones.

2.2 Cross-Tyne Phase 2

After careful consideration of the findings of Phase 1, all the parties concerned agreed to undertake a Cross-Tyne Phase 2 study. The Terms of Reference were:

- to develop the findings of Phase 1
- to prepare an individual report on each of the three schemes identified in phase 1, and to identify alternative possible means of addressing the problems of cross-Tyne travel, eg through traffic restraint measures/public transport improvements, which could form the basis of a further report
- to produce a final summary report

During the course of the Steering Group's deliberations, a variety of other potential bridge-crossings were considered, including a crossing at Walker. The Group felt that this crossing was the only additional site worthy of full evaluation.

The Technical Steering Group considered carefully whether it was appropriate for them to give recommendations at all, in the context of the many different interactions and given the need for political judgments and weightings. Informal advice was taken from the chief officers of the clients and, although no directive in any sense was implied, there was an indication that additional guidance on how to move to a decision would be greatly appreciated. It was therefore concluded that there was a need to give recommendations but in

doing so, the Technical Steering Group has tried to minimise the political judgements implicit in the guidance they offer.

The Summary Report of the Technical Steering Group stated that

"Arising from discussions within the Technical Steering Group, as to the interpretation of the findings of the study, an hierarchical 'structure' of the decision process emerged. Thus, it became clear that certain key decisions, on some of the main determinants of cross-river travel demand, would have to be faced before a final choice could be made as to which crossing or crossings (if any) should be implemented. The options considered serve different (though overlapping) catchments and have different relative impacts on the environment, on access to new developments, on congestion relief and so on. Depending on the direction taken by these decisions, one is led towards a particular recommended outcome and away from others."

2.3 PFI Feasibility Study

Following on from the Cross Tyne Studies (Phases 1 and 2) the Hambros Consortium was appointed in 1995 to carry out the Private Finance Initiative Feasibility Study for the Project Partners. The primary aim of this study was to establish whether the project could be taken forward under the Government's Private Finance Initiative and, if so, the most appropriate framework for the project, with due regard for the implications of public policy, legal, environmental and operational constraints.

No further analysis was undertaken into the most appropriate location and it was assumed that the crossing would be located at St Bede's. The study considered that "*this would make most operational sense, especially as we envisage that the existing tunnel and the new crossing will be operated as one business*".

A series of solutions were considered to deliver the capacity requirements, including:

- low level fixed bridge
- high level fixed bridge
- lifting bridge
- retractable bridge
- bascule bridge
- swing bridge
- immersed tube
- bored tunnel

The consortium recommended that "*on the basis of risk transfer, project specific requirements and environmental impact a tunnel option appears the most appropriate option*" and "*on the basis of whole life costing and construction risk there appears to be a significant benefit in an immersed tube as opposed to a bored tunnel*". Therefore the immersed tube tunnel option was taken forward as being the most suitable for a PFI solution to the need for a new crossing.

2.4 Crossing Options

The following alternative crossing options were developed in the Cross-Tyne Phase 1 and Phase 2 studies, as well as the PFI Feasibility Study, and are appraised following the Guidance on the Methodology on Multi-Modal Studies (GOMMMS). These have been appraised against the Reference Case scenario, ie the circumstances which would prevail should nothing happen other than those infrastructure schemes that are currently being progressed.

2.4.1 St Lawrence

On the north bank of the river, the alignment (Figure 1) lies to the west of the Spiller's Flour Mill and, on the south bank, to the east of the junction of South Shore Road and Albany Road. The bridge would be a two or three lane opening low level swing bridge with a link from the bridgehead on the south side to Heworth Roundabout and an underpass of Walker Road on the north side to connect with the western end of Shields Road bypass.

The carriageway over the bridge would be a minimum of 7.3m wide to accommodate two lanes of traffic. It may be possible to provide three lanes of traffic which would change with the tidal nature of the traffic ie two lanes northbound and one lane southbound in the a.m. peak and vice-versa in the p.m. peak.

Heworth roundabout would be upgraded to cope with extra traffic flows. This could include:

- a two-lane flyover to overpass the roundabout
- the enlargement of the north side of the roundabout to connect the new approach road; and/or
- the implementation of the long-standing Riverside Road proposal between Hebburn and Felling Shore, allowing traffic to avoid Heworth roundabout altogether.

2.4.2 St Anthony's

The bridge (Figure 2) would be a two lane opening single carriageway bridge from Heworth roundabout to a three-way junction at the northern bridgehead. Because of headroom constraints, it is necessary that the bridge should be an opening bridge approximately 18m above the river.

On the south side an at grade junction with the Eastern Riverside route would be provided and grade separation of Heworth roundabout as described for the St Lawrence option.

On the north side a three-way junction with the northern bridgehead would be provided. A two lane 10m wide road would link to White Street to the east, and a four lane 12m wide road would link to Shields Road bypass to the west. There are two possible variants for the western feeder roads which link to the Shields Road bypass:

St Anthony's Variant A – follows the former railway line all the way to Shields Road

St Anthony's Variant B – leaves the former railway line immediately west of the Oval and follows an alignment along the Allendale Road/Bothal Street corridor to the eastern end of the Shields Road bypass.

2.4.3 Walker

The bridge (Figure 3) would be a four lane opening bridge approximately 18m above the river. Immediately to the south of the bridge, a grade separated junction would be provided to link with the proposed Eastern Riverside Route. This junction would be constructed in the

open area north of Marian Drive and west of the Metro line. Due to the ground levels it is necessary to grade-separate the junction which does necessitate a large land take.

The main feeder road to the bridge on the south side would pass directly under both the Metro line and Victoria Road west, run across the areas of waste-tips and over mainly agricultural land to link with the present junction of Mill Lane and Leam Lane. At this location the feeder road would have to be connected back to the strategic road network on to the A194 west of Testo's roundabout on the A19. From the northern bridgehead the feeder roads are the same as for the St Anthony's option. The two separate variants for the western feeder roads are:

Walker Variant A – follows the former railway line all the way to Shields Road

Walker Variant B – leaves the former railway line immediately west of the Oval and follows an alignment along the Allendale Road/Bothal Street corridor to the eastern end of the Shields Road bypass.

2.4.4 St Bede's

There are four variants for the St Bede's option. All follow a similar alignment (Figure's 4 and 5) to the east of the existing Tyne Tunnel and tie into the A19 on both sides.

St Bede's Variant A – A two lane opening bridge (approximately 15m above the river) would be constructed to take through southbound traffic. Local and northbound traffic would use the same routes as present (ie the existing tunnel).

St Bede's Variant B – A four lane opening bridge (approximately 15m above the river) would be constructed to take all traffic. The existing tunnel would either be decommissioned or used when the bridge was closed.

St Bede's Variant C – A two lane bored tunnel would be constructed to provide a four lane total capacity between the two tunnels. Each tunnel would operate in a single direction.

St Bede's Variant D - A two lane immersed tube tunnel would be constructed to provide a four lane total capacity between the two tunnels. Each tunnel would operate in a single direction.

3. ENVIRONMENT

This section addresses the extent to which the proposed schemes achieve the government's objectives on environment, as part of the five overarching government objectives which also include safety, economy, accessibility and integration. The results of the assessments for each of the objectives are reviewed in the Appraisal Summary Tables (AST) included as Appendix B. The worksheets for the appraisal of the sub-objectives for each of the schemes are included in Appendices C.

The following subjects were assessed as part of the environment objective:

- Noise
- Local Air Quality
- Greenhouse Gases
- Landscape
- Townscape
- Heritage of Historic Resources
- Biodiversity
- Water Environment
- Physical Fitness
- Journey Ambience

The assessment method and results for each subject are discussed below.

3.1 Noise

An assessment of the impact of noise from road traffic only has been carried out following the method in GOMMMS and Calculation of Road Traffic Noise, 1988. The noise assessment considers the immediate area around the four route locations. This was carried out for the predicted traffic flows for the different locations, including their variants. Details of specific assumptions for the options are included in each section.

Three steps are recommended for a GOMMMS assessment and these are outlined below, along with details of how these requirements have been interpreted for the current study.

Calculation of Noise Exposure Levels

Noise levels are forecast before and after the scheme opening, with and without the scheme (referred to as "do something" and "Reference Case" respectively). Noise levels after scheme opening are calculated for both the opening year and the year of maximum traffic during the first 15 years after opening. For this study it is understood that the maximum flow is likely to be at the fifteenth year after opening and this has therefore been used for the worst year scenario in the assessment.

In certain locations the proposed routes go through areas that currently experience low traffic flows, and there is no data available from the traffic model, so for these areas it is not possible to predict the "Reference Case" noise levels. Due to the strategic level of the assessment, it is not appropriate to carry out ambient noise surveys. Where there are no predicted "Reference Case" noise levels, a level of 55 dBL_{A10} has been assumed for both 2006 and 2021.

Estimate of Population Exposed

Populations are based on the assumption that, in a built up environment, the immediate effect of road traffic noise from a route will occur over an area up to approximately 50 m from the centre of the road, and on the average population for each ward (taken from the government neighbourhood statistics database). The number of people likely to be affected is then calculated by multiplying the area of assessment (effectively a 100 m wide strip centred on the proposed route) by the population density.

Estimate Population Annoyed, with and without the Scheme

The population likely to be annoyed by noise in the opening year and in the longer term is estimated. The difference in population annoyed, with and without the scheme, is then calculated to indicate the impact of the scheme option.

Results

The results, presented in tables in a format similar to that of GOMMMS worksheet 4.2 for opening year (2006) and worst year after opening (2021), show the estimated change in population annoyed for the various route options and their variants. A comparative summary of the results is given below.

Comments on the findings of the assessment for each route option are given under the separate headings.

Assessment of Route Options

3.1.1 St Lawrence

South of the Tyne the route is primarily through an industrial area where no assessment is required. At the southern-most end of the route it runs near to houses in west Pelaw and in Corofell Gardens. Traffic flows on the existing road here are high and no significant noise change is predicted here.

North of the Tyne the bridgehead would be located in a principally industrial area and again no assessment is required. Moving northwards, the route passes mixed residential and commercial areas along the line of a disused railway, passing a public park before moving into a more residential district around Dalton Street and Albion Row. The existing roads through the majority of this northern section of the route are minor and traffic data is limited. However, it is possible to state that, in bringing a major new road through this area there will be an increase in annoyance at properties within 50 m of the proposed route. The predicted increase in annoyance due to noise for this option is chiefly for residents in this northern section.

3.1.2 St Anthony's

South of the Tyne the route is primarily through open space where no numerical assessment is required. There is however the potential for an adverse noise effect on the open space, the extent of which is dependent on the existing ambient noise level. At the southern-most end of the route it runs near to houses in west and north Pelaw. As for the St Lawrence option, at the southern-most end of the route it runs near to houses in west Pelaw and in Corrofell Gardens. Traffic flows and hence noise levels are predicted to be significantly higher at the Pelaw end of the route for this route compared with the St Lawrence crossing, resulting in a greater number of people experiencing increased annoyance.

North of the Tyne, the bridgehead would be located in an area of open space, with two proposed feeder roads linking the route over the river. To the east and west of the bridgehead these routes run behind residential properties where there is no existing road (as well as

through open space), and hence the previous comments regarding the introduction of a new road with significant traffic flow apply. The greatest effects are likely to be seen where the route runs close to residential properties such as those on Bernard Street, Annville Crescent, Merton Road and The Oval. Between Walker Road and White Street a significant increase in noise level was predicted with a consequent increase in annoyance for both route variants. North of Walker Road, to the north of Tyne Shields Road a greater number of people are predicted to have increased annoyance for Variant A compared with those to the east potentially affected by Variant B (which parallels the B1314), where the existing traffic flows are presently relatively high.

3.1.3 Walker

South of the Tyne the route runs principally through open countryside and space and therefore no numerical assessment has been necessary. There is however the potential for an adverse noise effect on the open space, the extent of which is dependent on the existing ambient noise levels. In the region of Victoria Road the route runs close to a number of residential properties some of which currently have no highly trafficked road close by. Significant noise increase was predicted here with a consequent increase in the number of people likely to be annoyed. However, this represents a small change in number of people affected as there are relatively few properties involved.

North of the Tyne, the bridgehead is located in an industrial area immediately to the south of West Walker School. The previous comments with respect to the feeder roads between White Street and Walker Road for Variants A and B apply here, as do comments with respect to Variant A north of Walker Road.

3.1.4 St Bede's

The bridge options, Variants A and B, are predicted to result in significant noise level increases and hence annoyance, as they would bring large volumes of road traffic close to properties that currently receive only distant road traffic noise from the A19 and noise from minor roads. Increased noise levels and hence annoyance are predicted due to road traffic for properties in Jarrow between Salem Street and the Tyne. Higher increases in the number of people annoyed are predicted for Variant B, under which the existing tunnel is replaced by a bridge, taking currently underground traffic along a surface route. The remaining school on Stanley Street is more likely to be adversely affected by Variants A and B (the bridge options) than by the tunnel options. North of the Tyne Variants A and B would be expected to give rise to greater change in annoyance because the roads are on the surface close to the residential area of East Howdon. However, this is not reflected in the numerical result due to the coarse assessment method used that does not take into account screening by landforms.

Overall, Variant A produces a smaller change in annoyance than Variant B because half the traffic flow remains in tunnel, whereas under Variant B the existing tunnel is decommissioned for normal use.

St Bede's tunnelled Variants C and D have been assessed, with some increase in the number of people annoyed in the East Howdon area north of the Tyne. Any changes will be broadly the same for Variants C and D leading up to the locations of the tunnel portals. This is essentially because the routes follow an existing road corridor, so no new areas of population are exposed to road traffic.

Table 3.1: Summary of Noise Impacts

Option	Variant	Significant change in annoyance (approximate balance of number of people with increased annoyance)	
		2006	2021
St Lawrence		35	49
St Anthony's	A	172	159
	B	135	131
Walker	A	131	144
	B	111	119
St Bede's	A	81	93
	B	113	128
	C	45	53
	D	45	53

3.2 Local Air Quality

The principal effect of a scheme on air quality will arise from the extent to which it affects road traffic, the main source of transport related local air quality pollutants. Therefore, the assessment of local air quality impacts of a scheme focuses on the effects arising from changes in road traffic. This assessment allows a comparison of the environmental performance of options to assist in the decision making process for route selection. The assessment has used the method described in GOMMMS and detailed below.

The indicator for the assessment of the local air quality impacts of the scheme is the total emission rate per zone multiplied by the population density for the zone. The concept of an "emissions estimate", in relation to the Reference Case scenario, is used in order to allow comparison. The method undertaken to calculate this emissions estimate is as follows:

i. calculate the total emissions (tonnes per year) for each zone for NO_2* and PM_{10}. This uses traffic flow, HGV, speed and emission factor data, related to each road link within each zone in the area being assessed, in each of the years being considered. The emission factor data are taken from the latest DEFRA guidance;

ii. estimate the total population per zone;

iii. for each zone, multiply i) by ii) and divide the result by the area of the zone, expressed as km^2;

iv. for each zone, subtract the value in iii) for each of the Reference Case from the value for the route/option;

v. count the number of positive values in iv) – the zones in which the route option is unlikely to improve air quality over the Reference Case;

vi. count the number of negative values in iv) – the zones in which the route option is likely to improve air quality over the Reference Case;

vii. sum the values in iv) over all zones to create the "emissions estimate" – this is done for NO_2 and PM_{10} separately, and for the route option compares to the present and future Reference Case.

* emission factors were calculated for NOx, for the purposes of the assessment all of the NOx was assumed to be NO_2.

This was undertaken for the four route options, for the two future years (2006 and 2021), the current Reference Case being taken as 1999. The results are presented fully in Appendices and summarised below. A negative overall assessment score indicates an overall beneficial impact from the scheme. A positive overall assessment score indicates an overall adverse impact from the scheme. The number of zones with negative/positive assessment scores or

reported in the AST tables in Appendix B as the number of winners/losers in each scenario. This is shown graphically on Figures 10 to 13 and illustrates the extent and scale of impacts on corridors to and from each of the crossing locations

Table 3.2: Summary of Air Quality Impacts

Compared to Reference Case	2006	2021
St Lawrence	beneficial	beneficial
St Anthony's	adverse	beneficial
Walker	beneficial	beneficial
St Bede's	beneficial	beneficial

3.3 Greenhouse Gases

The method used to calculate the impact on greenhouse gases was as described in GOMMMS. The Design Manual for Roads and Bridges (DMRB) Volume 11 has been used to provide the coefficients and speed relationships for the production of carbon dioxide (CO_2) forecasts, which can be used to indicate changes in global air quality.

The rate of emissions of CO_2 for cars is stated as 163 grams per kilometre at a constant 100 kilometres per hour for the base year 1996. DTLR estimate that vehicle improvements will reduce the rate of CO_2 emissions by 4% to the year 2006 and by 10% to 2016.

As CO_2 emissions vary with vehicular speed, the total vehicle kilometres travelled and average speed were tabulated for each road. It was then possible to calculate aggregate emissions for each road and an overall study area.

The results for each of the respective options in accordance with GOMMMS are summarised in the AST in Appendix B and the worksheets are shown in Appendix C.

The results indicate that the respective savings in total vehicle emissions vary over time probably as a result of congestion again building up on various crossing options. In the short term the St Anthony's option is the only option resulting in greater vehicle emissions than the Reference Case (do-nothing) although this is only for a period of two years. The St Lawrence option results in the greatest savings in vehicle emissions whilst savings are most consistent with the St Bede's option.

Table 3.3: Summary of Year 2006 CO_2 emission (kg), per day

	1999	2006	2021
Reference Case	1,925,143	2,093,672	2,391,907
St Lawrence		2,085,026	2,331,324
St Anthony's		2,097,026	2,370,918
Walker		2,076,617	2,366,959
St Bede's		2,082,211	2,378,845

3.4 Landscape

The landscape impact was assessed as described in GOMMMS for strategies.

The results of the landscape appraisal are presented in Appendix B and the worksheets are in Appendix C. An appraisal of each of the options is given below.

3.4.1 St Lawrence

From the roundabout at the junction of the A193 Shields Road bypass with Byker Bank, the route goes eastwards to Albion Road where it turns sharply to the south and progresses under the A193 and the Metro line in a new tunnel. It continues southwards to the west of Dalton Road through open space land associated with the Byker residential development. The land is currently shielded from Dalton Road by high stone walls which would have to be demolished thereby exposing the housing to the effects of traffic, noise, visual intrusion and safety concerns.

South of St Michael's Road the route passes between St Lawrence Park to the west and the commercial buildings to the east. A new road in this location would have a detrimental effect on the character of the park.

The route then crosses the A186 Walker Road on the line of the disused railway bridge before turning sharply south to cross the river on a 2/3 lane opening swing bridge. Various highway works will be required to connect the new road into the existing road system using a system of ramped approaches. This is a narrow section of the river and a low level bridge in this location could fit well into the existing landscape of the river corridor.

After crossing the river the route which is a 2 lane single carriageway road bears sharply to the east through a presently attractive area of parkland. It continues through a car park and along South Shore Road, a steeply sloping lane between extensive woodland planting. It continues eastwards following the line of Tyne Main Road for a short distance before turning off towards the river into the Friars Goose reclamation area. The route passes between two large mounds which will ensure that it is screened from the river and does not intrude into the river corridor landscape which at this point is largely semi-rural in character.

It continues across Green Lane which provides access to the hotel and the Friars Goose slipway and boating centre, and into the Keelmans Lane recreation area which was reclaimed from former industrial land in the early 1980's. The area is pleasantly wooded on steep slopes which open out to provide striking views down the river. This area is elevated and a road in this location would be highly visible and would adversely affect the largely rural character of this section of the river corridor.

The route continues to follow the line of the footpath as it leaves the recreation area and passes between the industrial developments until it finally joins Nest Road. At this point it continues in a south easterly direction to recross Nest Road and on through the recreation ground until it meets with Abbotsford Road. At this point it turns sharply eastwards continuing between the residential development of Corrofell Gardens to the north and the Felling Industrial Estate to the south. From Corrofell Gardens the route follows the footpath down Heworth Lane which follows the route of a dene running north to the river. At Heworth Lane the route turns sharply south through the Metro station car park to join a proposed grade separated junction at Heworth Roundabout.

The change in level of the landform between Heworth Lane and the proposed grade separated junction at Heworth Roundabout is considerable and extensive earthworks would be required to construct the necessary road system. Currently the area through which the road passes is well treed but the proposed earthworks would lead to most of it being removed.

3.4.2 St Anthony's

From the roundabout at the junction of the A193 Shields Road bypass with Byker Bank, the **Variant A** route goes eastwards to Albion Road where it turns sharply to the south and progresses under the A193 and the Metro line in a new tunnel. It continues southwards to the west of Dalton Road through open space land associated with the Byker residential development. The land is currently shielded from Dalton Road by high stone walls which would have to be demolished thereby exposing the housing to the effects of traffic, noise, visual intrusion and safety concerns.

South of St Michael's Road the route passes between St Lawrence Park to the west and the commercial buildings to the east. A new road in this location would have a detrimental effect on the character of the park.

The route then crosses the A186 Walker Road on the line of the disused railway bridge before turning eastward to follow the line of the former railway which has been converted into a pedestrian riverside walkway. The walkway occupies a level plateau elevated high above the river with steep slopes both above and below. These slopes have been very heavily wooded over the last twenty or so years. From the Marina development at St Peter's there is no further development between the proposed route and the river until the Walker Riverside Industrial Park, the land having been given over to recreational uses. This section of the river corridor is narrow with high steeply sloping banks. The investment in landscape improvement over the last three decades has produced a heavily wooded landscape, almost rural in character, which effectively screens the residential developments to the north.

It is proposed that the new feeder road to the west of the bridge crossing at St Anthony's Riverside Park should be a 4 lane single carriageway. To accommodate a road of this width on such a steeply sloping topography will require the construction of substantial retaining structures. Both the construction of the road and the traffic it would generate would be highly intrusive in the landscape and adversely affect the character which has been created over the last two to three decades.

The **Variant B** route commences at the roundabout at the eastern end of the Shields Road Bypass and continues south along the western edge of Allendale Road / Bothal Street corridor. This would involve:

- the removal of the screen mounding and planting around the eastern edge of the Byker development adjacent to Union Road and Bothal Street
- land take from the Newcastle City Council City Works Depot
- possible removal of properties at the east end of Commercial Road
- possible removal of the row of shops between Commercial Road and Ayton Street
- possible removal of properties at the east end of Ayton Street
- land take from the sports ground
- land take from St Anthony's Park

South of the A186 Walker Road the route connects into the former railway line immediately to the west of the Oval across an area of allotment gardens. The change in level between the former railway line and Walker Road is such that this connecting section of road would be very steep.

To the east of the bridge crossing at St Anthony's Point, both routes follow the edge of the plateau where it slopes sharply down to the river. It is still on the line of the former railway which has been converted into a pedestrian walkway. The route is set back from the river for a distance varying from 150m – 300m. Much of this is flat land adjacent to the river and

occupied mainly by industrial uses. The southern edge of the route slopes down steeply and in places is almost vertical. Although it is proposed to construct this section as a 2 lane single carriageway road the extent of the retaining structures required by the topography would be considerable. The bridge would be a 4 lane wide opening bridge constructed at a height of 18m above the river. The heights of the banks on both sides of the river at this point are such that a bridge of this height could fit well into the landscape.

South of the river the route passes through heavily wooded river banks before turning sharply westwards within the playing field area immediately north of Tyne View Gardens. This will result in the loss of a substantial area of woodland, the playing field and the loss of an amenity for the residents of Tyne View Gardens and surrounding area. On reaching Low Heworth Lane the route is the same as for the St Lawrence Bridge Crossing turning sharply south through the Metro station car park to join a proposed grade separated junction at Heworth Roundabout.

The change in level of the landform between Heworth Lane and the proposed grade separated junction at Heworth Roundabout is considerable and extensive earthworks would be required to construct the necessary road system. Currently the area through which the road passes is well treed but the proposed earthworks would lead to most of it being removed.

3.4.3 Walker

On the north side of the river the feeder roads are the same as for the St Anthony's option (variants A and B) except that the 4 lane single carriageway road extends to the bridge crossing which is located approximately 1.0km further east than in the St Anthony's option. This is likely to have an even greater adverse impact on the Pottery Bank area where housing to the south of Merton Road has already been demolished.

The location of the bridge crossing is in a section of the river corridor that is starting to open out and become more expansive as it moves to the east. There is flatter land on both sides of the river occupied by industry to the north and reclaimed land on the south bank. Consequently, the 4 lane single carriageway bridge constructed 18m above river level along with its associated earthworks for the grade separated junctions, will be an intrusive element within the broader river corridor.

The route continues across the open land almost touching the northeast corner of Marian Drive. From here it would pass directly under the Metro line and the A185 Victoria Road West. It then crosses South Tyneside College playing fields before passing into an area of reclaimed colliery spoil heaps immediately to the north of the Metro line. Construction of a road through this area would presumably require the removal and regrading of large quantities of colliery spoil.

The Metro line is in a cutting at the point where it is crossed by the road thereby avoiding the need for bridge embankments. South of the Metro line it crosses agricultural land before joining Mill Lane. At this point the new road layout arising from the connection into the junction on Leam Lane would result in the removal of a large part of the new Monkton Business Park. From the Leam Lane/Mill Lane junction the route progresses across flat open arable farmland to connect into the A184(T) just west of the Testo's Roundabout on the A19(T).

3.4.4 St Bede's (Variant A)

The proposed 2 lane opening bridge and approach roads closely follow the existing alignment of the Tyne Tunnel. Consequently, the effects on the local landscape / townscape will not be extensive in terms of excavation during the construction phase. In the long term however, a road would create a barrier to east west movement and cause major severance problems to the local communities.

The provision of a 2 lane opening bridge approximately 15m above river level should not in itself cause problems, particularly on the southern bank where the topography would accommodate the bridge abutments very well. However, on the north bank the land is flatter and lower and it is expected that embankments would probably be required.

3.4.5 St Bede's Crossing (Variant B)

This option in physical terms is almost identical to Variant A although the additional width of the road would compound the severance of communities, particularly in Jarrow.

3.4.6 St Bede's Crossing Variant (C)

The provision of a 2 lane bored tunnel following closely the line of the existing Tyne Tunnel would generally avoid disruption to the urban areas in Howdon and Jarrow and in particular to the listed buildings.

3.4.7 St Bede's Crossing (Variant D)

The two lane immersed tube tunnel would result in greater disruption to the urban areas of Jarrow and Howdon than the bored tunnel option.

3.5 Townscape

The townscape impact was assessed as described in the GOMMMS method for strategies.

The results of the townscape appraisal are presented in Appendix B and the worksheets are in Appendix C. The impact on the urban area is considered minimal at a strategic level for the St Lawrence, St Anthony's and Walker crossings and thus the townscape worksheets for these alternatives are not considered appropriate. The impact has therefore been classified as neutral/slight adverse.

3.5.1 St Bede's (Variant A and B)

Severance of urban area would result from major road creating a moderate adverse impact.

3.5.2 St Bede's (Variant C)

The extent of disruption necessary to build a bored tunnel is unknown and thus has been classified as a neutral impact.

3.5.3 St Bede's (Variant D)

The slight adverse effect could be mitigated by creation of opportunities for redevelopment.

3.6 Heritage of Historic Resources

The assessment of the impact of the various scheme options on the historic environment follows the method described in GOMMMS. The impact assessment study has been prepared with reference to both known and previously unrecorded archaeological sites, including scheduled monuments, designated Conservation Areas, Listed Buildings and other buildings of acknowledged architectural quality or historic significance. The potential for previously unknown or unrecorded sites to survive within the immediate area is also assessed. The likely direct impact of the road construction upon these sites, areas and buildings is considered, together with the indirect impacts on their settings.

The assessment is based on a desk study of cartographic evidence, sites and monuments records, national monument records, listed building schedules, conservation areas and lists of other historic buildings maintained by each of the relevant local authorities. During the course

of the assessment consultations were made with both the Tyne and Wear Archaeology Officer and the Tyne and Wear Industrial Archaeologist.

3.6.1 St Lawrence

The route would not impact upon any scheduled monuments but it is likely to have an adverse impact upon the setting of several listed buildings. The Heworth roundabout bisects the former village of Nether Heworth, the principal surviving elements of which are the Church of St Mary's (listed Grade II) and Heworth Constitutional Club, which was formerly Nether Heworth Hall (listed Grade II*). In addition the church cemetery contains one tomb (listed Grade II*) and a further eight monuments of groups of monuments (listed Grade II). Enlargement of the roundabout and the provision of a two lane flyover could have an adverse impact on the setting of the church and the Constitution Club and possibly several of the monuments in the cemetery. The removal of trees would increase the adverse impact in this area.

At Friars Goose the route passes within 100m of the former engine house (listed Grade II) which was associated with Tyne Main colliery. Any adverse impact on the setting would need to be mitigated.

Close to the point where it connects with the Shields Road bypass, the route would pass immediately to the north of the Church of St Silas (listed Grade II) and would adversely impact upon the setting of the building.

The Byker Wall together with the surrounding environs has been proposed for listing as Grade II *, and is also being considered as a future Conservation Area by Newcastle City Council. The route along the former Newcastle and Tynemouth Riverside Branch railway would lie immediately outside the boundaries of the area currently being considered but it could have an adverse impact on the setting and character of the Byker Wall area.

A wide range of industries and manufactories were formerly located on the banks of the Tyne. A number of elements are recorded on the sites and monuments record, but this is not an exhaustive or representative list of these activities or necessarily of the most significant elements. It is based largely on named features taken from 1st and 2nd edition Ordnance Survey mapping and does not take account of the actual or potential survival of physical remains. The significance of many elements can only be established through detailed map regression studies, documentary research and evaluation works. Potentially regionally significant features would include the site of St Lawrence's Chapel and the site of the Mushroom bottleworks (the Low Glasshouse) on the riverbank north of the swing bridge; medieval and early post-medieval remains on the St Lawrence and South Shore banks of the river.

The line of Hadrian's Wall, which is designated as a World Heritage Site, lies immediately to the south of Shields Road and at its northern end the route would fall within the Hadrian's Wall Military Zone as defined by Newcastle City Council. Only isolated elements of the wall are scheduled in urban areas where they are known to survive, and the closest scheduled section lies on Shields Road over 70m to the northwest of the end point of this route option. Although the route would not impact on the line of the wall, which lay further to the north, although it is possible that it could transect the line of the Vallum, which lay to the south of the Wall, although its course in this area is uncertain. The potential for impact upon Roman deposits within this area would require evaluation.

3.6.2 St Anthony's

The route would not impact upon any scheduled monuments but it would have an impact upon the setting of several listed buildings. At Heworth, the impact would be the same as for the St Lawrence Bridge Crossing. Enlargement of the roundabout and the provision of a two lane flyover would have an adverse impact on the setting of Church of St Mary's (listed Grade II)

and Heworth Constitutional Club, which was formerly Nether Heworth Hall (listed Grade II*) and possibly several of the listed monuments in the cemetery (listed Grade II and II*). The removal of trees would increase the adverse impact in this area.

A Gas Holder north of the Walker Riverside Industrial Park is recorded as a historic building of local architectural interest. In addition, the Wincomblee Area at the northern end of the route is also recorded as an area of local architectural interest. The route lies in close proximity to both areas and the significance of any impact should be considered.

Close to the point where it connects with the Shields Road bypass, the Variant A route would pass immediately to the north of the Church of St Silas (listed Grade II) and would adversely impact upon the setting of the building.

The Byker Wall together with the surrounding environs has been proposed for listing as Grade II *, and is also being considered as a future Conservation Area by Newcastle City Council. The Variant A route along the former Newcastle and Tynemouth Riverside Branch railway would lie immediately outside the area currently being considered. The Variant B route would run within and along the eastern edge of the proposed Conservation Area. Both variants could have an adverse impact on the setting and character of the Byker Wall area.

The line of Hadrian's Wall, which is designated as a World Heritage Site, lies immediately to the south of Shields Road and at its northern end the route would fall within the Hadrian's Wall Military Zone as defined by Newcastle City Council. Only isolated elements of the wall are scheduled in urban areas where they are known to survive. For Variant A, the closest scheduled section lies on Shields Road over 70m to the northwest of the end point of this route option. This route would not impact on the line of the wall, which lay further to the north, although it is possible that it could transect the line of the Vallum, which lay to the south of the Wall, although its course in this area is uncertain. For Variant B, the closest scheduled section lies at the western end of the Fossway, approximately 100m northeast of the end point of this route option. Once again, it is possible that it could transect the line of the Vallum at some point to the south of this but it is not known if any remains survive. The potential for impact upon Roman deposits within this area would require evaluation.

On the north side of the River Tyne the route follows the course of the former Newcastle and Tynemouth Riverside Branch railway. The construction of this railway is likely to have had a detrimental effect on the preservation of earlier historic features where it was in cutting, whilst conversely it will potentially have preserved earlier features where it was built up on an embankment. For the most part, mainly industrial features of probable local significance are recorded in the immediate vicinity of the route pre-dating the railway based on the cartographic evidence and on the sites and monuments record. The limitations to this evidence, as set out for the St Lawrence Bridge Crossing also apply here. The bridge crossing would transect the site of a shipbuilding yard which included a dry dock at St Anthony's in1853 and the site of parish Quay on the south bank. Both waterfront sites have the potential to be regionally significant.

3.6.3 Walker

With the exception of the bridge crossing, the impact of the route north of the River Tyne would be the same as for the St Anthony's Bridge Crossing (Variants A and B). South of the River, the route would not impact upon any scheduled monuments, the closest such site being Wardley moated site which lies north of South Wardley Farm over 600m to the south-west. There would be no impact on setting as a range of reclamation features lie between the route and the site. The route transects a section of the Bowes railway, parts of which are scheduled elsewhere, but the section north of the former Brandling Junction Railway does not have this designation and is in a poor condition. The railway as a whole is, however, one of 16 Other Important Archaeological Sites in the Borough which are cited in the UDP and deposits

should either be preserved in situ or if this is not possible, investigated and recorded prior to development.

Several listed buildings lie immediately north and south of the A184(T) to the west of the tie-in. Scots House together with the associated lodge and barn, and Boldon Fellgate Farm are all Grade II listed buildings. The barn at Boldon Fellgate Farm and two buildings at West Fellgate Farm are also recognised as buildings of acknowledged architectural quality or historic significance. Although the setting of Boldon Fellgate Farm has been adversely affected by its proximity to the existing A184(T), there had historically been a road to the south of the farm. The proposed route adversely impacts on the setting of the farm by separating the buildings from the agricultural landscape to the north and by confining the site in a narrow wedge of land. Any adverse impact on the setting of the buildings at Scot's House could probably be reduced or remedied by appropriate mitigation measures.

Although a limited number of archaeological and historic are recorded in close proximity to the route south of the Tyne, these mainly include features of local significance such as staithes, railways and waggonways. The most significant archaeological site is the Wrekendike, the Roman road to South Shields, which is one of 16 Other Important Archaeological Sites in the Borough which are cited in the UDP. The line of the Roman road is bisected by the route, but its course at this point lies beneath Leam Lane and the potential for good survival is considered to be low. Adequate mitigation through survey and investigation could be specified. Since the route south of the Tyne traverses quite extensive tracts of greenfield agricultural land, there is the potential for the route to have an impact on unrecorded archaeological remains. This impact could only be quantified through evaluation.

3.6.4 St Bede's (Variants A and B)

Both the bridge options would have a similar impact upon heritage features. On the south side of the river there are two Grade II listed buildings/structures within the immediate vicinity of the bridge alignments: the statue of Sir Charles Palmer and the Gaslight Public House. Although potentially not directly affected, the alignments could have an adverse impact on the setting of both the monument and the building. The monument has previously been moved to its present location and any impact could be mitigated by relocating it in a more appropriate part of the town centre.

No scheduled monuments would be affected by these variants and the affected archaeological sites are, with one exception, considered to be of local importance. The alignments transect the site of the Howdon Pans Shipbuilding Yard which is potentially a site of regional importance. This area is likely to contain the remains of former shipbuilding areas, a dry dock, buildings, quays, and saltpans and it is considered that a bridge would have a slight to moderate adverse impact on such remains.

3.6.5 St Bede's (Variant C)

The bored tunnel would have a very limited impact upon heritage features as it would avoid any impact upon either listed buildings/structures or upon nationally or regionally important archaeological sites or deposits. It could affect locally significant remains but this could be adequately mitigated through investigation and recording.

3.6.6 St Bede's (Variant D)

There are three Grade II listed buildings/structures within the immediate vicinity of the immersed tube tunnel alignment: the Tyne Pedestrian and Cycle Tunnel access complex, the statue of Sir Charles Palmer and the Gaslight Public House. The Pedestrian and Cycle Tunnel would not be directly affected, however, construction of new access roads would have a minor temporary adverse effect on its setting. The Charles Palmer Monument and the Gaslight Public House lie within a zone which would be affected by construction and demolition of the

structures would result in moderate adverse impacts. The Charles Palmer Monument has previously been moved to its present location and could be relocated to a more appropriate part of the town centre. The impact upon the Gaslight Public House could only partly by mitigated through a programme of recording prior to demolition.

No scheduled monuments would be affected by this variant and the affected archaeological sites are, with one exception, considered to be of local importance. The Howdon Pans Shipbuilding Yard occupies man-made platform that has been progressively reclaimed from the river and is potentially a site of regional importance. This area is likely to contain the remains of former shipbuilding areas, a dry dock, buildings, quays, and saltpans and it is considered that the construction of cut and cover tunnel through this zone would have a moderate adverse impact on such remains. This impact could be partially mitigated through a programme of archaeological investigation and recording.

3.7 Biodiversity

The assessment of the potential impact of each strategy on the biodiversity resources involved a description of each resource and its importance as well as an assessment of the magnitude and significance of the impact.

Information was obtained on the locations of designated sites, including Special Areas of Conservation (SAC), Special Protection Areas (SPA), Sites of Special Scientific Interest (SSSI), Sites of Nature Conservation Interest (SNCI) (county tier sites) and ancient woodlands. English Nature's profiles for the natural areas, through which the routes pass, were also obtained.

Little information was available on the locations of protected species at this strategy level of search, although it is likely that protected species may occur at some locations. There was also little information available on habitat types, with most information gained from maps and aerial photographs.

Additionally for some administrative areas, the county tier nature conservation information does not distinguish between whether sites are of district or of more local value. At this stage of the study, these sites were assumed to be of regional interest.

Although the study is a strategy level appraisal, the plan level worksheets (GOMMMS worksheet 4.10) were completed. It was considered that sufficient information about likely route corridors was available to identify specific locations that would be affected. However, since specific detailed alignments were not available, many of the impacts predicted are general in nature.

The results for each option are described below. A summary assessment score is provided in the AST's in Appendix B and the worksheets are presented in Appendix C. Figures 6 - 9 show the biodiversity constraints along each route.

3.7.1 St Lawrence

The route (Figure 6) would cut through part of Felling Shore SNCI, which will reduce its overall size and fragment the habitats present. It is assumed that the fringe areas adjacent to the river would not be directly impacted, although appropriate mitigation measures would be required to minimise encroachment. Further information on the habitats that would be lost may result in the magnitude of impact being upgraded.

3.7.2 St Anthony's

The route (Figure 7) would run parallel to the northern boundary of Walker Riverside, which is a Site of Local Conservation Interest (SLCI) and designated wildlife corridor. Development along this route may require mitigation or design measures to prevent excessive encroachment

and maintain the functionality of the wildlife corridor. Around the northern bridgehead, the site would be severed and an amount of land-take would be required. Appropriate mitigation measures could be implemented to maintain links across the site and reduce the overall severance impacts.

3.7.3 Walker

The route (Figure 8) would run parallel to the northern boundary of Walker Riverside, which is an SLCI and designated wildlife corridor. Development along this route may require mitigation or design measures to prevent excessive encroachment and maintain the functionality of the wildlife corridor. Around the northern bridgehead the site would be severed and an amount of land-take would be required. Appropriate mitigation measures could be implemented to maintain links across the site and reduce the overall impacts of the severance.

At the southern bridgehead there are two designated sites that would be directly impacted. Although these sites are separately designated, because they are in neighbouring local authority boundaries, ecologically they form a larger, continuous, single site, increasing their overall biodiversity value. The overall cumulative impact at these sites is considered to be significant - serious adverse under the revised guidance note on the environmental capital approach.

Pelaw Quarry would be significantly impacted by the route, which would cut through a large portion of the site and potentially affect its overall integrity. The site is within a larger area designated for use in the Great North Forest project, the potential success of which could be seriously restricted in this location from the route alignment. Compensation in the form of tree planting elsewhere may be appropriate to help ameliorate the long-term impacts of this development.

The route would cross the Calf Close Burn, possibly at two locations to accommodate the split lanes feeding into the A184. Downstream of the crossing location is an SNCI which could be indirectly impacted by construction activities should specific measures not be in place to deal with potential impacts (eg noise, spillages, runoff, plant access). No details were available on the habitats and species present within the SNCI, but impacts could be between neutral and minor adverse depending on the construction methods and species/habitats present.

3.7.4 St Bede's (Variants A, B and C)

The route (Figure 9) is very unlikely to have any direct impacts on Northumberland Dock SNCI or Jarrow Slake SNCI given their distance from any construction areas. There could be a direct impact around the southern limit of the River Don Salt Marsh SNCI if appropriate spillage and run-off containment procedures are not put in place. Depending on the species present (eg water voles), there may be adverse indirect impacts generated from construction disturbance. Detailed surveys would be necessary to describe the species and their distribution around the construction areas. This may result in the biodiversity and earth heritage value being upgraded although the summary assessment score would be likely to remain as minor adverse.

3.7.5 St Bede's (Variant D)

The route (Figure 9) is very unlikely to have any direct impacts on Northumberland Dock SNCI or Jarrow Slake SNCI given their distance from any construction areas. There could be a direct impact around the southern limit of the River don Salt Marsh SNCI if appropriate spillage and run-off containment procedures are not put in place. Depending on the species present (eg water voles), there may be adverse indirect impacts generated from construction disturbance. Detailed surveys would be necessary to describe the species and their distribution around the construction areas. This may result in the biodiversity and earth

heritage value being upgraded although the summary assessment score would be likely to remain as minor adverse.

Although there are a number of nationally and internationally important sites around the coastline, none of these sites is likely to be significantly impacted by the development proposals. However, there could be a potentially adverse impact on the migratory salmon population in the River Tyne from dredging activities. Restricting the dredging operations to the winter months, when the majority of salmon would be absent from the estuary system, could mitigate this impact.

3.8 Water Environment

The assessment of the impacts of the scheme options on the water environment has been undertaken as a qualitative assessment following the guidance given in GOMMMS. The assessment has been made through desk studies using Ordnance Survey maps and the Environment Agency website. Although the study is a strategy level appraisal, plan level worksheets (GOMMMS 4.12) have been completed for each of the options (see Appendix C). It was considered that there was sufficient information to identify route specific impacts, although general impacts are discussed where there is a lack of detailed knowledge.

The River Tyne runs west to east through the study area towards the North Sea. The banks of the River Tyne are mostly industrialised, although Walker Riverside Park follows the north bank in the St Anthony's area, and the south bank around Bill Quay is a designated conservation area.

Although the area is urbanised, several watercourses flow into the River Tyne: Willington Gut and Ouse Burn on the north bank; River Don, Calfclose Burn and Monkton Burn on the south bank. A number of mostly culverted watercourses and open drainage channels are also present, mainly on the southern side of the River Tyne.

Several water features are also present: Pelaw Quarry ponds and Bede's World ponds, and Sites of Natural Conservation Interest at Bill Quay, River Don Salt Marshes, Northumberland Dock and Jarrow Slake (all at St Bede's, Jarrow).

General Impacts

Each of the four proposed routes and crossing points considered in the study are likely to affect the water environment in the area in a similar manner.

Works on and in the River Tyne

Works in the river channel and along the banks have the potential to affect the river environment in a number of ways.

Disruption of potentially contaminated sediment in the river bed may affect the biodiversity of the river during construction. Additionally, there is a risk of direct contamination from spillages from the carriageway for the bridge crossing options. The River Tyne provides habitat for a number of fish species which may be affected by sediment suspension in the channel during construction, and mitigation measures would have to be implemented to reduce this impact.

Mitigation measures should be implemented to avoid the obstruction of the waterway. The river is a main navigational channel lined with a number of docks and marinas throughout the study area. The crossing has the potential to adversely affect the river navigation, although careful design and construction should avoid any significant impacts.

Works in the river channel may alter the flow regime of the river during construction and possibly during operation of the crossing. Bridge piers may increase the afflux in the river

and cause localised areas of erosion and deposition. This may have detrimental impacts on the ecology of the river. Construction impacts will be dependant on final design solution and likely level of disturbance of the river and river bed. Considerate design of any in-channel structures and construction activities may mitigate these impacts.

Surface Water Drainage

Generally in an urbanised area such as this, the proportionate increase in impermeable area, and hence increase in surface water run-off is negligible. However, cumulative and/or local impacts may be significant and it is assumed that mitigation measures, such as balancing ponds or oversized pipes would be used as required.

Water Quality in Receiving Watercourses

The effect of the surface water from the proposed roads on the quality of the receiving watercourse will depend on the size and flow of the watercourse. It is assumed that appropriate mitigation measures, such as oil interceptors, would be implemented as part of all the options to control pollution.

Groundwater

The study area is underlain by rocks of the Middle Coal Measures which are classed as a Minor Aquifer. These can be fractured or potentially fractured rocks, which do not have a high primary permeability, or other formations of variable permeability including unconsolidated deposits. Although these aquifers will seldom produce large quantities of water for abstraction, they are important for both local supplies and in supplying base flow to rivers. However, only sandstones in Coal Measures are likely to be sufficiently permeable to behave as aquifers.

The aquifer is protected by drift cover, but this is of variable permeability and is unlikely to protect the underlying aquifer completely. Potable abstraction is not believed to take place in this area; no Source Protection Zones have been identified.

Given the density of industry in the area, it is highly likely that much of the land will be 'made ground', particularly that near the banks of the River Tyne. There is also a strong possibility that the made ground is contaminated and disturbance through construction activities may cause contamination of the groundwater. It is important to note that if the aquifer has been designated as 'Minor' then it should be protected appropriately, taking into account the existing quality and whether the groundwater is currently abstracted for any purpose.

Floodplain

The area within this study falls inside the tidal zone of the River Tyne, and the Environment Agency indicative floodplain maps show a few small areas of tidal floodplain around the existing vehicle tunnel. The only fluvial floodplain indicated within the study area is on the banks of the River Don in Jarrow where proposed works around the A19 may be affected by flooding during a 1 in 200 year event. We are not aware of any issues regarding flooding of property in this area.

Although no floodplains are indicated on the Environment Agency website, localised areas surrounding these streams and ponds may be susceptible to flooding during severe events and this should be mitigated for in the design of the watercourse crossings.

Pipe Networks, Culverted Watercourses and Outfalls

In an urbanised area it is inevitable that developments have the potential to cause conflicts with the existing mains water, surface water and wastewater infrastructure.

Several short lengths of open watercourse (between longer, culverted sections) lie within the study area, but most are unlikely to be directly affected by the proposed development. Further investigation may be required to identify the route of any culverted drains as proposed construction activities may be in conflict. It is anticipated that these issues could be diverted without loss to the quality of the water environment.

3.8.1 St Lawrence

It is possible that the potential increase in surface water runoff from increased impermeable area due to the new road proposed on the south side of the River Tyne would have to be mitigated for through the use of attenuation systems. Given the close proximity of the Tyne for most of the route, it is likely that this would be the receiving watercourse for surface water. There is no significant increase of impermeable area on the north bank.

The proposed route passes over a previous landfill site at Old Fold. The potential for disturbing contaminated land is very high. A Site of Natural Conservation Interest located downstream, at Felling Shore, may be affected.

Sandstone is the underlying rock for most of the proposed route, with a combination of alluvium and till forming the drift deposit above. The Ouse Burn flows into the River Tyne approximately 500m upstream of the proposed crossing. This watercourse is unlikely to be directly affected by the proposed development.

In summary, the St Lawrence Option is considered to have **slight adverse** effects on the water environment provided mitigation measures are implemented.

3.8.2 St Anthony's

The proposals outlined for this route (both variants) result in few specific impacts on the water environment in addition to the general impacts discussed above. The impact from increased surface run-off is likely to be larger in this scheme than the St Lawrence or St Bede's Options due to a greater overall increase in impermeable area from proposed roads through Walker Riverside Park. Appropriate mitigation measures could be implemented to reduce the effects of increased run off, and a reduction in water quality.

Sandstone underlies the proposed route for most of its length, and Westerhope Dyke (an igneous intrusion) is present at the eastern end of the route which is likely to prevent groundwater flow from and to the north of the site. The drift deposits in this area are alluvium and till.

The marina at St Peter's may be affected due to the proposed four lane feeder road whose route passes less than 50m from the marina (Variant A). However, it is unlikely that the water environment relating to this marina will be affected to a large extent, either through construction or operation of the road.

In summary, this proposal is considered to have **slight adverse** effects on the water environment provided mitigation measures are implemented.

3.8.3 Walker

The route proposed in this option affects a large area of land and a number of features in the water environment. The route for this option on the north bank is very similar to that assessed in Option 2 (St Anthony's Bridge Crossing). A short section of drainage channel in Walker Riverside Park would be crossed by the proposed road, probably leading to the entire watercourse being culverted. This is not anticipated to significantly affect the water environment, as the watercourse is currently extensively culverted up and downstream, although it may be detrimental to the nature of Walker Riverside Park.

The proposed route on the south bank extends to approximately 4km from the River Tyne at Maloney's Quay to the A184(T) just east of Boldon Fellgate Farm. Much of this area is undeveloped agricultural or brownfield land, and the construction of a four lane road may considerably alter the surface water drainage regime through this area.

The proposed road crosses a number of streams: Calfclose Burn at Boldon Fellgate Farm; Monkton Burn upstream of West Fellgate Farm and the Cutthroat Dean at Bill Quay. The proposed route also passes close to Pelaw Quarry ponds.

A Site of Nature Conservation Interest is present downstream of where the proposed route crosses Calfclose Burn. Downstream of where the proposed route crosses Monkton Burn , several ponds are present (West Fellgate Farm). Appropriate mitigation measures would be required to protect all these water features from contamination during construction and operation of the proposed road.

Although the proposed road passes over the streams in an undeveloped area, the watercourses all flow into heavily built-up areas a few kilometres downstream of the crossing point. Discharge of surface water from the proposed road may increase the flood risk of the urban area downstream, and mitigation measures to attenuate the flow should be implemented.

The proposed road alignment also cuts through the SNCI at Bill Quay and appropriate mitigation measures would be required to minimise any impacts associated with changes in road run-off quality and quality. The proposed road alignment has the potential for direct disturbance of Cutthroat Dean, which runs through the SNCI. The road has the potential to disturb natural drainage patterns which may affect the nature and ecology of the SNCI.

The rock in the western part of the proposed route is sandstone, and mudstones and minor sandstones in the eastern section. Westerhope Dyke in the north may prevent groundwater flow in this direction, and a large fault present in the east of the site may either restrict or increase groundwater flow. Drift deposits in this area are likely to be alluvium and till.

The presence of former and existing quarry sites at Pelaw suggests that much of the land in the area is 'made ground' which may be contaminated. Disturbance of the ground through this area therefore has the potential to contaminate the ground and surface water.

The summary assessment score for the Walker Bridge Crossing is that it would have a **slight adverse** effect on the water environment providing mitigation measures are implemented as part of the scheme.

3.8.4 St Bede's (Variants A and B)

This option crosses the River Tyne in approximately the same location as the existing vehicle tunnel, connecting the A19(T) at Jarrow in the south to the same road at East Howdon in the north.

A former landfill site is present in the study area north of the proposed crossing and any development in this area would have to take account of the likely presence of contaminated land and the potential risk to groundwater quality during construction.

Most of the proposed route lies over mudstones with some minor sandstones. Drift alluvium is present in or near the river, with lacustrine clays or sands below; till is present below the alluvium inland.

Howdon Dean is a stream which runs through the Willington Quay area to the River Tyne, and is now culverted for most of its length (presumably constructed during development of the landfill). The only visible remains of this water course is a short length of ditch by the junction between the A193 and A19. The majority of this watercourse has been culverted and its route should be confirmed to assess whether any construction works in this area have the potential to cause conflict.

Surface water impacts on the drainage regime of the north and south banks are likely to be negligible. The River Don Salt Marsh SNCI is located downstream of the proposed works. Appropriate mitigation measures would be required to protect this water feature from contamination during construction and operation of the proposed road. Jarrow Slake and Northumberland Docks are also designated SNCIs but are not thought likely to be affected by the proposed development.

The proposed works on the A19(T) south of the River Tyne may reduce storage on the River Don floodplain. Mitigation measures may have to be implemented in order to prevent further exacerbation of any flooding in this area.

The summary assessment score of the St Bede's Bridge Crossing (Variants A and B) is that the option would have a **slight adverse** effect on the water environment provided mitigation measures are implemented.

3.8.5 St Bede's (Variant C)

Surface water impacts on the drainage regime of the north and south banks are likely to be negligible. Impacts of the proposed development on the SNCIs in the study area would be similar to those previously discussed. The quantity and quality of the water at Bede's World ponds may also be affected by changes to the groundwater in the area.

Most of the proposed route lies over mudstones with some minor sandstones. Drift alluvium is present in or near the river, with lacustrine clays or sands below; till is present below the alluvium inland. Groundwater may be affected during construction of the tunnel through disturbance during tunnel boring. Mitigation measures would have to be put into place to provide protection of the water in the minor aquifer.

The tunnel boring operations are also likely to cause conflict with a number of mains water and waste water services, particularly where the bore is near the surface. Diversions may also be required for pipes above the bore which are affected by settlement problems. Sediment generated by the tunnel construction should be prevented from washing into the River Tyne and the River Don. Sediment in silt-laden groundwater should be allowed to settle before discharging the water into watercourses.

In summary, provided mitigation measures are implemented, this proposal is considered to have a **slight adverse** effect on the water environment.

St Bede's (Variant D)

The new road system proposed for this option is similar to that illustrated in Variants A, B and C. In this case, the route across the River Tyne is provided by an immersed tube tunnel located alongside the existing Tyne vehicular tunnel.

Surface water impacts on the drainage regime of the north and south banks are likely to be negligible. Impacts of the proposed development on the SNCIs in the study area would also be similar to those previously discussed.

A larger number of conflicts with mains water and waste water services would be expected due to the cut and cover method of tunnel construction. All existing pipes and culverts which cross the route of the tunnel would have to be temporarily or permanently diverted.

As a result of the cut and cover construction method, there is the potential for significant volumes of heavily silt laden water to be generated, although this is a temporary effect and erosion on site would be low following construction. Mitigation measures should be implemented allowing the sediment to settle prior to discharging the water into a receiving watercourse.

The immersed tube construction of the tunnel would require significant dredging of the River Tyne. Significant volumes of sediment in the river could cause problems for both navigation

and the ecology of the river. The bed sediment could be contaminated. Most of the proposed route lies over mudstones with some minor sandstones. Drift alluvium is present in or near the river, with lacustrine clays or sands below; till is present below the alluvium inland.

The potential for groundwater to be affected during construction of the tunnel is high as much of the development is likely to be through 'made ground' which may be contaminated. Mitigation measures would have to be put into place to provide protection of the water in the minor aquifer.

The summary assessment of the St Bede's Crossing (Variant D) option is that, with appropriate mitigation measures, **moderate adverse** effects could be anticipated on the water environment due to the impact of dredging activities in the River Tyne.

St Bede's Crossing (Variant D) has the greatest potential to have a negative impact on the water environment. The St Bede's Crossing (Variant D) would have a moderate adverse impact on the River Tyne provided mitigation measures are implemented. All other options are expected to have a slight adverse effect on the water environment provided mitigation measures are implemented.

Physical Fitness

Physical fitness is identified in GOMMMS as one of the criteria for appraisal under the Environment objective. The scheme should result in improved physical fitness where it encourages opportunities to walk and cycle to local community facilities (eg shops, schools, health facilities) and employment areas, by reducing dependency on the private motorcar for those routes that are relieved of through traffic and in particular heavy goods vehicles. However, in many of the multi-modal studies to date this element has generally been discounted due to the very limited impact of emerging strategies. This is also the case for this study where it is considered that no significant impacts would occur in relation to physical fitness. An appraisal of this sub-objective has therefore been excluded from this analysis.

Journey Ambience

Method

Journey ambience is assessed using the three factors; Traveller Care; Traveller Views and Traveller Stress. In this 'strategy level' assessment there was limited information available to assess some factors.

For Traveller Care it cannot be determined what facilities and information would be provided along the route, whether cycle lanes and pedestrian crossings would be provided, and if public transport vehicles would be improved. Therefore, Traveller Care has not been assessed.

For Traveller Views an approximate alignment has been used but precise vertical alignments have not been determined. Hence, it was not possible to determine the impact on Traveller's Views for the St Lawrence, St Anthony's and Walker crossing locations. An assessment could be made for the St Bede's crossing, with the bridge providing a better view than a tunnel.

Traveller Stress comprises frustration, fear of potential accidents and route uncertainty. This was the main factor used to assess the impacts of each option on journey ambience.

Results

The results of the assessment of impact on journey ambience are presented in GOMMMS Worksheet 4.15 in Appendix C and summarised in the AST in Appendix C.

The new crossings would reduce traveller's frustration by decreasing traffic congestion and subsequent journey times. It is also likely that traveller's fear of accidents would be reduced due to the improved highway specification of the new routes.

Route uncertainty would be better with improved route signs for a modern road.

Except for the St Bede's Variants C and D, all routes would provide enhanced traveller views due to their elevation on bridges over the river. St Bede's Variants C and D are both additional tunnel crossings and would have a neutral impact on traveller's view compared with the existing situation.

There would be a beneficial impact on journey ambience for all of the crossing options.

4. SAFETY

This section addresses the safety appraisal. Safety is split into two sub-categories:

- Accidents
- Security

The former is appraised on a purely financial basis, being evaluated via a spreadsheet model, linked to the outputs from the transport model. This allows changes in flows or infrastructure to be reflected in accident savings (or increases) and then in cost terms. Security is assessed on a more subjective basis, giving consideration to the security of the users of all modes. A more detailed assessment of the methods used and the results obtained for each subject are discussed below.

Accidents

The method to appraise the impact on accidents was as described in Chapter 5 of GOMMMS (Volume 2). According to GOMMMS, transport accidents impose a range of impacts on people and organisations, including:

- medical and healthcare costs*
- lost economic output*
- pain, grief and suffering*
- material damage [a]
- police and fire service costs [a]
- insurance administration and
- legal and health care costs [a]

Those impacts marked ([a]) are closely related to the number of accidents, while those marked (*) are related to the number of casualties. Therefore, numbers of accidents and casualties are the key quantitative indicators for the assessment of the proposals. These numbers were combined with values for the prevention of casualties and accidents to provide a monetary estimate for the accident benefits of the proposals.

As the impact of casualties differs according to the severity of the injuries sustained, three groups (fatality, serious and slight injury) were differentiated on the basis of parameters defined in GOMMMS. Values for both the prevention of casualties and accident-related costs were obtained from the latest DfT advice outlined in the DMRB (Volume 13, Section 1).

In order to forecast the number of accidents and casualties and the accident reduction benefits arising from changes to the road network, the network-wide impact of the scheme was quantified by assessing the change in total vehicle kilometres caused by the scheme when compared to the Reference Case. The change was calculated for the forecast years of 2006 and 2021. The forecast total number of accidents across the traffic model network was estimated using accident rates from COBA13 and the net change in accidents calculated.

Table 4.1: Change in Accidents and Casualties

	Accidents	Casualties		
		Fatal	Serious	Slight
Reference Case	*56068*	*580*	*6952*	*72373*
St Lawrence	74	0	5	96
St Anthony's	39	0	-3	70
Walker	109	2	11	152
St Bede's	-646	-3	-73	-788

Analysis indicates that the St Bede's options do not result in the introduction of traffic to built up areas, thus reducing pedestrian/vehicle conflict and separates through traffic from local traffic, avoiding conflicts at a number of side roads and accesses. This is the **only** option that results in a **net reduction** in total accidents on the road network, consequently significant benefits in accident savings are realised with the St Bede's crossing options.

The other options whilst increasing the total number of accidents also result in increases in the severity of accidents and hence casualties as traffic is routed onto lesser standard roads. These roads invariably have greater frontage activity and generally pass through residential areas. Thus there will be additional costs related to accidents with all of the other crossing options.

Security

The method used to appraise the impact on security was as described in Chapter 5 of GOMMMS (Volume 2). According to GOMMMS, the aim of this sub-objective is to reflect changes in the level of security for road users, public transport passengers and freight, and also the likely numbers of users affected. An appraisal of the impact of the scheme on Security was undertaken based on the following indicators:

- formal surveillance
- informal surveillance
- landscaping
- lighting and visibility
- emergency call facilities
- pedestrian and cyclists facilities

The appraisal initially involved assessing the level on each security indicator prior to and following the implementation of the strategy. Guidelines on the categorisation of scenarios for each security indicator are outlined in GOMMMS and also in the best practice guidelines for railway stations and public transport operators published by the DfT's mobility unit (1998). As this study was undertaken at a strategic level, the approach was adapted to operate with more aggregated levels of information. Consequently, instead of considering each site separately, the strategic assessment took all sites of a given type together, basing the assessment on general trends.

An overall assessment of the security impact was then made by considering the changes in the level of security indicators, the relative importance of the indicators and the approximate numbers of users affected, based on the guidelines outlined in GOMMMS.

The results, presented in GOMMMS Worksheet 5.1 in Appendix C and also in the AST in Appendix C, show that the impact on the security of road users was **Large adverse** for all of the bridge crossings and **Large beneficial** for the tunnel options. This is due to the level of surveillance that is a feature of toll operations.

5. ECONOMY

This section addresses the economic objective appraisal. The following subjects were assessed as part of the economy requirements for GOMMMS:

- Transport Economic Efficiency
- Reliability
- Wider Economic Impacts

Transport Economic Efficiency

The extent to which the scheme meets the Transport Economic Efficiency sub-objective as set out in GOMMMS has been assessed by conventional cost-benefit analysis using the DfT multi-modal Transport User Benefits Appraisal (TUBA) computer program. TUBA quantifies the impacts on users, providers of the new infrastructure (private or public sector) and government.

The capital cost includes the cost of construction, land acquisition, scheme preparation and supervision, operating costs and major maintenance anticipated over the 30 year appraisal period.

Users derive benefits from reduced travel times, vehicle operating costs or out-of-pocket costs (eg public transport fares). Transport operators could experience changes in revenue as a result of new schemes; and the government may experience changes in tax flows.

The impacts are expressed in monetary terms, with the stream of costs and benefits occurring over the appraisal period discounted to a common base year, 1998. TUBA applies a 6% discount rate in accordance with the most recent DfT advice. Values of time and vehicle operating costs in TUBA were taken from the latest Transport Economics Note issued by DfT.

TUBA implements a matrix-based appraisal taking trip, travel times, distance and charge (public transport fares, parking charges or tolls) matrices from the transport model. Vehicle trip matrices, along with time and distance matrices for the Reference Case and the scheme have been extracted from the transport model. The inputs to the analysis were taken from the modelling and include vehicle distance travelled, time spent travelling and, by deduction, the travel speeds. Each of these variables has been considered in relation to the link class on which travel occurred. Disaggregation by link class allowed differential accident rates to be considered and emissions to be estimated by specific types of road.

Travel time savings were determined by summing the total vehicle hours across the road network in the model. The model used does not contain any segmentation by vehicle type. Therefore, an average road vehicle value of time of £7.84 per hour (1994 prices and values) was used to convert total vehicle hours into monetary units. This value of time was uprated by a weighted average between high and low growth in Gross Domestic Product (GDP).

The evaluations have been performed on the basis of the length of the appraisal period to be 30 years from the beginning of the opening year, this was assumed to be 2006. Matrices have been prepared for the average inter-peak hour for the two forecast years, ie 2006 and 2021. The results for these time periods have been multiplied by annualisation factors so that they represent a full year. TUBA then undertakes interpolation and extrapolation to derive the streams of costs and benefits for each year in the appraisal period.

No grant or subsidy has been assumed in the assessment.

Expenditure on the various measures has been profiled appropriately over the lead-up period peaking during the years of construction.

The Transport Economic Efficiency table for each scheme is provided in Appendix C under Economy.

Table 5.1: Summary Benefit/Cost Appraisal (£ Millions)

Option	Variant	Net Present Value	Present Value of Costs	Present Value of Cost to Gov't	Benefit/Cost Ratio	Value/Cost to Gov't Ratio
		(NPV)	(PVC)		(BCR)	(VCGR)
St Lawrence		83.6	-57.2	-67.0	2.46	1.25
St Anthony's	A	156.4	-91.6	-117.5	2.71	1.33
	B	146.3	-101.6	-127.5	2.44	1.15
Walker	A	126.9	-104.5	-131.2	2.21	0.97
	B	118.4	-113.1	-139.8	2.05	0.85
St Bede's	A	174.6	-87.4	6.8	3.00	-25.52
	B	149.3	-112.8	-18.5	2.32	8.08
	C	114.5	-147.6	-53.3	1.78	2.15
	D*	120.4	-141.7	-47.4	1.85	2.54

* It should be noted that the St Bede's Variant D has utilised the latest cost estimates for the New Tyne Crossing project whilst all other costs are derived from the Cross Tyne Study reports.

The results of the economic appraisal illustrate that the different crossing options perform in different ways and are financially attractive, or not, dependent upon who is to realise the benefits. It should be noted that the St Bede's crossing is the only option considered with a toll and thus there is revenue of approximately £120million (Net Present Value) that is 'deducted' as a user cost in determining the NPV in the above table. The impact of the toll in the financial analysis is better reflected in the Value/Cost to Government Ratio rather than the Benefit/Cost Ratio.

Reliability

In accordance with the targets in the Ten Year Plan, the average travel time lost on the road network, as an indicator of congestion, was utilised to assess travel time reliability. This equates the freeflow speeds on the road network to those experienced during the peak and off-peak periods and hence the additional time spent in making the journeys and 'lost' due to congestion. The GOMMMS appraisal recognises that reliability is related to congestion in the use of Congestion Reference Flows and thus this approach is considered to be consistent with the guidance.

Table 5.2: Total Lost Time (hours per day)

Option	2006			2021		
	Hours/day	Abs change	% change	Hours/day	Abs change	% change
Reference Case	34,326			53,254		
St Lawrence	29,846	-4,480	-13.1%	49,625	-3,629	-6.8%
St Anthony's	31,098	-3,228	-9.4%	43,513	-9,741	-18.3%
Walker	27,364	-6,962	-20.3%	43,274	-9,980	-18.7%
St Bede's	29,603	-4,723	-13.8%	50,733	-2,521	-4.7%

Inherent with the provision of additional highway capacity, all of the options result in reductions in lost time and hence improvement in terms of reliability in comparison with the Reference Case.

Wider Economic Impacts

Construction of an additional crossing over the River Tyne will generate varying local and sub regional economic effects depending upon location and structure. The significance of each effect is likely to be related to the scale of the traffic flows and small changes in accessibility for areas affected by the proposed crossing sites. These effects can be broadly grouped as wider-economic benefits.

The actual nature of the crossing (tunnel or bridge) does not appear to have any significance in the wider economic benefits sense. For this section of the GOMMMS appraisal the location will formulate the crux of the analysis. In economic development terms, access is one of the prime factors that create a viable development location, particularly in areas where the access improvement is significant and all other factors favour development.

Out of the four proposed crossing sites, two (St Lawrence and St Anthony's) are located adjacent to the city centre and are fairly close to each other. These crossings would better connect central Newcastle with Gateshead across the river to the south. This area of the city is commercially focused with higher concentrations of office and retail uses. The other two crossings at Walker and St Bede's are further east and are near to current and potential sites for industrial development. The locational context is important as the existing city centre and the eastern, more industrial area serve very different functions.

All four crossings will address some very general benefits to some degree. These benefits include:

- Improved traffic flows, reducing delays and local transport user cost
- Expanded labour catchment areas
- Possibility for improvements to public transport
- The potential for catalysing regeneration, by opening up new sites for development

However, account has also to be taken of the "network effects" of new crossings. By definition the construction of an additional crossing will either allow currently suppressed trips to take place or will lessen traffic flows on other crossings, as users will shift their journeys if a change can yield other benefits. If the latter is the case then other locations not directly affected may also benefit from accessibility improvements.

Reduced travel time means that potential employees access employment sites further from their residences and the reverse is true for employers as they could attract workers from further afield. Thus, the catchment area for any given employment site would expand and the actual labour market would gain in terms of flexibility. A wider labour catchment would allow both employers and employees more options in terms of where to work and could impact the cost of labour. Generally, wages are higher in North Tyneside and increased commuting between the north and south sides would facilitate a narrowing of the wage gap as employers become more competitive.

GOMMMS guidance is that assessments of wider economic effects should focus on the benefits to areas of specific, acknowledged regeneration need. The North East of England as a region is undergoing economic restructuring due to the decline of many traditional industries and the whole region is of regeneration need. The industrial decline has led to deprivation in many areas and the North East as a whole is an EU designated Objective 2 area, meaning that it is among a group of the most disadvantaged regions of Europe. The region also has large areas of land identified as "Assisted Areas" where job-creating investment may be eligible for grant support through of Regional Selective Assistance (RSA). The area has also been a recipient of many locally focused national programmes and measures including Enterprise Zones, Urban Development Corporations, Single Regeneration Budget and New Deal

programmes. In practice thus all of the crossings would be likely in GOMMMS terms to yield benefits to regeneration areas in different contexts.

Thus, in practice it is difficult to strictly distinguish between the different crossing schemes in terms of wider economic effects. In practice the most reliable comparative assessment is one based on a comparison of scheme user benefits as covered by the TUBA assessment detailed above. This is because it seems reasonable to assume that those offering the highest benefits to cost ratio will also yield "best value" in terms of regeneration. Much also depends on the specific objectives being addressed or prioritised, eg city or town centres, attraction of large scale inward investment and so on. Nevertheless, it is judged worth drawing attention to some broad conclusions on the nature of impact in each case that are relevant to crossing choice decision-taking.

Significantly, many of the wards along both sides of the river suffer some of the worst levels of deprivation in the UK, although on a strategic scale and in relative terms deprivation is generally worse on the eastern side of the Tyne and Wear sub region. This tends to suggest that crossings or other actions that promote accessibility improvements to the more easterly areas may be considered higher priority than those to the central and more western areas.

St Lawrence and St Anthony's

The proposed St Anthony's and St Lawrence crossings are located in the more central area of Newcastle. These two crossings would connect the central area of Newcastle with Gateshead. It is expected that these two crossings would yield very similar effects due to their proximity and most probable use. Furthermore, these crossings are in areas where there are already alternative crossings, which would lessen their impact in terms of opening up new areas for development. The areas that would be connected by these two crossings includes more office and retail districts north of the river and more office/commercial areas to the south in Gateshead. Land availability near both of these sites is relatively scarce compared to the larger Newcastle area. There are some areas available for infill, development and redevelopment.

Both of these crossings would be expected to strengthen the competitive position of the city centre, albeit marginally given that the centre of Newcastle is already very accessible both by road and public transport. There are already existing east-west Metro routes and many north-south bus routes. These crossings would ease local congestion on the existing crossings but given the complexities of city centres and the numerous factors driving the development and redevelopment processes it remains difficult to ascertain the value of the crossing in terms of its regenerative effects.

Walker

The proposed Walker Crossing is further east than the St Anthony's and St Lawrence crossings. It would facilitate north south movement in a relatively well-developed part of the city. The area is well developed as it would link North and South Tynesides in a partially industrial area particularly as it would be situated next to an existing industrial park. Its local economic benefits would be in improving access to these sites and supporting their continuing competitiveness. This in turn could support business retention and or promote redevelopment as existing developed sites fall vacant. There is also significant deprivation in this area and increased accessibility could be of great value to this community given its need for increased income and employment.

St Bede's

Construction at St Bede's would have a different focus, as the existing crossing is a strategic link on the A19 trunk road. This link is currently a single-c'way tunnel, with dual c'way approaches and faces current and, in the future, increasingly worse problems of congestion.

The crux of this location is that the A19 has been singled out in local development plans as a corridor for large scale investment and growth. The A19 south of the Tyne is an area with a strong track record of development and investment and addressing the current tunnel "bottleneck" would help to pull this development northwards. The sites on the A19 north of the Tyne will make a critical contribution to realisation of the economic scenario sought by the Regional Development Agency *OneNorth East's* Regional Economic Strategy and the sites are a critical element of the industrial land strategy set out in RPG 1 Regional Planning Guidance for the North East. The ability to bring these forward with competitive access also reduces pressure for further Greenbelt releases south of the Tyne.

6. ACCESSIBILITY

The accessibility objective is defined in GOMMMS as the improvement of access to facilities for those without a car and the reduction of severance. It has three sub-objectives:

- option values
- severance
- access to the transport system

Each has been considered for the scheme against the Reference Case.

Option Values

Section 7.2 in GOMMMS (Volume 2) indicates that it will be particularly important to consider option values if the strategies or plans which are being appraised include necessary measures which will substantially change the availability of transport services within the study area (eg the opening or closure of a rail service). Option values are associated with unexpected use of the transport facility that is not built into the forecasts produced by the modelling stage, and which would otherwise not appear in the appraisal as a benefit. They are related to the individual's attitude to uncertainty. In practice, a range of option values is likely to be found within the population.

This sub-objective is not applicable for this appraisal and as no new transport service would be provided this measure would have a **neutral** impact.

Severance

Section 7.3 of GOMMMS (Volume 2) sets out a possible methodology for the assessment of severance as it affects those using non-motorised modes (particularly pedestrians). According to GOMMMS, the degree of detail required will vary depending on the level of information available. Consequently, a qualitative assessment procedure based broadly on GOMMMS has been undertaken. The following four-point assessment scale has been used for the appraisal of severance:

- None: Little or no hindrance to movement
- Slight: Some hindrance to movement
- Moderate: Journeys will be longer or less attractive
- Severe: Considerable hindrance will be experienced

The assessments have been based on the change in potential conflict between the population of a ward and the number of vehicle kilometres travelled on the road network in that ward. Some locations in a network may experience reductions in severance, others may experience increases, whilst some locations may experience greater changes in severance than others. Professional judgement has been utilised to establish vehicle-population conflict values attributable to each level of severance in the Reference Case. In this regard it is acknowledged that some populations currently experience little, if any, severance. The values have then been used to establish the degree of severance with each of the respective crossing options. As this approach is purely numeric and given the range of values, substantial changes could occur within the band widths. Thus further consideration was given to the percentage increase in traffic flows when determining the respective category of change. The assessment of change in severance has been undertaken in accordance with GOMMMS table 7.1 and consequently Worksheet 7.1 in GOMMMS has not been used.

Table 6.1: Summary Changes in Severance (for affected wards only)

Ward	Reference Case	St Lawrence	St Anthony's	Walker	St Bede's
Bede (GH)	Severe	Moderate	Slight	Moderate	
Byker	Slight	Severe	Severe	Moderate	
Deckham	Slight		None		
Heaton	None	Slight			
Hebburn Quay	None			Slight	
Monkchester	None		Moderate	Slight	
Pelaw and Heworth	Moderate		Severe		
Walker	None		Moderate	Moderate	
Walkergate	Slight			Moderate	

It should be noted that all other wards are considered to have no change in the level of severance in comparison with the Reference Case. The results of the analyses indicate that no change in the level of severance will occur with the St Bede's crossing option in comparison with the Reference Case, thus the impact is **neutral**.

All of the other crossing options result in a net increase in severance in comparison with the Reference Case scenario. Although some benefits arise local to the existing Tyne Tunnel, **Moderate adverse** impacts (two step change) occur in one ward for the St Lawrence and Walker options but in three wards for the St Anthony's option. Therefore this is considered to be the overall level of impact of these options.

Access to the Transport System

Section 7.4 in GOMMMS (Volume 2) indicates that the most important determinant of access to the transport system is the availability of a vehicle for private use. For those without access to a car, access to the public transport system is of crucial importance. One way to appraise this issue is to identify those areas of development that are in excess of a certain distance (250 metres) or walking time from a public transport service.

The strategic nature of this study makes it difficult to apply the detailed GOMMMS criteria for this section. This sub-objective is not directly applicable to this appraisal, thus this measure would have a **neutral** impact for all schemes.

7. INTEGRATION

This section addresses the integration objective appraisal. It has three sub-objectives:

- Transport interchange
- Land use policy
- Other government policies

Transport Interchange

Section 8 of GOMMMS (Volume 2) considers the Transport Interchange sub-objective. Improving interchange is identified in the Government White Paper 'A New Deal for Transport' (DfT, 1998) as a key factor in achieving truly integrated transport. The Government's objectives for freight also include a shift towards rail, which is likely to involve additional modal transfers to/from road at each end of the journey. GOMMMS splits the transport interchange into two elements, according to whether the proposed strategy is likely to affect freight and/or passengers.

Whilst no specific freight related measures are proposed, the scheme will assist in the movement of freight. The initial consultations established that freight traffic was considered to be a victim of congestion on the trunk road network rather than the cause. As such the improvements to the highway infrastructure will assist freight movements on the trunk road network.

Assuming all benefits relating to travel time changes and the interchange penalty have been valued and included in the cost-benefit appraisal (TUBA) as the 'Economic efficiency of the transport system' element of the assessment, this leaves a series of additional factors that can be assessed using a qualitative approach. The aim of the passenger interchange assessment is to identify in broad terms the extent to which particular indicators would change following implementation of a particular strategy or plan together with the number of passengers affected.

According to GOMMMS, the first stage is to assess the level on each indicator both prior to and following the strategy. The levels can be assessed according to a series of recognition criteria outlined in below:

- waiting environment
- level of facilities
- level of information
- visible staff presence
- physical linkage for next stage of journey
- reliability of journey

This sub-objective is only applicable for schemes in certain cases where an interchange between different modes forms part of the scheme, such as Park & Ride facilities. As no new facility would be provided, this measure would have a **neutral** impact.

Land-Use Policy

This sub-objective summarises the assessments made of the extent to which a measure is integrated with land use or transport proposals and policies. The assessment of proposals in the context of national, regional, strategic and detailed local planning policies is included in current recommended appraisal practise. However, this sub-objective has wider coverage than formally adopted plans, which may be out of date and take no account of changes in national or local policies. In particular, it also covers transport policies and proposals (all motorised and non-motorised modes, not just road-based) and, proposals by operators and others as well as those proposed by planning authorities. Worksheet 8.3 in Appendix C advises that the entry for the Assessment column should use a three point textual scale (Neutral, Beneficial and Adverse). The assessment is also to be supported by qualitative information where appropriate.

From the regional level to the local level, policy supports regeneration and development in the Tyneside area. At the local level a common policy theme is the need to link people to opportunities, particularly employment, whilst creating coherence in the area by reducing barriers. The lack of investment in key infrastructure, particularly roads, has been singled out as potentially affecting inward investment and peoples ability to access employment opportunities. National land use policy is generally positive to the need to remove congestion from key trunk roads, balancing the additional provision of public transport facilities that encourage people to reduce their reliance on the private car, with the necessary improvements to roads functioning above their operational capacity.

St Lawrence

The northern section of the proposed route for the crossing passes through an area retained for industrial uses, the Hadrian's Way Strategic Recreational Route, a proposed cycle and recreational route and a wildlife corridor. Therefore, north of the river this route will have a potentially detrimental impact on the development of an industrial area and on the leisure use of the Hadrian's Way Strategic Recreational Route.

The southern section of the proposal passes through an area that is designated as an urban green space (much of it with public open space protection), urban countryside, a green corridor and a site of local heritage importance. As such the proposal is likely to have a detrimental impact due to the loss of urban open space.

St Anthony's

The northern section of the route passes through an area of identified open space that is also part of a wildlife corridor, a site of local conservation interest and an area of countryside character. The route also bisects the Hadrian's Way Strategic Recreational Route for much of its length, along with a proposed cycle and recreational route. To the east, the route passes through an area retained for industrial uses, as well as an area identified for industrial and commercial improvement. The route would therefore have a detrimental impact on a now established employment area, designated nature conservation interests and a designated recreational route.

The southern section of the route would pass through an area of urban green space with public open space protection, a green corridor and across an area of protected playing pitches, Pelaw Fields. The proposed route also follows part of the Western Riverside Route protected road route. Although the route would have a detrimental impact on sites of designated environmental value, it would also follow a protected route through the Hebburn to Pelaw Riverside Park.

Walker

The northern section of the route would pass over a now established industrial park, Walker Riverside, which is designated for economic development and employment uses in the UDP. As with the St Lawrence and St Anthony's crossings, the Walker Riverside route would also pass through a wildlife corridor, the Hadrian's Way Strategic Recreational Route, a proposed recreational and cycle route, and an area of designated open space. The northern section of the route would have a detrimental impact on designated employment and nature conservation areas.

The southern section of the route would pass through a Site of Nature Conservation Importance, an area of Urban Green Space with public open space protection, proposed recreational open space, the Great North Forest, Green Belt, 3 green corridors and the linked open space system. Although the Green Belt area is designated as being of low quality, that does not alter its purpose which would be detrimentally affected by the proposed route.

St Bede's

The northern section of the route will pass through designated employment areas, derelict sites earmarked for reclamation, marine-related development areas, and an area of open space. However, the route is also identified as a proposed major highway improvement. This section of the route would have a negative impact on the area of open space, but would be likely to have a low impact on the employment sites as a tunnel would pass under these sites.

The southern section of the route passes through predominantly industrial areas on the south bank, designated recreational open spaces, footpaths/cycleways, and a conservation area. As with the northern section, the route is also identified as a major highway improvement.

Other Government Policies

This is summarised in GOMMMS as "integration with policies for education, health and wealth creation, so that transport helps make a fairer, more inclusive society". The approach includes a review to identify whether the strategy/scheme as a whole either contributes to and is consistent with, or has no overall contribution or is inconsistent with, other Government policies beyond transport. The assessment framework is as follows:

- beneficial – where more key policies are benefited than hindered by the strategy or plan
- neutral – where a roughly equal number of policies are benefited as are hindered or where there are no Government policies affected
- adverse – if more key policies are hindered than benefited by the strategy or plan, or the strategy or plan is broadly inconsistent with Government policies

The Government has set up a number of programmes aimed at tackling social exclusion and spatially concentrated problems.

Some relevant initiatives include:

- Health Action Zones
- Healthy Living Centres
- Forthcoming Learning and Skills Council (at a local level they are responsible for a range of initiatives to meet the needs of local communities, employers and individuals):
- Education Action Zones
- Employment Zones

The project is an essential ingredient to the regeneration of the area. It would be developed as part of an area-based approach to integrated transport. It is therefore viewed that this could positively contribute to a wide range of initiatives, including area regeneration, economic efficiency, the tackling of social exclusion, environmental improvement, and the improvement of people's health. It does not adversely impact on any wider mainstream government policies. The impact on other government policies is consequently considered to be **slight beneficial** for all of the alternative crossing options.

8. ACHIEVEMENT OF OBJECTIVES

Government Objectives

Environment

Noise impacts are lowest with the St Lawrence and St Bede's tunnel options (variants C and D).

The St Anthony's options result in a short term worsening in air quality whilst all other options result in short and longer term improvements in air quality in comparison with the Reference Case.

The St Anthony's options result in a short term worsening in emissions of greenhouse gases whilst all other options result in short and longer term improvements in comparison with the Reference Case.

Large adverse landscape impacts arise with all bridges with the exception of the St Lawrence crossing. A neutral impact upon the landscape results for the St Bede's bored tunnel option (variant C) with slight adverse impacts for the remaining options.

Most of the options result in neutral/slight adverse impacts upon townscape.

Most of the options result in negative/slight adverse impacts upon heritage.

Large adverse biodiversity impacts arise with the Walker crossing with a moderate adverse impact for the St Lawrence crossing. The other options have slight adverse impacts on biodiversity.

Moderate adverse impacts upon the water environment arise with the St Bede's immersed tube tunnel (variant D). All other options have a slight adverse impact.

The impact upon physical fitness is neutral for all options.

The impact upon journey ambience is large beneficial for all options.

Safety

The St Bede's crossing options are the only schemes to result in a net reduction in the number of accidents on the road network as well as a large beneficial effect upon security.

Economy

All of the options have positive benefit/cost ratios although involving different contributions from the public and private sector. Journey time reliability is also improved with all of the options and serve the regeneration initiatives of the wider region.

Accessibility

The St Lawrence, St Anthony's and Walker crossings have moderate adverse impacts upon severance whilst the St Bede's options are neutral in this respect.

Integration

The St Lawrence, St Anthony's and Walker crossings have slight adverse impacts upon land use policies whilst the St Bede's options are neutral in this respect. All options are slightly beneficial with regard to impacts upon other Government policies.

Local Objectives

The Tyne & Wear Passenger Transport Authorities (TWPTA) project specific local objectives of the New Tyne Crossing are summarised as:

- *solve the problems of congestion in the tunnel at the entrances and it's approaches*

The St Bede's options address this objective best as the schemes upgrade the existing infrastructure where the problems are experienced.

- *improve safety and lower the risk to the travelling public in the tunnel*

In accordance with the appraisal of the Governments overarching objective regarding safety, the St Bede's options address this objective best as the schemes upgrade the existing infrastructure which is the cause of the problems related to non-essential traffic on non-strategic routes.

- *improve public transport access through the tunnel and in the vicinity*

Only the St Bede option facilitates improvements to public transport through the existing Tyne Tunnel. The St Lawrence option does not result in any reduction in current vehicle flows through the tunnel. The St Anthony's and Walker options will result in traffic flows returning to current levels within fifteen years. The latter options do not significantly reduce traffic flows to facilitate further improvements to public transport access over and above what has recently been completed.

- *promote wider economic benefits in the region*

All of the options serve the regeneration initiatives of the wider region.

9. IMPACT ON PROBLEMS

The previous studies have identified the constraint on capacity for cross Tyne movements with most of the crossings being congested during the peak periods. The benefits arising from each of the new crossing options is shown below

Table 9.1: 2006 Effect on Tyne Tunnel Flows

	Annual Average Weekday Traffic Flow	Congestion Reference Flow	Induced Traffic, vehicles per day
Ref Case	38,0000	131%	-
St Lawrence	32,600	113%	1700
St Anthony's	27,500	95%	2300
Walker	27,000	96%	2100
St Bede's	40,500	46%	400

The table illustrates that in the opening year with the St Lawrence crossing flows through the Tyne Tunnel are equivalent to current levels (32,800 vehicles per weekday) and thus would do little to relieve the current problems. The greatest benefit would be realised by traffic utilising the Tyne Bridge.

The largest traffic flows on any new crossing would be realised at St Anthony's. This would reduce flows through the Tyne Tunnel and across the Tyne Bridge although these would return to current levels within fifteen years.

The St Bede's crossing results in the least amount of induced traffic on to the local road network. This is because the scheme upgrades an existing transport corridor rather than creating a new one. A new crossing in this location consequently resolves the current problems at the Tyne Tunnel better than other crossing alternatives.

The following tables show the total impact of each of the crossing options on overall traffic characteristics in the Tyneside area in the opening year and fifteen years thereafter in comparison with the Reference Case scenario, ie do-nothing.

Table 9.2: Reference Case Trends

Year	Daily Trips	Total Distance Travelled (km)	Total Time Travelled (hrs)	Average Trip Length (km)	Average Trip Time (mins)	Average Speed (km/h)
1999	1,619,422	15,233,661	362,646	9.41	13.4	42.0
2006	1,787,149	16,911,394	410,521	9.46	13.8	41.2
2021	2,067,597	19,535,660	498,378	9.45	14.5	39.2

The Reference Case forecasts illustrate that trip lengths will increase as will journey times whilst travel speeds will decrease. The increase in trip length is due to traffic avoiding congestion hot spots, such as the Tyne Tunnel, and using longer routes instead.

Table 9.3: Year 2006 Average Trip Characteristics

Scenario	Daily Trips	Total Distance Travelled (km)	Total Time Travelled (hrs)	Average Trip Length (km)	Average Trip Time (mins)	Average Speed (km/h)
Reference Case	1,787,149	16,911,394	410,521	9.46	13.8	41.2
St Lawrence	1,789,314	16,898,025	407,743	9.44	13.7	41.4
St Anthony's	1,789,627	16,874,086	406,646	9.43	13.6	41.5
Walker	1,789,668	16,869,639	403,293	9.43	13.5	41.8
St Bede's	1,787,850	16,890,898	405,380	9.45	13.6	41.7

Table 9.4: Year 2021 Average Trip Characteristics

Scenario	Daily Trips	Total Distance Travelled (km)	Total Time Travelled (hrs)	Average Trip Length (km)	Average Trip Time (mins)	Average Speed (km/h)
Reference Case	2,067,597	19,535,660	498,378	9.45	14.5	39.2
St Lawrence	2,071,031	19,535,450	494,161	9.43	14.3	39.5
St Anthony's	2,071,771	19,522,639	488,081	9.42	14.1	40.0
Walker	2,071,799	19,516,754	487,353	9.42	14.1	40.0
St Bede's	2,069,251	19,504,656	489,157	9.43	14.2	39.9

In comparison with the Reference Case, all of the options result in reductions in total distance and time travelled and hence reductions in trip length and journey time and improvements in travel speed. Thus all of the options are in accordance with the general requirements of Planning Policy Guidance note 13: Transport.

10. SUPPORTING ANALYSES

Distribution and Equity

This supporting analysis is designed to show the distribution of the overall impacts summarised in the Appraisal Summary Table, thereby enabling a judgement to be made about the fairness of the impacts across those affected by the options. The main determinants of the distributional analyses that can be undertaken will be:

- the spatial basis for the transport model and the degree of segmentation of the travel demand within the model
- the geographical relationship between the interventions making up the strategy and factors which have a geographical position, such as the population, designated areas, water resources etc

The following sub-sections present the kinds of distributional analysis which were carried out and considered in the Appraisal Summary Table.

The different crossings are not 'options' in the strict sense of the term. Each option has different environmental, safety, economic, accessibility and integration implications dependent upon the respective community affected or aspect considered.

The St Lawrence crossing provides a local crossing to relieve congestion on the central bridges whilst doing little to resolve existing problems at the Tyne Tunnel. Some degree of severance is also introduced.

The St Anthony's options connect large urban areas on the north bank with trunk roads on the south thus whilst benefiting from improved cross Tyne accessibility introduces traffic and the associated environmental conditions, such as noise, poorer air quality and increased greenhouse gases emissions as well as adverse landscape impacts to residential areas.

The Walker options also connect large urban areas on the north bank with trunk roads on the south. Similarly whilst benefiting from improved cross Tyne accessibility these options introduce traffic and the associated environmental conditions such as noise and large adverse landscape and biodiversity impacts to residential areas.

The St Bede's crossing options overcome a bottleneck on the strategic/trunk road network. These options generally result in an amelioration of the current situation by the upgrading of an existing transport corridor. The environmental impacts associated with this location are primarily related to the type of crossing and the construction method to be employed.

Affordability and Financial Sustainability

The Cross Tyne Phase 2 Report indicated that all of the options could be funded by the local authorities and the, at the time, Transport Supplementary Grant Process. The approach roads to the crossings were identified as being solely attributable to the local authorities with potentially private sector involvement in the bridges requiring the introduction of toll facilities. The proximity of the St Bede's crossing to the Tyne Tunnel made possible the incorporation of the whole scheme into a single project making it more attractive for private investors who could recover the investment by charging tolls.

The PFI Feasibility Study analysed the financial viability of the project on the basis of the traffic and revenue forecasts and the capital costs of the immersed tube tunnel. The study concluded that:

- *"Transferring the existing vehicle, cycle and pedestrian tunnels to the private sector and responsibility for their maintenance over the concession period is considered to be necessary for a viable PFI solution. They would revert to the Project Partners at the end of the concession period.*
- *Maintaining the existing tolls is likely to result in a significant Public Sector Contribution being required to fund the construction of the new crossing. In order to minimise the Public Sector Contribution, an increase in tolls is required.*
- *The Public Sector Contribution requirement is likely to be reduced through the impact of competitive tendering between private sector parties."*

Practicality and Public Acceptability

GOMMMS requires there to be an overall assessment of the practicality of the strategy and, where relevant, what countervailing or complementary measures are needed to make the strategy or plan practicable. The following consider the practicality and public acceptability of the options.

Practicality

All of the schemes are practicable engineering options and could be promoted using the powers available to the local authorities.

Feasibility – the St Bede's option scheme is included in the adopted Unitary Development Plans of North and South Tyneside. There are unlikely to be major obstacles to obtaining full planning approval for the scheme. None of the other options have similar status in their entirety although parts of the route, for example the Eastern Riverside Route, are in the development plans.

Enforcement – no supporting enforcement measures required for any of the options.

Breadth of decision – most of the options involve the Project Partners and potentially the Highways Agency, thus the area of interest is similar for all of the options.

Complexity – as primarily road proposals, the options are relatively straightforward with little complexity.

Time-scale – it is considered that implementation for all of the options could take place within a similar overall timescale. Some options do not have any status and as such would need developing and promoting whilst other options will involve longer construction periods.

Phasing – Phasing of any option involving the private sector will potentially need their early involvement to make the scheme viable.

Partitioning – The St Lawrence, St Anthony's and Walker options could be undertaken by the early construction of the approach roads to the crossings although this would result in little benefit to the local road network. For the St Bede's options while all the components need to be implemented these cannot be adopted in stages.

Complementarity – With the exception of the St Lawrence crossing the proposals are complementary to the aims to improve public transport services and reliability along the existing roads around the Tyne Tunnel providing relief from through traffic for communities in this important transport corridor. The options are also partly complementary to each other as they serve different functions.

Conflicts - The options do not conflict with others that have been or are likely to be made. Construction of the St Bede's crossing is compatible with proposed bus-priority measures in the A19 corridor.

Political nature - The St Bede's proposal has the support of the strategic and local planning authorities as well as both the neighbouring strategic and local planning authorities. The other options have previously been rejected by the local authorities.

Public Acceptability

The scheme currently being progressed is identified within the Unitary Development Plans of North Tyneside and South Tyneside and as such has been subject to public examination in the statutory procedures of these documents. The local authorities have also undertaken a consultation exercise. In general terms, there is considerable support for the scheme by the local authorities, despite the acknowledged disruption that may be caused during the construction period. Most respondents to the consultation exercise recognise that the long-term gains outweigh any short-term disadvantages.

It is acknowledged that there are objections to the scheme being progressed on several grounds. However that is not to assume that any of the other options considered in this assessment are more acceptable to these objectors or would not result in more objections as the options involve routing high traffic flows through mainly residential areas.

11. CONCLUSIONS

The following can be concluded as a result of this review of the crossing location options for a new River Tyne crossing in terms of the overarching Government objectives:

- Noise impacts are lowest with the St Lawrence and St Bede's tunnel options (variants C and D)
- The St Anthony's options result in a short term worsening in air quality whilst all other options result in short and longer term improvements in air quality in comparison with the Reference Case
- The St Anthony's options result in a short term worsening in emissions of greenhouse gases whilst all other options result in short and longer term improvements in comparison with the Reference Case
- Large adverse landscape impacts arise with all bridges with the exception of the St Lawrence crossing. A neutral impact upon the landscape results for the St Bede's bored tunnel option (variant C) with slight adverse impacts for the remaining options
- Most of the options result in neutral/slight adverse impacts upon townscape
- Most of the options result in negative/slight adverse impacts upon heritage
- Large adverse biodiversity impacts arise with the Walker crossing with a moderate adverse impact for the St Lawrence crossing. The other options have slight adverse impacts on biodiversity
- Moderate adverse impacts upon the water environment arise with the St Bede's immersed tube tunnel (variant D). All other options have a slight adverse impact
- The impact upon journey ambience is large beneficial for all options
- The St Bede's crossing options are the only schemes to result in a net reduction in the number of accidents on the road network as well as a large beneficial effect upon security
- All of the options have positive benefit/cost ratios although involving different contributions from the public and private sector. Journey time reliability is also improved with all of the options and serve the regeneration initiatives of the wider region
- The St Lawrence, St Anthony's and Walker crossings have moderate adverse impacts upon severance whilst the St Bede's options are neutral in this respect
- The St Lawrence, St Anthony's and Walker crossings have slight adverse impacts upon land use policies whilst the St Bede's options are neutral in this respect. All options are slightly beneficial with regard to impacts upon other Government policies

The following can be concluded in terms of the local project specific objectives:

- The St Bede's options best address the problems of congestion in the tunnel at the entrances and it's approaches as the schemes upgrade the existing infrastructure where the problems are experienced
- Only the St Bede's options improve safety and lower the risk to the travelling public in the tunnel
- Only the St Bede option facilitates improvements to public transport access through the tunnel and in the vicinity
- All of the options promote wider economic benefits in the region

APPENDIX B

Appraisal Summary Tables

ST LAWRENCE

ST LAWRENCE CROSSING	**Description:**	**Problems:.**	**Present Value Cost:** £57.2m

OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE MEASURE	ASSESSMENT
Environment	Noise			Change in estimated properties annoyed by noise: 2021 = +49
	Local Air Quality		2006 NO2: 35 win 38 lose; 2006 PM10: 31 win 42 lose; 2021 NO2: 30 win 43 lose; 2021 PM10: 30 win 43 lose	2006 PM10: -1367 2006 NO2: -28099 2021 PM10: -2248 2021 NO2: -105714
	Greenhouse Gases		Not applicable	Reduction in CO_2 emissions 2006 = 3156 tonnes Reduction in CO_2 emissions 2021 = 22113 tonnes
	Landscape			Slight adverse
	Townscape			Neutral/slight adverse
	Heritage of Historic Resources	Potential for impact on the setting of several listed buildings, the Byker Wall area and archaeological deposits.	Not applicable	Negative
	Biodiversity	Significant impact at one SNCI	Not applicable	Moderate adverse
	Water Environment		Not applicable	Slight adverse
	Physical Fitness			Neutral
	Journey Ambience	Route to current design standards.	Not applicable	Large beneficial
Safety	Accidents	Introduction of traffic to built up areas increases pedestrian/vehicle conflict	Accidents +74; Deaths 0; Serious +5; Slight +96	PVB £-0.53m
	Security	Route to current design standards.	None	Large adverse
Economy	Transport Economic Efficiency	X		Users: NPV £+156.4m Public: NPV £-67.0m Other Gov't: NPV £-5.9m
	Reliability	Route currently highly stressed; congestion and delays at peak periods.	Total lost time saved = 60,818 hrs	Slight beneficial
	Wider Economic Impacts	Assisted Area Tier 2; European Structural Fund Objective 2 Area.	Serves designated regeneration area. Development depends on scheme.	Yes No
Accessibility	Option values	Not applicable	Not applicable	Neutral
	Severance		X	Moderate adverse
	Access to the Transport System	X	Not applicable	Neutral
Integration	Transport Interchange	Not applicable	Not applicable	Neutral
	Land-Use Policy	Largely in accord with key areas of local, regional and national guidance.	X	Slight adverse
	Other Government Policies	Does not adversely impact on any wider 'mainstream' government policies	X	Slight beneficial

ST ANTHONY'S

ST ANTHONY'S CROSSING	Description:	Problems:.	Present Value Cost: £91.6m(A), £101.6m(B)

OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE MEASURE	ASSESSMENT
Environment	Noise			Change in estimated properties annoyed by noise: 2021 (A) = +159 2021 (B) = +131
	Local Air Quality		2006 NO2: 34 win 39 lose; 2006 PM10: 31 win 42 lose; 2021 NO2: 32 win 41 lose; 2021 PM10: 31 win 42 lose	2006 PM10: 491 2006 NO2: 26456 2021 PM10: -2809 2021 NO2: -105512
	Greenhouse Gases		Not applicable	Increase in CO_2 emissions 2006 = 1224 tonnes Reduction in CO_2 emissions 2021 = 7661 tonnes
	Landscape			Large adverse
	Townscape			Neutral/slight adverse
	Heritage of Historic Resources	Potential for impact on the setting of several listed buildings, the Byker Wall area and archaeological deposits.	Not applicable	Negative
	Biodiversity	Minor adverse impact at one SLCI	Not applicable	Slight adverse
	Water Environment			Slight adverse
	Physical Fitness			Neutral
	Journey Ambience	Route to current design standards.	Not applicable	Large beneficial
Safety	Accidents	Introduction of traffic to built up areas increases pedestrian/vehicle conflict	Accidents +39; Deaths 0; Serious -3; Slight +70	PVB £-0.11m
	Security	Route to current design standards.	None	Large adverse
Economy	Transport Economic Efficiency	X		Users: NPV £+282.9m Public: NPV £-117.5m(A), £-127.5m(B) Other Gov't: NPV £-9.0m
	Reliability	Route currently highly stressed; congestion and delays at peak periods.	Total lost time saved = 97,268 hrs	Slight beneficial
	Wider Economic Impacts	Assisted Area Tier 2; European Structural Fund Objective 2 Area.	Serves designated regeneration area. Development depends on scheme.	Yes No
Accessibility	Option values	Not applicable	Not applicable	Neutral
	Severance		X	Moderate adverse
	Access to the Transport System	X	Not applicable	Neutral
Integration	Transport Interchange	Not applicable	Not applicable	Neutral
	Land-Use Policy	Largely in accord with key areas of local, regional and national guidance.	X	Slight adverse
	Other Government Policies	Does not adversely impact on any wider 'mainstream' government policies	X	Slight beneficial

WALKER

WALKER CROSSING	Description:	Problems:.	Present Value Cost: £104.5m(A), £113.1m(B)

OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE MEASURE				ASSESSMENT
Environment	Noise						Change in estimated properties annoyed by noise: 2021 (A) = +144 2021 (B) = +119
	Local Air Quality		2006		2021		2006 PM10: -2954 2006 NO2: -66867 2021 PM10: -3546 2021 NO2: -140889
			NO2	PM10	NO2	PM10	
			31 win 42 lose	30 win 43 lose	31 win 42 lose	32 win 41 lose	
	Greenhouse Gases		Not applicable				Reduction in CO_2 emissions 2006 = 6225 tonnes Reduction in CO_2 emissions 2021 = 9106 tonnes
	Landscape						Large adverse
	Townscape						Neutral/slight adverse
	Heritage of Historic Resources	Potential for impact on the setting of several listed buildings, the Byker Wall area and archaeological deposits.	Not applicable				Negative
	Biodiversity	Three minor impacts and three significant impacts at six locally/regionally important resources. Overall cumulative impact is deemed to be higher than the individual impacts.	Not applicable				Large adverse
	Water Environment						Slight adverse
	Physical Fitness						Neutral
	Journey Ambience	Route to current design standards.	Not applicable				Large beneficial
Safety	Accidents	Introduction of traffic to built up areas increases pedestrian/vehicle conflict	Accidents +109	Deaths +2	Serious +11	Slight +152	PVB £-1.37m
	Security	Route to current design standards.	None				Large adverse
Economy	Transport Economic Efficiency	X					Users: NPV £+268.0m Public: NPV £-131.2m(A), £-139.8m(B) Other Gov't: NPV £-9.9m
	Reliability	Route currently highly stressed; congestion and delays at peak periods.	Total lost time saved = 127,065 hrs				Slight beneficial
	Wider Economic Impacts	Assisted Area Tier 2; European Structural Fund Objective 2 Area.	Serves designated regeneration area. Development depends on scheme.				Yes No
Accessibility	Option values	Not applicable	Not applicable				Neutral
	Severance		X				Moderate adverse
	Access to the Transport System	X	Not applicable				Neutral
Integration	Transport Interchange	Not applicable	Not applicable				Neutral
	Land-Use Policy	Largely in accord with key areas of local, regional and national guidance.	X				Slight adverse
	Other Government Policies	Does not adversely impact on any wider 'mainstream' government policies	X				Slight beneficial

ST BEDE'S

ST BEDE'S CROSSING	Description:	Problems:.	Present Value Cost: £87.4m(A), £112.8m(B), £147.6m(C)

OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE MEASURE	ASSESSMENT
Environment	Noise			Change in estimated properties annoyed by noise: 2021 = +93 (A), +128 (B), +53 (C)
	Local Air Quality		2006 NO2: 33 win 40 lose; 2006 PM10: 26 win 47 lose; 2021 NO2: 30 win 43 lose; 2021 PM10: 31 win 42 lose	2006 PM10: -1452 2006 NO2: -19585 2021 PM10: -2178 2021 NO2: -101704
	Greenhouse Gases		Not applicable	Reduction in CO_2 emissions 2006 = 4183 tonnes Reduction in CO_2 emissions 2021 = 4768 tonnes
	Landscape			(A + B) Large adverse (C) Neutral (D) Slight adverse
	Townscape			(A + B) Moderate adverse (C) Neutral, (D) Slight adverse
	Heritage of Historic Resources	Potential for slight adverse impact on setting of two listed buildings (A + B). Variant D would result in demolition of two listed buildings and moderate adverse impact on archaeological deposits.	Not applicable	(A + B) Slight adverse (C) Neutral, (D) Moderate adverse
	Biodiversity	A minor adverse impact on a SNCI (A-C). Variant D could have an additional minor adverse impact on the migratory salmonid populations.	Not applicable	Slight adverse
	Water Environment			(A, B + C) Slight adverse (D) Moderate adverse
	Physical Fitness			Neutral
	Journey Ambience	Route to current design standards.	Not applicable	Large beneficial
Safety	Accidents	Routing of traffic from built up areas reduces pedestrian/vehicle conflict	Accidents -646; Deaths -3	Serious -73; Slight -788; PVB £+5.37m
	Security	Route to current design standards.	None	Large beneficial
Economy	Transport Economic Efficiency	X		Users: NPV £+195.6m Public: NPV £+6.8m(A), £-18.5m(B), £-53.3m(C) Other Gov't: NPV £-27.8m
	Reliability	Route currently highly stressed; congestion and delays at peak periods.	Total lost time saved = 54,330 hrs	Slight beneficial
	Wider Economic Impacts	Assisted Area Tier 2; European Structural Fund Objective 2 Area.	Serves designated regeneration area. Development depends on scheme.	Yes No
Accessibility	Option values	Not applicable	Not applicable	Neutral

	Severance		X	Neutral
	Access to the Transport System	X	Not applicable	Neutral
Integration	Transport Interchange	Not applicable	Not applicable	Neutral
	Land-Use Policy	Largely in accord with key areas of local, regional and national guidance.	X	Slight beneficial
	Other Government Policies	Does not adversely impact on any wider 'mainstream' government policies	X	Slight beneficial

APPENDIX C

Worksheets

1. NOISE

Calculation of Estimated Population Annoyed (EPA) by Noise

St Lawrence

Estimated Population	With Option Compared to Do-Minimum 2006	With Option Compared to Do-Minimum 2021
...with increased annoyance ("losers")	36	51
...with reduced annoyance ("winners")	1	2
Total Change in Estimated Population Annoyed	35	49

St Anthony's

Estimated Population	Option A		Option B	
	With Option Compared to Do-Minimum 2006	With Option Compared to Do-Minimum 2021	With Option Compared to Do-Minimum 2006	With Option Compared to Do-Minimum 2021
...with increased annoyance ("losers")	179	170	147	142
...with reduced annoyance ("winners")	7	11	12	11
Total Change in Estimated Population Annoyed	172	159	135	131

Walker

Estimated Population	Option A		Option B	
	With Option Compared to Do-Minimum 2006	With Option Compared to Do-Minimum 2021	With Option Compared to Do-Minimum 2006	With Option Compared to Do-Minimum 2021
...with increased annoyance ("losers")	135	144	118	124
...with reduced annoyance ("winners")	4	0	7	5
Total Change in Estimated Population Annoyed	131	144	111	119

St Bede

Estimated Population	Option A		Option B		Option C	
	With Option Compared to Do-Minimum 2006	With Option Compared to Do-Minimum 2021	With Option Compared to Do-Minimum 2006	With Option Compared to Do-Minimum 2021	With Option Compared to Do-Minimum 2006	With Option Compared to Do-Minimum 2021
...with increased annoyance ("losers")	85	96	117	131	49	56
...with reduced annoyance ("winners")	4	3	4	3	4	3
Total Change in Estimated Population Annoyed	81	93	113	128	45	53

References: Design Manual for Roads and Bridges (DMRB) Volume 11, Part 7 (1994), HMSO

Calculation of Road Traffic Noise (1988), Department of Transport Welsh Office, HMSO

Traffic Data Sources: Arup Transport

Population Data Sources: http://www.neighbourhood.statistics.gov.uk. 1998 population estimates.

Qualitative comments: The assessment summary indicates that the St Lawrence bridge crossing will have the least annoyance impact of the possible route options. The St Bedes tunnel crossings (options C and D), also have a comparatively low impact. Given the relatively coarse assessment and the assumptions with respect to existing background noise where traffic data was not available, the difference between the outcome for St Lawrence bridge and the St Bedes tunnel crossings is unlikely to be significant. The difference between St Bedes option B and Walker option B is also not significant. Similarly, Walker option A & St Anthonys option B should be considered to have equivalent impacts.

2. LOCAL AIR QUALITY

(Source: GOMMMS Worksheet 4.4)

2006 St Lawrence

NUMBER OF ZONES...	With Option Compared to Present Do-Minimum		With Option Compared to Future Do-Minimum	
	NO_2	PM_{10}	NO_2	PM_{10}
...with positive % "losers"	73	73	38	42
...with negative % "winners"	0	0	35	31
...with no change	0	0	0	0
Emissions estimate	-6,222,856	-286,279	-28,099	-1,367

2006 St Anthony's

NUMBER OF ZONES...	With Option Compared to Present Do-Minimum		With Option Compared to Future Do-Minimum	
	NO_2	PM_{10}	NO_2	PM_{10}
...with positive % "losers"	72	72	39	42
...with negative % "winners"	1	1	34	31
...with no change	0	0	0	0
Emissions estimate	-6,168,301	-284,421	26,456	491

2006 Walker

NUMBER OF ZONES...	With Option Compared to Present Do-Minimum		With Option Compared to Future Do-Minimum	
	NO_2	PM_{10}	NO_2	PM_{10}
• ...with positive % "losers"	72	72	42	43
...with negative % "winners"	1	1	31	30
...with no change	0	0	0	0
Emissions estimate	-6,261,624	-287,866	-66,867	-2,954

2006 St Bede's

Number of zones...	With Option Compared to Present Do-Minimum		With Option Compared to Future Do-Minimum	
	NO2	PM10	NO2	PM10
...with positive % "losers"	72	73	40	47
...with negative % "winners"	1	0	33	26
...with no change	0	0	0	0
Emissions estimate	-6,214,342	-286,364	-19,585	-1,452

2021 St Lawrence

NUMBER OF ZONES...	With Option Compared to Present Do-Minimum		With Option Compared to Future Do-Minimum	
	NO_2	PM_{10}	NO_2	PM_{10}
...with positive % "losers"	73	73	43	43
• ...with negative % "winners"	0	0	30	30
...with no change	0	0	0	0
Emissions estimate	-6,704,779	-353,066	-105,714	-2,248

2021 St Anthony's

NUMBER OF ZONES...	With Option Compared to Present Do-Minimum		With Option Compared to Future Do-Minimum	
	NO_2	PM_{10}	NO_2	PM_{10}
...with positive % "losers"	72	72	41	42
...with negative % "winners"	1	1	32	31
...with no change	0	0	0	0
Emissions estimate	-6,704,577	-353,626	-105,512	-2,809

2021 Walker

NUMBER OF ZONES...	With Option Compared to Present Do-Minimum		With Option Compared to Future Do-Minimum	
	NO_2	PM_{10}	NO_2	PM_{10}
...with positive % "losers"	72	72	42	41
...with negative % "winners"	1	1	31	32
...with no change	0	0	0	0
Emissions estimate	-6,739,955	-354,363	-140,889	-3,546

2021 St Bede's

NUMBER OF ZONES...	With Option Compared to Present Do-Minimum		With Option Compared to Future Do-Minimum	
	NO_2	PM_{10}	NO_2	PM_{10}
...with positive % "losers"	73	73	43	42
...with negative % "winners"	0	0	30	31
...with no change	0	0	0	0
Emissions estimate	-6,700,770	-352,995	-101,704	-2,178

3. GREENHOUSE GASES

(Source: GOMMMS Worksheet 4.5)

Data Sources:

Design Manual for Roads and Bridges (DMRB) 11.3, March 2000

St Lawrence 2006

Tonnes per year					
	Do minimum		Do-something	Do something as % of	
	Present	Future		Present Do-Min	Future Do-Min
CO2	702,677	764,190	761,034	+8.3	-0.4
The total emission from all zones in the study area 761,034 tonnes					

Assessment:

Beneficial impact.

St Anthony 2006

Tonnes per year					
	Do minimum		Do-something	Do something as % of	
	Present	Future		Present Do-Min	Future Do-Min
CO2	702,677	765,190	765,415	+8.9	+0.2
The total emission from all zones in the study area 765,415 tonnes					

Assessment:

Adverse impact.

Walker 2006

Tonnes per year					
	Do minimum		Do-something	Do something as % of	
	Present	Future		Present Do-Min	Future Do-Min
CO2	702,677	764,190	757,965	+7.9	-0.8
The total emission from all zones in the study area 757,965 tonnes					

Assessment:

Beneficial impact.

St Bede 2006

Tonnes per year					
	Do minimum		Do-something	Do something as % of	
	Present	Future		Present Do-Min	Future Do-Min
CO2	702,677	764,190	760,007	+8.2	-0.5
The total emission from all zones in the study area 760,007 tonnes					

Assessment:

Beneficial impact.

St Lawrence 2021

Tonnes per year					
	Do minimum		Do-something	Do something as % of	
	Present	Future		Present Do-Min	Future Do-Min
CO2	702,677	873,046	850,933	+21.1	-2.5
The total emission from all zones in the study area 850,933 tonnes					

Assessment:

Beneficial impact.

St Anthony 2021

Tonnes per year					
	Do minimum		Do-something	Do something as % of	
	Present	Future		Present Do-Min	Future Do-Min
CO2	702,677	873,046	865,385	+23.2	-0.9
The total emission from all zones in the study area 865,385 tonnes					

Assessment:

Beneficial impact.

Walker 2021

Tonnes per year					
	Do minimum		Do-something	Do something as % of	
	Present	Future		Present Do-Min	Future Do-Min
CO2	702,677	873,046	863,940	+22.9	-1.0
The total emission from all zones in the study area 863,940 tonnes					

Assessment:

Beneficial impact.

St Bede 2021

Tonnes per year					
	Do minimum		Do-something	Do something as % of	
	Present	Future		Present Do-Min	Future Do-Min
CO2	702,677	868,046	868,278	+23.6	-0.5
The total emission from all zones in the study area 868,278 tonnes					

Assessment:

Beneficial impact.

4. LANDSCAPE

(Source: GOMMMS Worksheet 4.6)

Reference source(s): Ove Arup & Partners. 1:12,000 Route Plan (Nov 2002)

St Lawrence

Features	Description	Scale it Matters	Rarity	Importance	Substitutability	Impact	Additional Mitigation
Pattern	Inner City / Post Industrial river valley	local recreational	not rare	local low	no	Moderate adverse	-
Tranquility	Urban / Industrial Riverside Park	local	low	low	no	Moderate adverse	-
Cultural	• River orientated recreation	local	Locally important	low	no	Negative for recreation	-
Landcover	Residential / Industry Reclaimed Industrial Land	local	low	low	no	Severance Minor adverse	-
Summary of Character	Mix of urban / industrial but predominantly reclaimed industrial river corridor.	local	locally low	low	no	Moderate adverse	-

Summary assessment score: Slight Adverse

Qualitative comments: Severance of riverside recreation area at Friars Goose.

Removal of riverside walks (Keelman's Way).

Introduction of large scale engineering structures into sensitive section of river corridor at Felling Shore

St Anthony's

Features	Description	Scale it Matters	Rarity	Importance	Substitutability	Impact	Additional Mitigation
Pattern	Junction between urban area and river valley. Steeply sloping	local aesthetic recreational		local medium	no	High adverse	-
Tranquility	Largely Riverside Park	immediate inhabitants	high for local residents	high local	no	High adverse	-
Cultural	Hadrian Way C2C Cycle Route	local and regional	local and regional	high regional	no	High adverse	-
Landcover	Urban/Industrial Predom woodland on steep slopes	local residents	local	high local	no	High adverse	-
Summary of Character	Visual Amenity Recreation	local residents	River Corridor	local negative for Walker	no	High adverse	-

Summary assessment score: Large Adverse

Qualitative comments: Creates barrier between residential development at Walker and St Peters and the recreational opportunities provided by the river (severance).

Removal of established riverside walks and recreation areas including the Hadrian Way long distance cycle route (part of the C2C).

Introduction of large scale engineering works into a sensitive section of the river corridor (retaining walls).

Loss of a large amount of woodland which determines the character of this section of the river corridor (Riverside Park).

Walker

Features	Description	Scale it Matters	Rarity	Importance	Substitutability	Impact	Additional Mitigation
Pattern	River Corridor, post industrial. Large fields.	local aesthetics recreational	not rare	local medium	no	High adverse	-
Tranquility	• St Peter's and Walker riverside and urban fringe	immediate inhabitants	high for local residents	high local	no	High adverse	-
Cultural	Hadrians Way Monkton Mill Farm Country Park	local and regional	local and regional	high regional	no	High adverse	-
Landcover	Urban / Urban Fringe wooded river corridor	local farmer residents	high for urban fringe	high local	no	High adverse	-
Summary of Character	Visual Amenity Recreational	urban fringe and river corridor	urban fringe river coridor	local negative Walker Riverside Park/ Monkton Business Park	-	High adverse	-

Summary assessment score: Large Adverse

Qualitative comments:

The bridge and its associated earthworks would create an intrusive element in the broader river landscape ie the bridge abutments and earthworks for the approach roads would not fit easily with the topography, particularly on the south bank.

Removal of established riverside walks on north side of river including Hadrian's Way long distance cycle route (part of the C2C cycle route).

Severance of communities in Walker from the river.

Destruction of Riverside Park.

Disruption and demolition of part of Monkton Business Park.

Severance of Monkton Hill Farm Country Park.

St Bede's (Variant A & B)

Features	Description	Scale it Matters	Rarity	Importance	Substitutability	Impact	Additional Mitigation
Pattern	• Urban open space playing fields	local aesthetics recreation	not rare	local medium	no	High adverse	-
Tranquility	Riverside Park Jarrow	local	not rare	local medium	no	High adverse	-
Cultural	River Tyne	local residents	locally important	local high	no	High adverse	-
Landcover	Mainly amenity grassland	local residents	not rare	local medium	no	High adverse	-
Summary of Character	Visual amenity recreational	local residents	urban/ industrial	local	no	High adverse	-

Summary assessment score: Large Adverse

Qualitative comments: High visual intrusion particularly in Jarrow.

Severance of landscape by embankments for approach roads to bridge.

St Bede's (Variant C)

Features	Description	Scale it Matters	Rarity	Importance	Substitutability	Impact	Additional Mitigation
Pattern	• Urban Open Space Playing Fields	local aesthetics recreation	not rare	local medium	-	neutral	-
Tranquility	Riverside Park Jarrow	local	not rare	local medium	-	neutral	-
Cultural	River Tyne	local residents	locally important	local high	-	neutral	-
Landcover	Mainly Amenity Grassland	local residents	not rare	local medium	-	neutral	-
Summary of Character	Visual amenity recreation	local residents	urban / industrial	local	-	neutral	-

Summary assessment score: Neutral

Qualitative comments: Some disruption during construction at entrance to tunnel.

St Bede's (Variant D)

Features	Description	Scale it Matters	Rarity	Importance	Substitutability	Impact	Additional Mitigation
Pattern	• Urban Open Space Playing Fields	local aesthetics recreational	not rare	local medium	Yes 10 yrs	Slight (adverse)	-
Tranquility	Riverside Park Jarrow	local	not rare	local medium	Yes 10 yrs	Slight (adverse)	-
Cultural	River Tyne	local residents	locally important	local high	-	Slight (adverse)	-
Landcover	Mainly amenity grassland	local residents	not rare	local medium	Yes 10 yrs	Slight (adverse)	-
Summary of Character	Visual amenity recreation	local residents	urban/ industrial	local	Yes	Slight (adverse)	-

Summary assessment score: Slight Adverse

Qualitative comments: Disruption experienced during construction phase due to excavation of trench but opportunity to create public open space and improve riverside park

5. TOWNSCAPE

(Source: GOMMMS Worksheet 4.7)

Reference source(s): Ove Arup & Partners. 1:12,000 Route Plan (Nov 2002)

St Bede's Crossing (Variant A & B)

Features	Description	Scale it Matters	Rarity	Importance	Substitutability	Changes in Do-Minimum	Impact	Additional Mitigation
Layout	Fragmented	local	not rare	local	Yes	Further fragmentation	Major adverse	
Density and Mix	• Low	local	not rare	local	Yes	Reduction in density	Slight adverse	
Scale	Predom low rise	local	not rare	local	Yes	Conflict of scale	Slight adverse	
Appearance	Mix 19th Century with 20th Century redevelopment	local	not rare	local	Yes	Intrusive engineering	Major adverse	
Human Interaction	Good community interaction	local	not rare	local	Yes	Structure Severance	Major adverse	
Cultural	Strong historic street pattern	local	not rare	local	Yes	Reduction in historic fabric	Minor adverse	
Land Use	Residential, Industrial, Commercial	local	not rare	local	Yes	Roads assume prominence	Minor adverse	
Summary of Character	Fragmented. Some cleared undeveloped areas.	local	not rare	local	Yes	Area dominated by roads	Moderate adverse	

Summary assessment score: Moderate Adverse

Qualitative comments: Extent of approach road embankments not known.

Severance of urban area would result from major road.

St Bede's Crossing (Variant C)

Features	Description	Scale it Matters	Rarity	Importance	Substitutability	Changes in Do-Minimum	Impact	Additional Mitigation
Layout	• Fragmented	local	not rare	local	Yes	No change	Neutral	
Density and Mix	Low	local	not rare	local	Yes	No change	Neutral	
Scale	Predom low rise	local	not rare	local	Yes	No change	Neutral	
Appearance	Mix 19th Century with 20th Century redevelopment	local	not rare	local	Yes	No change	Neutral	
Human Interaction	Good community interaction	local	not rare	local	Yes	No change	Neutral	
Cultural	Strong historic street pattern	local	not rare	local	Yes	No change	Neutral	
Land Use	Residential, Industrial, Commercial	local	not rare	local	Yes	No change	Neutral	
Summary of Character	Fragmented. Some cleared undeveloped areas.	local	not rare	local	Yes	No change	Neutral	

Summary assessment score: Neutral

Qualitative comments: Extent of disruption necessary to build bored tunnel unknown.

St Bede's Crossing (Variant D)

Features	Description	Scale it Matters	Rarity	Importance	Substitutability	Changes in Do-Minimum	Impact	Additional Mitigation
Layout	Fragmented	local	not rare	local	Yes	Increase in open space	Slight adverse	-
Density and Mix	Low	local	not rare	local	Yes	Density reduces	Neutral	-
Scale	Predom low rise	local	not rare	local	Yes	No change	Neutral	-
Appearance	• Mix 19th Century with 20th Century redevelopment	local	not rare	local	Yes	Less urban	Slight adverse	-
Human Interaction	Good community interaction	local	not rare	local	Yes	No change	Neutral	-
Cultural	Strong historic street pattern	local	not rare	local	Yes	Slight reduction	Neutral	-
Land Use	Residential, Industrial, Commercial	local	not rare	local	Yes	Increase in open space	Slight adverse	-
Summary of Character	Fragmented. Some cleared undeveloped areas.	local	not rare	local	Yes	More open	Slight adverse	-

Summary assessment score: Slight Adverse

Qualitative comments: The slight adverse effect could be mitigated by creation of opportunities for redevelopment

6. HERITAGE OF HISTORIC RESOURCES

(Source: GOMMMS Worksheet 4.9)

St Lawrence

Level	Policy/objective	Positive	Negative	Mixed	Indeterminate
National	PPG 15, 2.16: The setting of listed buildings		Impacts on 13 listed buildings and one proposed listed building		
	PPG 15, 4.14: Use of planning powers in conservation areas		Impact on one proposed conservation area		
	PPG 15, 6.35: protection of World Heritage Sites		Impact on Hadrian's Wall Military Zone		
	PPG 16, paras. 18-25: protection of archaeological remains				Possible impacts on archaeological remains of national, regional and local importance (requires evaluation)
	Hadrian's Wall Management Plan: protection of World Heritage Site		Impact on Hadrian's Wall Military Zone		
Local	Protection of listed buildings Newcastle UDP C2		Impacts on setting of St Silas' Church and Byker Wall (proposed Grade II* listed building)		
	Gateshead UDP E11		Impacts on the setting of Church of St Mary (Grade II) and Heworth Constitutional Club (Grade II*) at Heworth roundabout		Impact on setting of Friars Goose engine house (LB II) Impacts on setting of one Grade II* and eigth Grade II listed monuments within Heworth cemetery
	Conservation Areas: preservation of character/appearance Newcastle UDP C3		Impact on Byker Wall (proposed Conservation Area)		
	Protection of archaeological remains Newcastle UDP C4				Potential impacts requiring evaluation: Hadrian's Wall vallum; site of St Lawrence Chapel; site of Mushroom bottleworks and medieval and early post-medieval remains on the St Lawrence banks of the Tyne
	Gateshead UDP E19 - E20				Potential impacts requiring evaluation: medieval and post-medieval remains along the South Shore, Felling Shore and Friars Goose

Reference source(s): National Monuments Records, Tyne and Wear Sites and Monuments Records, Tyne and Wear Archives (cartographic evidence), secondary sources. National Planning Policy Guidance, Urban Development Plans and Hadrian's Wall World Heritage Site Management Plan 2002-2007.

Summary assessment score: Negative

Qualitative comments: The route would not impact upon any scheduled monuments but it is likely to have an adverse impact upon the setting of several listed buildings and a proposed conservation area. Impact on archaeological remains, including remains within the Hadrian's Wall World Heritage Site, requires evaluation but any adverse impact could probably be adequately/partially mitigated through investigation and recording if preservation in situ not possible.

St Anthony's

Level	Policy/objective	Positive	Negative	Mixed	Indeterminate
National	PPG 15, 2.16: The setting of listed buildings		Impacts on 12 listed buildings and one proposed listed building		
	PPG 15, 4.14: Use of planning powers in conservation areas		Impact on one proposed conservation area		
	PPG 15, 6.35: protection of World Heritage Sites		Impact on Hadrian's Wall Military Zone		
	PPG 16, paras. 18-25: protection of archaeological remains				Possible impacts on archaeological remains of national, regional and local importance (requires evaluation)
	Hadrian's Wall Management Plan: protection of World Heritage Site		Impact on Hadrian's Wall Military Zone		
Local	Protection of listed buildings Newcastle UDP C2		Impact on setting of St Silas' Church and Byker Wall (proposed Grade II* listed building)		
	Gateshead UDP E11		Impacts on the setting of Church of St Mary (Grade II) and Heworth Constitutional Club (Grade II*) at Heworth roundabout		Impacts on setting of one Grade II* and eigth Grade II listed monuments within Heworth cemetery
	Conservation Areas: preservation of character/appearance Newcastle UDP C3		Impact on Byker Wall (proposed Conservation Area)		
	Protection of archaeological remains Newcastle UDP C4				Potential impacts requiring evaluation: Hadrian's Wall vallum; St Anthony's shipyard site
	Gateshead UDP E19 - E20				Potential impacts requiring evaluation: Parrish Quay and foreshore area

Reference source(s): National Monuments Records, Tyne and Wear Sites and Monuments Records, Tyne and Wear Archives (cartographic evidence), secondary sources. National Planning Policy Guidance, Urban Development Plans and Hadrian's Wall World Heritage Site Management Plan 2002-2007

Summary assessment score: Negative

Qualitative comments: The route would not impact upon any scheduled monuments but it is likely to have an adverse impact upon the setting of several listed buildings and a proposed conservation area. Impact on archaeological remains, including remains within the Hadrian's Wall World Heritage Site, requires evaluation but any adverse impact could probably be adequately/partially mitigated through investigation and recording if preservation in situ not possible.

Walker

Level	Policy/objective	Positive	Negative	Mixed	Indeterminate
National	PPG 15, 2.16: The setting of listed buildings		Impacts on five listed buildings and one proposed listed building		
	PPG 15, 4.14: Use of planning powers in conservation areas		Impact on one proposed conservation area		
	PPG 15, 6.35: protection of World Heritage Sites		Impact on Hadrian's Wall Military Zone		
	PPG 16, paras. 18-25: protection of archaeological remains				Possible impact on archaeological remains of national, regional and local importance (requires evaluation)
	Hadrian's Wall Management Plan: protection of World Heritage Site		Impact on Hadrian's Wall Military Zone		
Local	Protection of listed buildings South Tyneside UDP ENV6		Impacts on setting of Grade II buildings: Boldon Fellgate Farm, Scots House, Lodge and Barn. Also unlisted Boldon Fellgate barn.		
	Newcastle UDP C2		Impacts on setting of St Silas' Church (Grade II) and Byker Wall (proposed Grade II*)		
	Conservation Areas: preservation of character/appearance Newcastle UDP C3		Impact on Byker Wall (proposed Conservation Area)		
	Protection of archaeological remains Newcastle UDP C4				Potential impacts requiring evaluation: Hadrian's Wall vallum; foreshore north of Bill Point
	Gateshead UDP E19 - E20				Potential impacts requiring evaluation: bridge and junction on post-medieval staithes and waggonways at Pelaw Main (local importance)
	South Tyneside UDP ENV 8/2 South Tyneside UDP ENV 9				Potential impacts requiring evaluation: Impact on line of Bowes Railway and Wrekendike Roman Road. Potential for unrecorded archaeological remains within greenfield areas

Reference source(s): National Monuments Records, Tyne and Wear Sites and Monuments Records, Tyne and Wear Archives (cartographic evidence), secondary sources. National Planning Policy Guidance, Urban Development Plans and Hadrian's Wall World Heritage Site Management Plan 2002-2007

Summary assessment score: Negative

Qualitative comments: The route would not impact upon any scheduled monuments but it is likely to have an adverse impact upon the setting of several listed buildings and a proposed conservation area. Impact on archaeological remains, including remains within the Hadrian's Wall World Heritage Site, requires evaluation but any adverse impact could probably be adequately/partially mitigated through investigation and recording if preservation in situ not possible.

St Bede's (Variants A and B)

Level	Policy/objective	Positive	Negative	Mixed	Indeterminate
National	PPG 15, 2.16: The setting of listed buildings		Impacts on two listed buildings		
	PPG 16, paras. 18-25: protection of archaeological remains				Possible impact on archaeological remains of national, regional and local importance (requires evaluation)
Local	Protection of listed buildings South Tyneside UDP ENV6		Impacts on setting of Grade II buildings: Sir Charles Palmer Monument and Gaslight Public House		
	Protection of archaeological remains North Tyneside UDP E18				Potential impacts requiring evaluation: Howdon Pans Shipbuilding Yard
	South Tyneside UDP ENV 9				Potential for unrecorded archaeological remains on Jarrow foreshore

Reference source(s): National Monuments Records, Tyne and Wear Sites and Monuments Records, Tyne and Wear Archives (cartographic evidence), secondary sources. National Planning Policy Guidance, Urban Development Plans and Hadrian's Wall World Heritage Site Management Plan 2002-2007

Summary assessment score: Slight Adverse

Qualitative comments: The route would not impact upon any scheduled monuments but it is likely to have an adverse impact upon the setting of two listed buildings. Impact on archaeological remains requires evaluation but any adverse impact could probably be adequately/partially mitigated through investigation and recording if preservation in situ not possible.

St Bede (Variant D)

Level	Policy/objective	Positive	Negative	Mixed	Indeterminate
National	PPG 15, 2.16: The setting of listed buildings		Impacts on three listed buildings		
	PPG 16, paras. 18-25: protection of archaeological remains				Possible impact on archaeological remains of national, regional and local importance (requires evaluation)
Local	Protection of listed buildings South Tyneside UDP ENV6		Demolition of Sir Charles Palmer Monument and Gaslight Public House Grade II buildings.		Temporary impact during construction on setting of Grade II Tyne Pedestrian and Cycle Tunnel.
	Protection of archaeological remains North Tyneside UDP E18				Potential impacts requiring evaluation: Howdon Pans Shipbuilding Yard
	South Tyneside UDP ENV 9				Potential for unrecorded archaeological remains on Jarrow foreshore

Reference source(s): National Monuments Records, Tyne and Wear Sites and Monuments Records, Tyne and Wear Archives (cartographic evidence), secondary sources. National Planning Policy Guidance, Urban Development Plans and Hadrian's Wall World Heritage Site Management Plan 2002-2007

Summary assessment score: Moderate Adverse

Qualitative comments: The route would not impact upon any scheduled monuments but would result in the demolition of two listed buildings. This could only be partially mitigated through the re-location of one and the recording of the second. Impact on archaeological remains requires evaluation but any adverse impact could probably be adequately/partially mitigated through investigation and recording.

7. BIODIVERSITY

(Source: GOMMMS Worksheet 4.10)

St Lawrence

Area	Description of feature/attribute	Scale (at which attribute matters)	Importance (of attribute)	Trend (in relation to target)	Biodiversity and earth heritage value	Magnitude of impact	Assessment Score
Felling Shore	SNCI on south bank of River Tyne. No details available.	Regional	Not known but riverside habitats characteristic of Natural Area 5 may be present.		Medium	Intermediate negative	Significant adverse

Reference Source(s): English Nature: Natural Area Profiles and Local Authority Plans.

Summary Assessment Score: Moderate adverse

Qualitative Comments: The route would cut through part of Felling Shore, which will reduce its overall size and fragment the habitats present. It is assumed that the fringe areas adjacent to the river would not be directly impacted, although appropriate mitigation measures would be required to minimise encroachment. Further information on the habitats that would be lost may result in the magnitude of impact being upgraded to 'major negative', however the assessment score would remain unchanged.

St Anthony's

Area	Description of feature/attribute	Scale (at which attribute matters)	Importance (of attribute)	Trend (in relation to target)	Biodiversity and earth heritage value	Magnitude of impact	Assessment Score
Walker Riverside	SLCI on north bank of River Tyne comprising a dismantled railway corridor, recovered industrial land and riverside fringes. No details available.	Local	Not known but riverside habitats characteristic of Natural Area 5 may be present.		Lower	Intermediate negative	Minor adverse

Reference Source(s): English Nature: Natural Area Profiles and Local Authority Plans.

- **Summary Assessment Score:** Slight adverse

Qualitative Comments: The route would run parallel to the northern boundary of Walker Riverside, which is an SLCI and designated wildlife corridor. Development along this route may require mitigation or design measures to prevent excessive encroachment and maintain the functionality of the wildlife corridor. Around the northern bridgehead, the site would be severed and an amount of land-take would be required. Appropriate mitigation measures could be implemented to maintain links across the site and reduce the overall severance impacts.

Walker

Area	Description of feature/attribute	Scale (at which attribute matters)	Importance (of attribute)	Trend (in relation to target)	Biodiversity and earth heritage value	Magnitude of impact	Assessment Score
Walker Riverside	SLCI on north bank of River Tyne comprising a dismantled railway corridor, recovered industrial land and riverside fringes. No details available.	• Local	Not known but riverside habitats characteristic of Natural Area 5 may be present.		Lower	Intermediate negative	Minor adverse
Hebburn Riverside	SNCI on south bank of River Tyne. No details available. May include boundary features, grassland, areas of woodland and intertidal riverside habitats.	Regional	Not known but riverside habitats characteristic of Natural Area 5 may be present.		Medium	Major negative	Significant adverse
Bill Quay	SNCI on south bank of River Tyne. No details available. May include boundary features, grassland, areas of woodland and intertidal riverside habitats.	Regional	Not known but riverside habitats characteristic of Natural Area 5 may be present.		Medium	Major negative	Significant adverse
Great North Forest	Strategic woodland network through Durham, Tyne and Wear and Northumberland	Regional	Local importance for access to ecological areas. May consist of mixed woodland characteristic of Natural Area 5.		Lower	Minor Negative	Minor adverse
Pelaw Quarry	SNCI on a former quarry site. No details available. Includes areas of standing water and associated habitats.	Regional	Not known but standing open water is a characteristic habitat of Natural Area 5.		Medium	Major negative	Significant adverse
Lakeside Inn	SNCI. No details available. Includes an area of standing water.	Regional	Not known but standing open water is a characteristic habitat of Natural Area 5.		Medium - lower	Neutral	Neutral
Calf Close Burn	SNCI. No details available. May include boundary features, stream habitats and associated species.	Regional	Not known but riverside habitats characteristic of Natural Area 5 may be present.		Medium	Neutral - minor negative	Neutral - minor adverse
Boldon Lake	SNCI. No details available. Includes an area of standing water.	Regional	Not known but standing open water is a characteristic habitat of Natural Area 5.		Medium	Neutral	Neutral
Mount Pleasant Marsh	SNCI. No details available. May include areas of marsh and swamp.	Regional	Habitats of fen, marsh and swamp are characteristic of Natural Area 5 and may be present.		Medium	Neutral	Neutral

Area	Description of feature/attribute	Scale (at which attribute matters)	Importance (of attribute)	Trend (in relation to target)	Biodiversity and earth heritage value	Magnitude of impact	Assessment Score
Strother House Farm	SNCI. No details available.	Regional	Not known but habitats characteristic of Natural Area 5 may be present.		Medium	Neutral	Neutral

Reference Source(s): English Nature: Natural Area Profiles and Local Authority Plans.

Summary Assessment Score: Large adverse

Qualitative Comments: The route would run parallel to the northern boundary of Walker Riverside, which is an SLCI and designated wildlife corridor. Development along this route may require mitigation or design measures to prevent excessive encroachment and maintain the functionality of the wildlife corridor. Around the northern bridgehead the site would be severed and an amount of land-take would be required. Appropriate mitigation measures could be implemented to maintain links across the site and reduce the overall impacts of the severance.

At the southern bridgehead there are two designated sites that would be directly impacted. Although these sites are separately designated because they are in neighbouring local authority boundaries, ecologically they form a larger, continuous, single site, increasing their overall biodiversity value. The overall cumulative impact at these sites is considered to be significant - serious adverse under the revised guidance note on the environmental capital approach.

Pelaw Quarry would be significantly impacted by the route, which would cut through a large portion of the site and potentially affect its overall integrity. The site is within a larger area designated for use in the Great North Forest project, the potential success of which could be seriously restricted in this location from the route alignment. Compensation in the form of tree planting elsewhere may be appropriate to help ameliorate the long-term impacts of this development.

The route would cross the Calf Close Burn, possibly at two locations to accommodate the split lanes feeding into the A184. Downstream of the crossing location is an SNCI which could be indirectly impacted by construction activities should specific measures not be in place to deal with potential impacts (e.g. noise, spillages, runoff, plant access). No details were available on the habitats and species present within the SNCI, but impacts could be between neutral and minor adverse depending on the construction methods and species/habitats present.

St Bede's (Variants A, B and C)

Area	Description of feature/attribute	Scale (at which attribute matters)	Importance (of attribute)	Trend (in relation to target)	Biodiversity and earth heritage value	Magnitude of impact	Assessment Score
Northumberland Dock	SNCI on north bank of River Tyne. Includes areas of intertidal mud, saltmarsh, mesotrophic grassland and scrub.	Regional	Riverside habitats characteristic of Natural Area 5 are present.		Medium	Neutral	Neutral
Jarrow Slake Mud Flats	SNCI on south bank of River Tyne. Includes areas of intertidal mud.	Regional	Riverside habitats characteristic of Natural Area 5 are present.		Medium	Neutral	Neutral
River Don Salt Marsh	SNCI on tributary of the River Tyne. Includes a succession of grassland, saltmarsh and intertidal habitats.	Regional	Riverside habitats characteristic of Natural Area 5 are present.		Medium - high	Minor negative	Minor adverse

Reference Source(s): English Nature: Natural Area Profiles and Local Authority Plans.

Summary Assessment Score: Slight adverse

Qualitative Comments: The development is very unlikely to have any direct impacts on Northumberland Dock SNCI or Jarrow Slake SNCI given their distance from any construction areas. There could be a direct impact around the southern limit of the River don Salt Marsh SNCI if appropriate spillage and run-off containment procedures are not put in place. Depending on the species present (e.g. water voles), there may be adverse indirect impacts generated from construction disturbance. Detailed surveys would be necessary to describe the species and their distribution around the construction areas. This may result in the biodiversity and earth heritage value being upgraded to 'high' although the summary assessment score would be likely to remain as minor adverse.

St Bede's (Variant D)

Area	Description of feature/attribute	Scale (at which attribute matters)	Importance (of attribute)	Trend (in relation to target)	Biodiversity and earth heritage value	Magnitude of impact	Assessment Score
Northumberland Dock	SNCI on north bank of River Tyne. Includes areas of intertidal mud, saltmarsh, mesotrophic grassland and scrub.	Regional	Riverside habitats characteristic of Natural Area 5 are present.		Medium	Neutral	Neutral
Jarrow Slake Mud Flats	SNCI on south bank of River Tyne. Includes areas of intertidal mud.	Regional	Riverside habitats characteristic of Natural Area 5 are present.		Medium	Neutral	Neutral
River Don Salt Marsh	SNCI on tributary of the River Tyne. Includes a succession of grassland, saltmarsh and intertidal habitats.	Regional	Riverside habitats characteristic of Natural Area 5 are present.		Medium – high	Minor negative	Minor adverse
River Tyne Entrance	SNCI at mouth of the River Tyne. Contains grassland and scrub vegetation.	Regional	Not known but habitats characteristic of Natural Area 5 may be present.		Medium	Neutral	Neutral
Northumberland Shore	SSSI including most of the coastline between the Scottish border and the Tyne Estuary. Consists of sandy bays, rocky headlands, dune systems, mudflats and saltmarsh.	National	Provides intertidal habitats important for wintering birds. Considered to be of international/national significance for six species: purple sandpiper, turnstone, sanderling, golden plover, ringed plover and redshank.		High - very high	Neutral	Neutral
Durham Coast	SSSI between South Shields and Hart Warren. Includes areas of coastline with exposed heathlands of maritime grassland, boulder clay slopes and open beaches.	National	Contains most of the paramaritime Magnesium Limestone vegetation in Britain, which is characteristic of Natural Area 6. Also supports internationally important breeding populations of little terns and nationally important numbers of wintering purple sandpiper.		High - very high	Neutral	Neutral
Tynemouth to Seaton Sluice	SSSI	National	One of the best exposures of coal measures strata in Great Britain, characteristic of Natural Area 5. Supports winter populations of internationally important bird species.		High – very high	Neutral	Neutral

Area	Description of feature/attribute	Scale (at which attribute matters)	Importance (of attribute)	Trend (in relation to target)	Biodiversity and earth heritage value	Magnitude of impact	Assessment Score
Northumbria Coast	SPA and Ramsar site incorporating parts of coastline from the Scottish border to Durham.	International	Supports important populations of regularly occurring little terns (listed in Annex 1 under the Birds Directive) and internationally important migratory populations of purple sandpiper and turnstone.		Very High	Neutral	Neutral
River Tyne Salmon Fish Populations	Salmon population specific to the River Tyne	National	The largest salmon population supported by a single river in England.	Declining in UK	High – very high	Minor negative	Minor adverse
Durham Coast	SAC	International	The only example of vegetated sea cliffs on magnesium limestone exposures in the UK, characteristic of Natural Area 6. Contains rare species-rich communities of high scientific interest.		Very High	Neutral	Neutral

Reference Source(s): English Nature: Natural Area Profiles and SSSI schedules, Local Authority Plans and JNCC SAC listings.

Summary Assessment Score: Slight adverse

Qualitative Comments: The development is very unlikely to have any direct impacts on Northumberland Dock SNCI or Jarrow Slake SNCI given their distance from any construction areas. There could be a direct impact around the southern limit of the River don Salt Marsh SNCI if appropriate spillage and run-off containment procedures are not put in place. Depending on the species present (e.g. water voles), there may be adverse indirect impacts generated from construction disturbance. Detailed surveys would be necessary to describe the species and their distribution around the construction areas. This may result in the biodiversity and earth heritage value being upgraded to 'high' although the summary assessment score would be likely to remain as minor adverse.

Although there are a number of nationally and internationally important sites around the coastline, none of these sites are likely to be significantly impacted by the development proposals. However, there could be a potentially adverse impact on the migratory salmon population in the River Tyne from dredging activities. Restricting the dredging operations to the winter months, when the majority of salmon would be absent from the estuary system, could mitigate this impact.

8. WATER ENVIRONMENT

(Source: GOMMMS Worksheet 4.12)

St Lawrence

Description of study area / Summary of potential impacts	Feature	Attributes/Services	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
Potential Impacts: During construction: • Cut into potentially contaminated ground • Contamination of ground water • Conflict with services and outfalls • Conflict with culverted watercourses • Possible in-channel works for bridge	**River Tyne**	Conveyance of flow, Transport and dilution of waste products, Biodiversity, Recreation, Value to economy	NWC Grade B	Regional	High	Low	High	Minor	Low Significance
	Ouse Burn	Conveyance of flow, Transport and dilution of waste products, Biodiversity	GQA Grade C	Local	Medium	Medium	Medium	Negligible	Insignificant
	Various Un-named Watercourses	• Conveyance of flow, Transport and dilution of waste products, biodiversity	Unknown	Local	Low	Medium	Low	Minor	Insignificant

Description of study area / Summary of potential impacts	Feature	Attributes/Services	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
During operation: • Increase in surface water run-off • Contamination of River Tyne through spillage from bridge traffic Contamination of ground water	**Ground Water**	Transport and dilution of waste products, Conveyance of flow and material, Biodiversity	Minor Aquifer	Regional	Medium	Low	Medium	Minor	Low Significance

Reference Source(s): Ordnance Survey maps (various scales); Environment Agency website

Summary assessment score: Slight adverse

Qualitative comments: Provided appropriate mitigation measures are adopted as part of the scheme.

St Anthony's

Description of study area / Summary of potential impacts	Feature	Attributes/Services	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance

Description of study area / Summary of potential impacts	Feature	Attributes/Services	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
Potential Impacts: During construction: • Cut into potentially contaminated ground • Contamination of ground water • Conflict with services and outfalls • Conflict with culverted watercourse • Possible in-channel works for bridge • During operation: • Contamination of ground water • Increase in surface water run-off • Contamination of River Tyne through spillage from bridge traffic	**River Tyne**	• Conveyance of flow, transport and dilution of waste products, biodiversity, recreation, value to economy	NWC Grade B	Regional	High	Low	High	Minor	Low Significance
	Ouse Burn	Conveyance of flow, transport and dilution of waste products, biodiversity	GQA Grade C	Local	Medium	Medium	Medium	Negligible	Insignificant
	Various Un-named Watercourses	Conveyance of flow, transport and dilution of waste products, biodiversity	Unknown	Local	Low	Medium	Low	Minor	Insignificant
	Ground Water	Transport and dilution of waste products, conveyance of flow and material, biodiversity	Minor Aquifer	Regional	Medium	Low	Medium	Minor	Low Significance

Reference Source(s): Ordnance Survey maps (various scales); Environment Agency website

Summary assessment score: Slight adverse

Qualitative comments: Provided appropriate mitigation measures are adopted as part of the scheme.

Walker

Description of study area / Summary of potential impacts	Feature	Attributes/Services	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
Potential Impacts: During construction: • Cut into potentially contaminated ground • Contamination of ground water • Conflict with services and outfalls • Conflict with culverted watercourses • Possible in-channel works for bridge • Cumulative impact – lead to an overall decrease in water quality of a number of water features in the area During operation: • Increase in surface water run-off • Contamination of ground water • Contamination through spillage of River Tyne from bridge traffic	**River Tyne**	• Conveyance of flow, transport and dilution of waste products, biodiversity, recreation, value to economy	NWC Grade B	Regional	High	Low	High	Minor	Low Significance
	Ouse Burn	Conveyance of flow, transport and dilution of waste products, biodiversity	GQA Grade C	Local	Medium	Medium	Medium	Negligible	Insignificant
	Calfclose Burn	Conveyance of flow, transport and dilution of waste products, Biodiversity – an SNCI is located downstream	Unknown	Local	Low	Medium	Medium	Minor	Insignificant
	Monkton Burn	Conveyance of flow, transport and dilution of waste products, biodiversity – burn flows into West Fellgate Farm ponds downstream	Unknown	Local	Low	Medium	Medium	Minor	Insignificant
	Cutthroat Dean	Conveyance of flow, transport and dilution of waste products, biodiversity – flows through designated SNCI, cultural heritage – marks Borough Constitutional Boundary	Unknown	Local	Low	Medium	Medium	Moderate	Low Significance
	Pelaw Quarry Ponds	Biodiversity – in regenerated parkland, Aesthetics,	Unknown	Local	Medium	Low	Medium	Minor	Insignificant
	Various Un-named Watercourses	Conveyance of flow, transport and dilution of waste products, biodiversity	Unknown	Local	Low	Medium	Low	Minor	Insignificant
	Ground Water	Transport and dilution of waste products, conveyance of flow and material, biodiversity	Minor Aquifer	Regional	Medium	Low	Medium	Minor	Low Significance

Reference Source(s): Ordnance Survey maps (various scales); Environment Agency website

Summary assessment score: Slight adverse

Qualitative comments: Provided appropriate mitigation measures are adopted as part of the scheme.

St Bede's (Variants A & B)

Description of study area /Summary of potential impacts	Feature	Attributes/Services	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
Potential Impacts: During construction: • Contamination of ground water • Conflict with services and outfalls • Conflict with culverted watercourses • Cut into potentially contaminated ground • Possible in-channel works for bridge During operation: • Contamination through spillage of River Tyne from bridge traffic • Insignificant increase in surface water run-off • Loss of floodplain storage (River Don)	**River Tyne**	Conveyance of flow, transport and dilution of waste products, biodiversity – Jarrow Slake; Northumberland Docks, value to economy	NWC Grade B	Regional	High	Low	High	Minor	Low Significance
	River Don	Conveyance of flow, transport and dilution of waste products, biodiversity – SNCI River Don Salt Marsh, recreation	GQA Grade C	Local	Medium	Medium	Medium	Minor	Insignificant
	Floodplain (River Don)	Conveyance of flood flow	1 in 200 year	Local	Medium	Medium	Medium	Negligible	Insignificant
	Bede's World Ponds	Biodiversity, recreation	Unknown	Local	Medium	Medium	Medium	Negligible	Insignificant
	Pipe Networks	Supply of mains water, removal of foul and surface water	Urbanised area, serves large area and WTW	Local	Medium	Medium	Medium	Minor	Insignificant
	Howdon Dean (culverted)	Conveyance of flow	Unknown	Local	Low	Medium	Low	Minor	Insignificant
	Ground Water	Transport and dilution of waste products, conveyance of flow and material, biodiversity	Minor Aquifer	Regional	Medium	Low	Medium	Minor	Low Significance

Reference Source(s): Ordnance Survey maps (various scales); Environment Agency website

Summary assessment score: Slight adverse

Qualitative comments: Provided appropriate mitigation measures are adopted as part of the scheme.

St Bede's (Variant C)

Description of study area / Summary of potential impacts	Feature	Attributes/Services	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
Potential Impacts: During construction: • Conflict with services and outfalls • Conflict with culverted watercourses • Cut into potentially contaminated ground • Contamination of ground water • Generation of sediment During operation: • Loss of floodplain storage (River Don) • Insignificant increase in surface water run-off	**River Tyne**	Conveyance of flow, transport and dilution of waste products, biodiversity (Jarrow Slake, Northumberland Docks), value to economy	NWC Grade B	Regional	High	Low	High	Negligible	Insignificant
	River Don	Conveyance of flow, transport and dilution of waste products, biodiversity – SNCI River Don Salt Marsh, recreation	GQA Grade C	Local	Medium	Medium	Medium	Minor	Insignificant
	Floodplain (River Don)	Conveyance of flood flow	1 in 200 year	Local	Medium	Medium	Medium	Minor	Insignificant
	Bede's World Ponds	Biodiversity, recreation	Unknown	Local	Medium	Medium	Medium	Negligible	Insignificant
	Pipe Networks	Supply of mains water, removal of foul and surface water	Urbanised area, serves large area and WTW	Local (although some large pipes)	Medium	Medium	Medium	Minor	Insignificant
	Howdon Dean (culverted)	Conveyance of flow	Unknown	Local	Low	Medium	Low	Minor	Insignificant
	Ground Water	Transport and dilution of waste products, conveyance of flow and material, biodiversity	Minor Aquifer	Regional	Medium	Low	Medium	Moderate	Low Significance

Reference Source(s): Ordnance Survey maps (various scales); Environment Agency website

Summary assessment score: Slight adverse

Qualitative comments: Provided appropriate mitigation measures are adopted as part of the scheme.

St Bede's (Variant D)

Description of study area / Summary of potential impacts	Feature	Attributes/Services	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
Potential Impacts: During construction: • Cut into potentially contaminated ground • Contamination of ground water • Contamination of River Tyne through disturbance of potentially contaminated river bed silt • Conflict with culverted watercourses • Conflict with services and outfalls During operation: • Insignificant increase in surface water run-off • Loss of floodplain storage (River Don)	**River Tyne**	Conveyance of flow, transport and dilution of waste products, biodiversity – Jarrow Slake; Northumberland Docks, value to economy	NWC Grade B	Regional	High	Low	High	Moderate (due to dredging works required in river bed)	Significant
	River Don	Conveyance of flow, transport and dilution of waste products, biodiversity – SNCI River Don Salt Marsh, recreation	GQA Grade C	Local	Medium	Medium	Medium	Minor	Insignificant
	Floodplain (River Don)	Conveyance of flood flow	1 in 200 year	Local	Medium	Medium	Medium	Minor	Insignificant
	Bede's World Ponds	Biodiversity, recreation	Unknown	Local	Medium	Medium	Medium	Negligible	Insignificant
	Pipe Networks	Supply of mains water, removal of foul and surface water	Urbanised area, serves large area and WTW	Local (although some very large pipes)	Medium	Medium	Medium	Minor	Insignificant
	Howdon Dean (culverted)	Conveyance of flow	Unknown	Local	Low	Medium	Low	Minor	Insignificant
	Ground Water	Transport and dilution of waste products, conveyance of flow and material, biodiversity	Minor Aquifer	Regional	Medium	Low	Medium	Moderate	Low Significance

Reference Source(s): Ordnance Survey maps (various scales); Environment Agency website

Summary assessment score: Moderate adverse

Qualitative comments: Moderate adverse as dredging may affect the River Tyne. Provided appropriate mitigation measures are adopted as part of the scheme.

9. JOURNEY AMBIENCE

(Source: GOMMMS Worksheet 4.15)

St Lawrence, St Anthony's, Walker and St Bede's (A and B)

Factor	Sub-factor	Better	Neutral	Worse
Traveller Care	Cleanliness		✔	
	Facilities		✔	
	Information		✔	
	Environment		✔	
Travellers' Views	-	✔		
Traveller Stress	Frustration	✔		
	Fear of potential accidents	✔		
	Route uncertainty	✔		

Reference Source(s): Horizontal route alignment in the Cross Tyne Study reports

Summary Assessment Score: Large beneficial

Qualitative Comments: All of these options would provide enhanced traveller views due to their elevation on bridges over the river.

The new crossings would reduce traveller's frustration by decreasing traffic congestion and subsequent journey times. It is also likely that traveller's fear of accidents would be reduced due to the improved highway specification of the new routes.

The overall summary assessment score has been derived using the GOMMMS guidance that over 10,000 travellers would be affected.

St Bede's (C and D)

Factor	Sub-factor	Better	Neutral	Worse
Traveller Care	Cleanliness		✔	
	Facilities		✔	
	Information		✔	
	Environment		✔	
Travellers' Views	-		✔	
Traveller Stress	Frustration	✔		
	Fear of potential accidents	✔		
	Route uncertainty	✔		

Reference Source(s): Horizontal route alignment in the Cross Tyne Study reports

Summary Assessment Score: Large beneficial

Qualitative Comments:

There would be no improvement to traveller's views with either of these options because the route would remain in a tunnel.

The new crossings would reduce traveller's frustration by decreasing traffic congestion and subsequent journey times. It is also likely that traveller's fear of accidents would be reduced due to the improved highway specification of the new routes.

The overall summary assessment score has been derived using the GOMMMS guidance that over 10,000 travellers would be affected.

10. ACCIDENTS

Year 2006 Distance Travelled ('000 km) by Link Class

Link Type	Do Minimum	St Lawrence	St Anthonys	Walker	Bede
1	1277	1278	1278	1278	1276
2	5618	5601	5590	5551	5625
3	2095	2073	2057	2049	2163
4	774	805	867	869	775
5	1205	1203	1203	1228	1203
6	1566	1530	1533	1533	1483
7	2075	2095	2039	2054	2070
8	346	340	333	337	343
9	84	89	84	82	83
10	701	701	700	699	702
11	1103	1116	1126	1124	1100
12	64	64	62	63	64
13	3	2	2	2	3
Total	**16911**	**16898**	**16874**	**16870**	**16891**

Year 2021 Distance Travelled ('000 km) by Link Class

•

Link Type	Do Minimum	St Lawrence	St Anthonys	Walker	Bede
1	1481	1483	1484	1484	1482
2	6356	6356	6352	6316	6388
3	2406	2388	2373	2367	2505
4	885	913	978	981	883
5	1397	1396	1396	1422	1394
6	1794	1759	1764	1760	1694
7	2493	2513	2453	2464	2462
8	403	395	389	391	397
9	99	103	97	94	95
10	866	864	865	864	858
11	1279	1288	1297	1297	1270
12	74	74	74	73	73
13	3	3	3	3	3
Total	**19536**	**19535**	**19523**	**19517**	**19505**

Year 2006 Annual Accidents by Link Class

Link Type	Reference Case	St Lawrence	St Anthony's	Walker	St Bede
Zone Centroid Connector	231	231	231	231	231
High grade dual and m'way with grade separated junctions	153	153	153	152	154
Medium grade dual with at-grade intersections	70	69	69	68	72
Low grade 40mph dual	121	126	136	136	121
Principle - Rural single	69	69	69	70	69
Principle - High quality suburban single	282	275	276	276	267
Principle - Poor quality suburban single	373	377	367	369	372
Principle - Urban single	62	61	60	61	62
Principle - Central area single	15	16	15	15	15
Secondary - Rural single	78	77	77	77	78
Secondary - Suburban single	200	202	204	204	199
Secondary - Urban single	12	12	11	11	12
Secondary - Central area single	0	0	0	0	0
TOTAL	**1666**	**1669**	**1667**	**1671**	**1651**

Year 2021 Annual Accidents by Link Class

Link Type	Reference Case	St Lawrence	St Anthony's	Walker	St Bede
Zone Centroid Connector	268	269	269	269	268
High grade dual and m'way with grade separated junctions	174	174	174	173	175
Medium grade dual with at-grade intersections	80	80	79	79	84
Low grade 40mph dual	138	143	153	154	138
Principle - Rural single	80	80	80	81	79
Principle - High quality suburban single	323	316	317	317	305
Principle - Poor quality suburban single	448	452	441	443	443
Principle - Urban single	72	71	70	70	71
Principle - Central area single	18	19	17	17	17
Secondary - Rural single	96	96	96	96	95
Secondary - Suburban single	232	233	235	235	230
Secondary - Urban single	13	13	13	13	13
Secondary - Central area single	1	1	1	1	1
TOTAL	**1943**	**1945**	**1944**	**1946**	**1919**

Reference sources:

Summary assessment score:

Qualitative comment: Removal of traffic from built up areas reduces pedestrian/vehicle conflict and separates through traffic from local traffic, avoiding conflicts at a number of side roads and accesses.

11. SECURITY

(Source: GOMMMS Worksheet 5.1)

Scheme/Option: St Lawrence, St Anthony's, Walker and St Bede's (A and B)

Security Indicator	Relative importance (High/Medium/Low)	Without strategy (Poor/Moderate/High)	With strategy (Poor/Moderate/High)
Site perimeters, entrances and exits	Not applicable	Not applicable	Not applicable
Formal surveillance	High	High	Poor
Informal surveillance	High	High	Moderate
Landscaping	Medium	Moderate	High
Lighting and visibility	High	Moderate	High
Emergency call	Medium	Moderate	Poor
Pedestrian and cycles facilities	Low	Moderate	Moderate

Approximate numbers of users affected 10000 +

Reference Source(s): GOMMMS

Summary Assessment Score: Large adverse

Qualitative Comments:

St Bede's (C and D)

Security Indicator	Relative importance (High/Medium/Low)	Without strategy (Poor/Moderate/High)	With strategy (Poor/Moderate/High)
Site perimeters, entrances and exits	Not applicable	Not applicable	Not applicable
Formal surveillance	High	High	High
Informal surveillance	High	High	High
Landscaping	Medium	Moderate	High
Lighting and visibility	High	Moderate	High
Emergency call	Medium	Moderate	High
Pedestrian and cycles facilities	Low	Moderate	Moderate

Approximate numbers of users affected 10000 +

Reference Source(s): GOMMMS

Summary Assessment Score: Large beneficial

Qualitative Comments:

12. ECONOMIC EFFICIENCY OF THE TRANSPORT SYSTEM

St Lawrence

Economy: Economic Efficiency of the Transport System(TEE) (1998 prices discounted to 1999 values)				
• Impact		• TOTAL	Private	Goods
User benefits				
Travel Time	•	129104	118124	10980
Vehicle operating costs		18390	12982	5408
User charges		8936	7870	1066
Construction/maintenance delay				
NET IMPACT	[1]	156430	138976	17454
Private Sector Provider Impacts				
Revenue				
Operating costs	[a]			
Investment costs	[b]			
Grant/subsidy				
NET IMPACT	[2]			
Public Sector Provider Impacts				
Revenue		-9778	-8712	-1066
Operating costs	[c]	-6995	-6995	
Investment costs	[d]	-50209	-50209	
NET IMPACT	[3]	-66982	-65916	-1066
Other Government Impacts				
Grant/subsidy payments	[e]			
Indirect tax revenues		-5892	-3464	-2428
NET IMPACT	[4]	-5892	-3464	-2428
TOTAL				
Net Present Value, NPV	[5]=[1]+[2]+[3]+[4]	83556		
Present Value of Costs, PVC	[6]=[a]+[b]+[c]+[d]	-57204		
Present Value of Cost to Government	[7]=[3]+[e]	-66982		
Benefit/Cost Ratio, BCR	[8]=(([5]-[6])/-[6])	2.461		
Value/Cost to Gov't Ratio, VCGR	[9]=[5]/-[7]	1.247		

St Anthony's

Economy: Economic Efficiency of the Transport System(TEE) (1998 prices discounted to 1999 values)				
• Impact		TOTAL	• Private	Goods
User benefits				
Travel Time	•	233742	215122	18620
Vehicle operating costs		25844	18368	7475
User charges		23324	20400	2924
Construction/maintenance delay				
NET IMPACT	[1]	282910	253890	29019
Private Sector Provider Impacts				
Revenue				
Operating costs	[a]			
Investment costs	[b]			
Grant/subsidy				
NET IMPACT	[2]			
Public Sector Provider Impacts				
Revenue		-25903	-22979	-2924
Operating costs	[c]	-6995	-6995	
Investment costs	[d]	-84590	-84590	
NET IMPACT	[3]	-117488	-114564	-2924
Other Government Impacts				
Grant/subsidy payments	[e]			
Indirect tax revenues		-9046	-5514	-3532
NET IMPACT	[4]	-9046	-5514	-3532
TOTAL				
Net Present Value, NPV	[5]=[1]+[2]+[3]+[4]	156376		
Present Value of Costs, PVC	[6]=[a]+[b]+[c]+[d]	-91585		
Present Value of Cost to Government	[7]=[3]+[e]	-117488		
Benefit/Cost Ratio, BCR	[8]=(([5]-[6])/-[6])	2.707		
Value/Cost to Gov't Ratio, VCGR	[9]=[5]/-[7]	1.331		

St Anthonys: Variant B

Economy: Economic Efficiency of the Transport System(TEE) (1998 prices discounted to 1999 values)				
Impact		TOTAL	Private	Goods
User benefits				
Travel Time		233,742	215,122	18,620
Vehicle operating costs		25,844	18,368	7,475
User charges		23,324	20,400	2,924
Construction/maintenance delay		0	0	0
NET IMPACT	[1]	282,910	253,890	29,019
Private Sector Provider Impacts				
Revenue				
Operating costs	[a]			
Investment costs	[b]			
Grant/subsidy				
NET IMPACT	[2]			
Public Sector Provider Impacts				
Revenue		-25,903	-22,979	-2,924
Operating costs	[c]	-6,995	-6,995	
Investment costs	[d]	-94,636	-94,636	
NET IMPACT	[3]	-127534	-124610	-2924
Other Government Impacts				
Grant/subsidy payments	[e]			
Indirect tax revenues		-9,046	-5,514	-3,532
NET IMPACT	[4]	-9,046	-5,514	-3,532
TOTAL				
Net Present Value, NPV	[5]=[1]+[2]+[3]+[4]	146330		
Present Value of Costs, PVC	[6]=[a]+[b]+[c]+[d]	-101631		
Present Value of Cost to Government	[7]=[3]+[e]	-127534		
Benefit/Cost Ratio, BCR	[8]=(([5]-[6])/-[6])	2.440		
Value/Cost to Gov't Ratio, VCGR	[9]=[5]/-[7]	1.147		

Walker: Variant A

Economy: Economic Efficiency of the Transport System(TEE) (1998 prices discounted to 1999 values)				
Impact	•	TOTAL	Private	Goods
User benefits	•			
Travel Time		213231	195726	17505
Vehicle operating costs		30634	22166	8468
User charges		24127	21022	3105
Construction/maintenance delay				
NET IMPACT	[1]	267992	238914	29078
Private Sector Provider Impacts				
Revenue				
Operating costs	[a]			
Investment costs	[b]			
Grant/subsidy				
NET IMPACT	[2]			
Public Sector Provider Impacts				
Revenue		-26699	-23594	-3105
Operating costs	[c]	-6995	-6995	
Investment costs	[d]	-97500	-97500	
NET IMPACT	[3]	-131194	-128089	-3105
Other Government Impacts				
Grant/subsidy payments	[e]			
Indirect tax revenues		-9850	-6034	-3815
NET IMPACT	[4]	-9850	-6034	-3815
TOTAL				
Net Present Value, NPV	[5]=[1]+[2]+[3]+[4]	126948		
Present Value of Costs, PVC	[6]=[a]+[b]+[c]+[d]	-104495		
Present Value of Cost to Government	[7]=[3]+[e]	-131194		
Benefit/Cost Ratio, BCR	[8]=(([5]-[6])/-[6])	2.215		
Value/Cost to Gov't Ratio, VCGR	[9]=[5]/-[7]	0.968		

Walker: Variant B

Economy: Economic Efficiency of the Transport System(TEE) (1998 prices discounted to 1999 values)				
Impact		• TOTAL	Private	Goods
• User benefits				
• Travel Time		213,231	195,726	17,505
Vehicle operating costs		30,634	22,166	8,468
User charges		24,127	21,022	3,105
Construction/maintenance delay		0	0	0
NET IMPACT	[1]	267,992	238,914	29,078
Private Sector Provider Impacts				
Revenue				
Operating costs	[a]			
Investment costs	[b]			
Grant/subsidy				
NET IMPACT	[2]			
Public Sector Provider Impacts				
Revenue		-26,699	-23,594	-3,105
Operating costs	[c]	-6,995	-6,995	
Investment costs	[d]	-106,087	-106,087	
NET IMPACT	[3]	-139781	-136676	-3105
Other Government Impacts				
Grant/subsidy payments	[e]			
Indirect tax revenues		-9,850	-6,034	-3,815
NET IMPACT	[4]	-9,850	-6,034	-3,815
TOTAL				
Net Present Value, NPV	[5]=[1]+[2]+[3]+[4]	118361		
Present Value of Costs, PVC	[6]=[a]+[b]+[c]+[d]	-113082		
Present Value of Cost to Government	[7]=[3]+[e]	-139781		
Benefit/Cost Ratio, BCR	[8]=(([5]-[6])/-[6])	2.047		
Value/Cost to Gov't Ratio, VCGR	[9]=[5]/-[7]	0.847		

St Bede's: Variant A

Economy: Economic Efficiency of the Transport System(TEE) (1998 prices discounted to 1999 values)				
Impact		• TOTAL	Private	Goods
User benefits	•			
Travel Time		250581	231390	19190
Vehicle operating costs		25896	19833	6063
User charges		-80922	-71469	-9454
Construction/maintenance delay				
NET IMPACT	[1]	195555	179754	15799
Private Sector Provider Impacts				
Revenue				
Operating costs	[a]			
Investment costs	[b]			
Grant/subsidy				
NET IMPACT	[2]			
Public Sector Provider Impacts				
Revenue		94285	84832	9454
Operating costs	[c]	-15493	-15493	
Investment costs	[d]	-71948	-71948	
NET IMPACT	[3]	6844	-2609	9454
Other Government Impacts				
Grant/subsidy payments	[e]			
Indirect tax revenues		-27763	-24712	-3051
NET IMPACT	[4]	-27763	-24712	-3051
TOTAL				
Net Present Value, NPV	[5]=[1]+[2]+[3]+[4]	174636		
Present Value of Costs, PVC	[6]=[a]+[b]+[c]+[d]	-87441		
Present Value of Cost to Government	[7]=[3]+[e]	6844		
Benefit/Cost Ratio, BCR	[8]=(([5]-[6])/-[6])	2.997		
Value/Cost to Gov't Ratio, VCGR	[9]=[5]/-[7]	-25.517		

St Bede's: Variant B

Economy: Economic Efficiency of the Transport System(TEE) (1998 prices discounted to 1999 values)				
Impact		TOTAL	Private	Goods
User benefits				
Travel Time		250,581	231,390	19,190
Vehicle operating costs		25,896	19,833	6,063
User charges		-80,922	-71,469	-9,454
Construction/maintenance delay		0	0	0
NET IMPACT	[1]	195,555	179,754	15,799
• Private Sector Provider Impacts				
Revenue				
Operating costs	[a]			
Investment costs	[b]			
Grant/subsidy				
NET IMPACT	[2]			
Public Sector Provider Impacts				
Revenue		94,285	84,832	9,454
Operating costs	[c]	-15,493	-15,493	
Investment costs	[d]	-97,276	-97,276	
NET IMPACT	[3]	-18484	-27937	9454
Other Government Impacts				
Grant/subsidy payments	[e]			
Indirect tax revenues		-27,763	-24,712	-3,051
NET IMPACT	[4]	-27,763	-24,712	-3,051
TOTAL				
Net Present Value, NPV	[5]=[1]+[2]+[3]+[4]	149308		
Present Value of Costs, PVC	[6]=[a]+[b]+[c]+[d]	-112769		
Present Value of Cost to Government	[7]=[3]+[e]	-18484		
Benefit/Cost Ratio, BCR	[8]=(([5]-[6])/-[6])	2.324		
Value/Cost to Gov't Ratio, VCGR	[9]=[5]/-[7]	8.077		

St Bede's: Variant C

Economy: Economic Efficiency of the Transport System(TEE) (1998 prices discounted to 1999 values)				
• Impact	•	TOTAL	Private	Goods
User benefits	•			
Travel Time		250,581	231,390	19,190
Vehicle operating costs		25,896	19,833	6,063
User charges		-80,922	-71,469	-9,454
Construction/maintenance delay		0	0	0
NET IMPACT	[1]	195,555	179,754	15,799
Private Sector Provider Impacts				
Revenue				
Operating costs	[a]			
Investment costs	[b]			
Grant/subsidy				
NET IMPACT	[2]			
Public Sector Provider Impacts				
Revenue		94,285	84,832	9,454
Operating costs	[c]	-15,493	-15,493	
Investment costs	[d]	-132,113	-132,113	
NET IMPACT	[3]	-53321	-62774	9454
Other Government Impacts				
Grant/subsidy payments	[e]			
Indirect tax revenues		-27,763	-24,712	-3,051
NET IMPACT	[4]	-27,763	-24,712	-3,051
TOTAL				
Net Present Value, NPV	[5]=[1]+[2]+[3]+[4]	114471		
Present Value of Costs, PVC	[6]=[a]+[b]+[c]+[d]	-147606		
Present Value of Cost to Government	[7]=[3]+[e]	-53321		
Benefit/Cost Ratio, BCR	[8]=(([5]-[6])/-[6])	1.776		
Value/Cost to Gov't Ratio, VCGR	[9]=[5]/-[7]	2.147		

St Bede's: Variant D

Economy: Economic Efficiency of the Transport System(TEE) (1998 prices discounted to 1999 values)				
• Impact	•	TOTAL	Private	Goods
User benefits	•			
Travel Time		250,581	231,390	19,190
Vehicle operating costs		25,896	19,833	6,063
User charges		-80,922	-71,469	-9,454
Construction/maintenance delay		0	0	0
NET IMPACT	[1]	195,555	179,754	15,799
Private Sector Provider Impacts				
Revenue				
Operating costs	[a]			
Investment costs	[b]			
Grant/subsidy				
NET IMPACT	[2]			
Public Sector Provider Impacts				
Revenue		94,285	84,832	9,454
Operating costs	[c]	-15,493	-15,493	
Investment costs	[d]	-126,161	-126,161	
NET IMPACT	[3]	-47369	-56822	9454
Other Government Impacts				
Grant/subsidy payments	[e]			
Indirect tax revenues		-27,763	-24,712	-3,051
NET IMPACT	[4]	-27,763	-24,712	-3,051
TOTAL				
Net Present Value, NPV	[5]=[1]+[2]+[3]+[4]	120423		
Present Value of Costs, PVC	[6]=[a]+[b]+[c]+[d]	-141654		
Present Value of Cost to Government	[7]=[3]+[e]	-47369		
Benefit/Cost Ratio, BCR	[8]=(([5]-[6])/-[6])	1.850		
Value/Cost to Gov't Ratio, VCGR	[9]=[5]/-[7]	2.542		

13. REGENERATION

(Source: GOMMMS Worksheet 6.2)

Table 1 - Potential regeneration benefits of the project

Designated Regeneration Areas	Is the project in a designated regeneration area?		
	Road which the proposal affects passes through regeneration area (A)	Road junction within that area (B)	Access road to/from site (C)
Assisted Area Tier 1, 2 or 3	Yes	Yes	No
Single Regeneration Budget	Yes	Yes	No
European Structural Funds	Yes	Yes	No

Overall Assessment:

Yes

Table 2 - Development dependency

Have development dependent sites been identified?	Yes
• If Yes then:	
Likely that that the Highways Agency, Local Highway Authority or public transport providers or operators would object to the project?	No
Planning permission for site is conditional on project?	No
Investors would not come forward?	No

Overall Assessment:

No

14. SEVERANCE

(Source: GOMMMS Worksheet 7.1)

•		% Increase In Vehicle km			
Ward	**Population**	**St Lawrence**	**St Anthony**	**Walker**	**Bede**
All Saints	7500	0%	0%	1%	1%
Battle Hill	12300	-1%	2%	1%	0%
Beacon and Bents	7800	-4%	-6%	-6%	-4%
BedeGH	8100	-10%	-25%	-16%	-1%
BedeST	7600	-6%	-10%	-11%	-6%
Bensham	7600	-4%	-5%	-3%	-1%
Benton	9000	2%	3%	5%	0%
Benwell	8100	0%	-1%	0%	-1%
Biddick Hall	7200	0%	0%	0%	-1%
Blakelaw	12400	0%	-1%	-1%	-1%
Blaydon	9100	-1%	-1%	-1%	-1%
Boldon Colliery	9100	-3%	-3%	-3%	2%
Byker	9200	49%	58%	17%	-1%
Camperdown	9300	0%	-1%	0%	1%
Castle	11800	0%	0%	0%	-1%
Chirton	9000	-2%	-4%	-4%	3%
Chowdene	8800	-5%	-10%	-7%	0%
Collingwood	9800	-1%	0%	0%	1%
Cullercoats	9700	0%	-1%	-1%	-1%
Deckham	8100	-5%	-13%	-10%	0%
Dene	15400	2%	1%	2%	-1%
Denton	10600	0%	0%	0%	0%
Dunston	10100	0%	0%	0%	0%
Elswick	9300	-3%	-4%	-2%	-1%
Fawdon	10500	-1%	-1%	-1%	-2%
Fellgate and Hedworth	8800	3%	3%	8%	-1%
Felling	8000	13%	-17%	-11%	-1%
Fenham	11300	0%	-2%	-2%	-1%
Grange	12900	1%	0%	0%	-1%
Heaton	11100	17%	9%	4%	-2%
Hebburn Quay	8000	1%	3%	11%	1%
Hebburn South	5900	0%	2%	22%	-1%
High Fell	8000	0%	0%	-3%	0%
Holystone	12900	-1%	-3%	-1%	1%
Horsley Hill	8000	-1%	0%	-2%	0%
Howdon	8200	-3%	-2%	-2%	3%
Jesmond	12500	-2%	-2%	-2%	0%
Kenton	10800	0%	0%	1%	0%
Leam	10200	-1%	5%	-1%	0%
Lemington	10400	-1%	-1%	-2%	-2%
Longbenton	6300	0%	0%	1%	0%

•		% Increase In Vehicle km			
Ward	**Population**	**St Lawrence**	**St Anthony**	**Walker**	**Bede**
Low Fell	9800	-3%	-7%	-5%	0%
Monkchester	9300	8%	25%	11%	0%
Monkseaton	10600	0%	1%	1%	0%
Monkton	8500	-1%	-4%	-6%	-3%
Moorside	11100	-1%	-1%	-1%	0%
North Shields	10200	0%	0%	0%	0%
Northumberland	12200	-1%	-1%	0%	0%
Pelaw and Heworth	8500	10%	28%	15%	-1%
Primrose	8600	-4%	-8%	-9%	6%
Rekendyke	7200	1%	2%	1%	0%
Riverside	8700	-6%	-11%	-12%	9%
Saltwell	8900	-2%	-7%	-5%	-2%
Sandyford	11600	-9%	-5%	-6%	0%
Scotswood	7500	-1%	-1%	-1%	-1%
Seatonville	9700	0%	1%	2%	0%
South Gosforth	10900	-2%	-2%	-2%	-1%
Teams	9700	-1%	-1%	-1%	-1%
Tyne Dock and Simonside	6100	0%	1%	1%	1%
Tynemouth	8900	-1%	-1%	-1%	-1%
Valley	9700	-1%	-1%	-1%	2%
Walker	8800	0%	338%	333%	0%
Walkergate	10600	6%	20%	33%	0%
Wallsend	9000	-2%	16%	16%	0%
Washington West	12200	4%	5%	4%	0%
Weetslade	10100	-1%	-1%	-1%	0%
West City	7900	-2%	-3%	-2%	-1%
West Park	7200	-2%	-4%	0%	-1%
Westoe	8100	0%	0%	0%	0%
Whickham North	10200	0%	0%	0%	0%
Whitley Bay	9000	0%	-1%	-1%	-1%
Wingrove	11100	-1%	-1%	-1%	-1%
Wrekendyke	10300	8%	14%	-2%	-1%
Total	**692900**	**0%**	**0%**	**0%**	**0%**
Maximum	15400	49%	338%	333%	87%
Minimum	5900	-10%	-25%	-16%	-6%
Count of +ive	73	27	26	23	20
Count of -ive		46	47	50	53
mean	9492	0%	5%	5%	1%
SD	1778	7%	41%	40%	10%

Reference source(s):

Assessment Score:

Qualitative comments:

FIGURES

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Link to East Quayside

2/3 lane opening swing bridge

Possible toll plaza

2 lane single carriageway road

Grade separation of Heworth roundabout

At grade junction with Eastern Riverside Route

St Ann's

St Lawrence

Byker

Walker

St Peter's

Saltmeadows

GATESHEAD

East Gateshead

Friars Goose

Old Fold

Felling Shore

Mount Pleasant

Pelaw

St Anthony's

River Tyne

Arup**Transport**

Tyne & Wear Passenger Transport Authority

New Tyne Crossing
GOMMMS assessment

LEGEND

St Lawrence Alignment

St Lawrence Crossing

ARUP

Date	Scale	
FEB 2003	1:12,000	**Figure 1**

C:\mapsnts_GOMMMS\Alternative crossings 211102.mxd

Variant A railway route

Variant B Allendale Road route

Link to East Quayside

2 lane single carriageway feeder road

4 lane single carriageway feeder road

4 lane single carriageway bridge (18m height)

Possible toll plaza

Grade separation of Heworth roundabout

Byker

Walker

Low Walker

St Lawrence

St Peter's

St Anthony's

Felling Shore

Old Fold

East Gateshead

Friars Goose

Mount Pleasant

Pelaw

Bill Quay

River Tyne

Arup**Transport**

Tyne & Wear Passenger Transport Authority

New Tyne Crossing GOMMMS assessment

LEGEND

St Anthony's Alignment

- Variant A
- Variant B

St Anthony's Crossing (Variants A and B)

ARUP

Date	Scale	
FEB 2003	1:12,000	**Figure 2**

C:\maps\ntc_GOMMMS\Alternative crossings 211102.mxd

Variant A railway route

Variant B Allendale Road route

2 lane single carriageway feeder road

4 lane single carriageway bridge (18m height)

Grade separated junction with Eastern Riverside Route

Link to East Quayside

4 lane single carriageway feeder road

4 lane single carriageway feeder road

Road passes underneath Victoria Road and Metro

Grade separation of Mill Lane/Leam Lane junction

2 lane single carriageway

N

Arup**Transport**

Tyne & Wear Passenger Transport Authority

New Tyne Crossing
GOMMMS assessment

LEGEND

Walker Alignment

Variant A

Variant B

Walker Crossing
(Variants A and B)

ARUP

Date	Scale	
FEB 2003	1:25,000	**Figure 3**

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Toll plaza

Variant A: 2 lane opening bridge
Variant B: 4 lane opening bridge

Variant C: Bored tunnel

Grade seperation of southern junction

N

Arup**Transport**

Tyne & Wear Passenger Transport Authority

New Tyne Crossing
GOMMMS assessment

LEGEND

- Bridge Alignment (Variants A and B)
- Bored Tunnel Alignment (Variant C)

St Bede's Crossing
(Variants A, B and C)

ARUP

Date	Scale	
FEB 2003	1:12,000	**Figure 4**

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Toll plaza

Immersed tube tunnel

Jarrow junction

Willington Quay

East Howdon

Howdon Pans

River Tyne

JARROW

N

Arup**Transport**

Tyne & Wear Passenger Transport Authority

New Tyne Crossing
GOMMMS assessment

LEGEND

Immersed Tube Tunnel Alignment (Variant D)

St Bede's Crossing
(Variant D)

ARUP

Date	Scale	
FEB 2003	1:12,000	**Figure 5**

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Arup**Transport**

Tyne & Wear Passenger Transport Authority

New Tyne Crossing
GOMMMS assessment

LEGEND

- St Lawrence Alignment
- Site of Local Conservation Importance
- Site of Nature Conservation Importance
- Great North Forest

St Lawrence Alignment - Biodiversity Resources

ARUP

Date	Scale	
FEB 2003	1:12,000	**Figure 6**

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Arup**Transport**

Tyne & Wear Passenger Transport Authority

New Tyne Crossing
GOMMMS assessment

LEGEND

St Anthony's Alignment
- Variant A
- Variant B

Site of Local Conservation Importance

Site of Nature Conservation Importance

Great North Forest

St Anthony's Alignment - Biodiversity Resources

ARUP

Date	Scale	
FEB 2003	1:12,000	**Figure 7**

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Arup**Transport**

Tyne & Wear Passenger Transport Authority

New Tyne Crossing
GOMMMS assessment

LEGEND

Walker Alignment
- Variant A
- Variant B

Site of Local Conservation Importance

Site of Nature Conservation Importance

Great North Forest

Willington Gut

Jarrow Slake Mud Flats

River Don Salt Marsh

River Don Salt Marsh

Straker Street (potential)

Cemetery Road (potential)

Hebburn Riverside

Bill Quay

Felling Shore

Walker Riverside

Pelaw Quarry

Great North Forest

Lakeside Inn, Felgate

Calf Close Burn

Boldon Lake

Mount Pleasant Marsh

Strother House Farm

Walker Alignment - Biodiversity Resources

ARUP

Date	Scale	
FEB 2003	1:25,000	**Figure 8**

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N

Arup**Transport**

Tyne & Wear Passenger Transport Authority

New Tyne Crossing
GOMMMS assessment

LEGEND

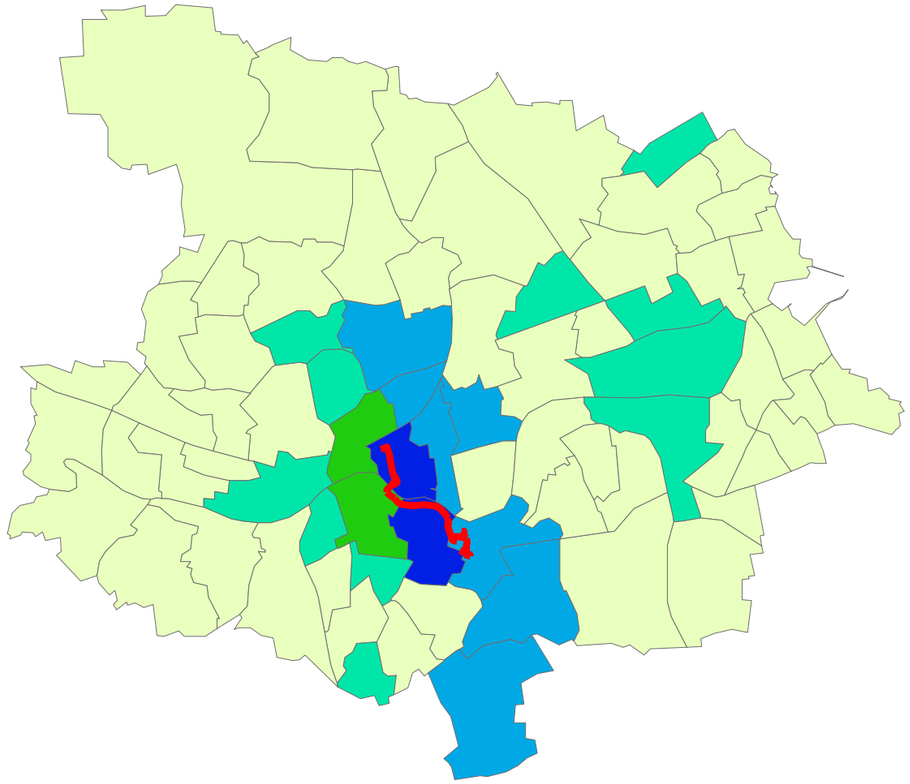
- St Bede's Bridge Alignment (Variants A and B)
- St Bede's Bored Tunnel Alignment (Variant C)
- St Bede's Immersed Tube Tunnel Alignment (Variant D)
- Site of Local Conservation Importance
- Site of Nature Conservation Importance
- Great North Forest

St Bede's Alignment - Biodiversity Resources

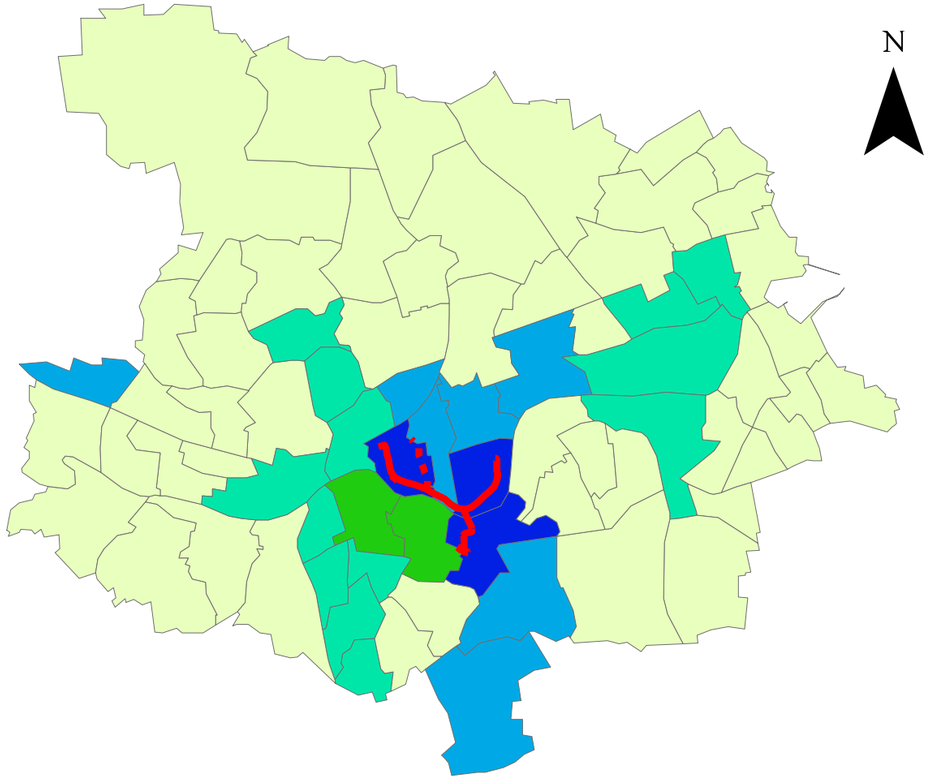
ARUP

Date	Scale	
FEB 2003	1:12,000	**Figure 9**

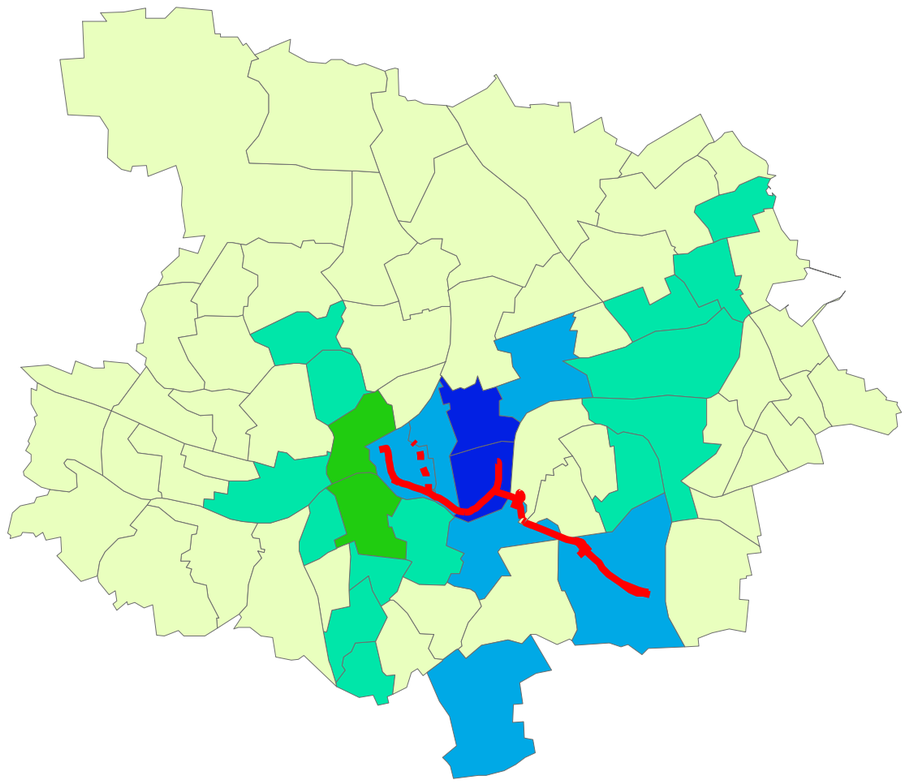
C:\maps\ntc_GOMMMS\AQ\AQ NO2 2006 results - 150103.mxd



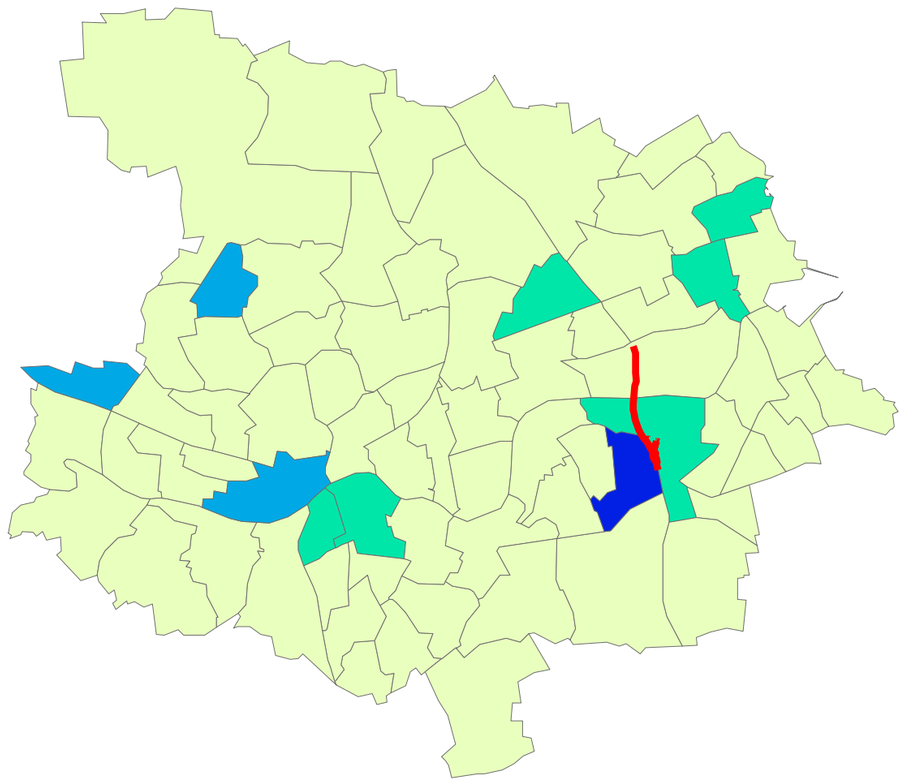
St Lawrence



St Anthony's



Walker



St Bede's

N

Arup**Transport**

Tyne & Wear Passenger Transport Authority

New Tyne Crossing GOMMMS assessment

LEGEND

Crossing alignments

Difference in emissions estimate*

- < -25000
- -24999 - -5000
- -4999 - 5000
- 5001 - 25000
- > 25001

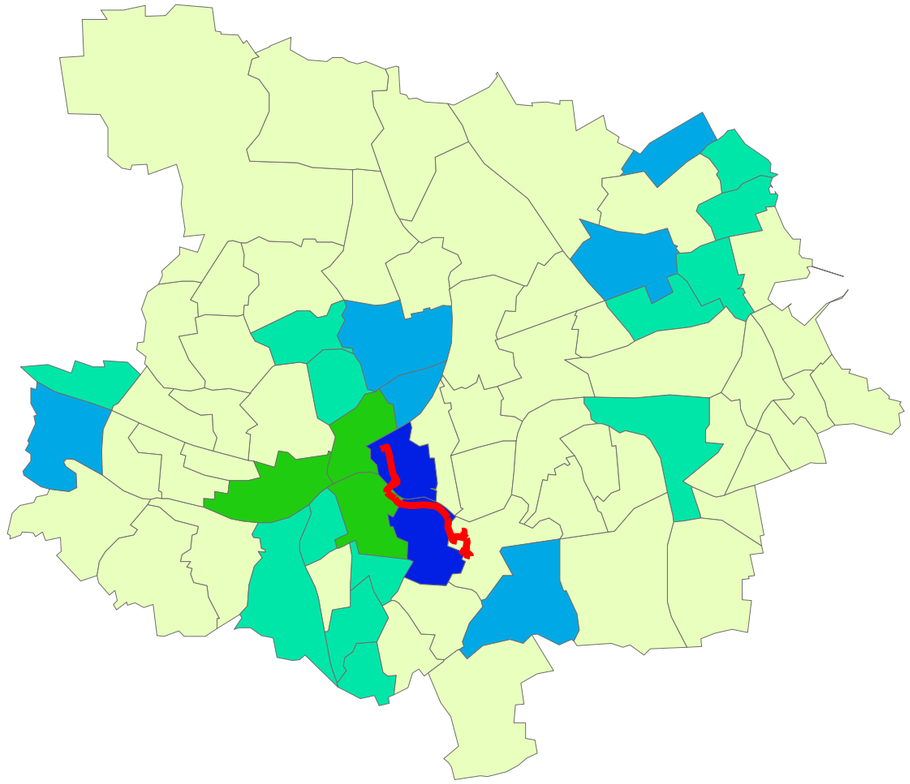
* The difference in emissions estimate is between the Do-Minumum and each Do-Something scenario. A negative value denotes an beneficial impact while a positive result denotes an adverse impact.

Difference in emissions estimates for nitrogen dioxide in 2006 compared to Do-Minimum

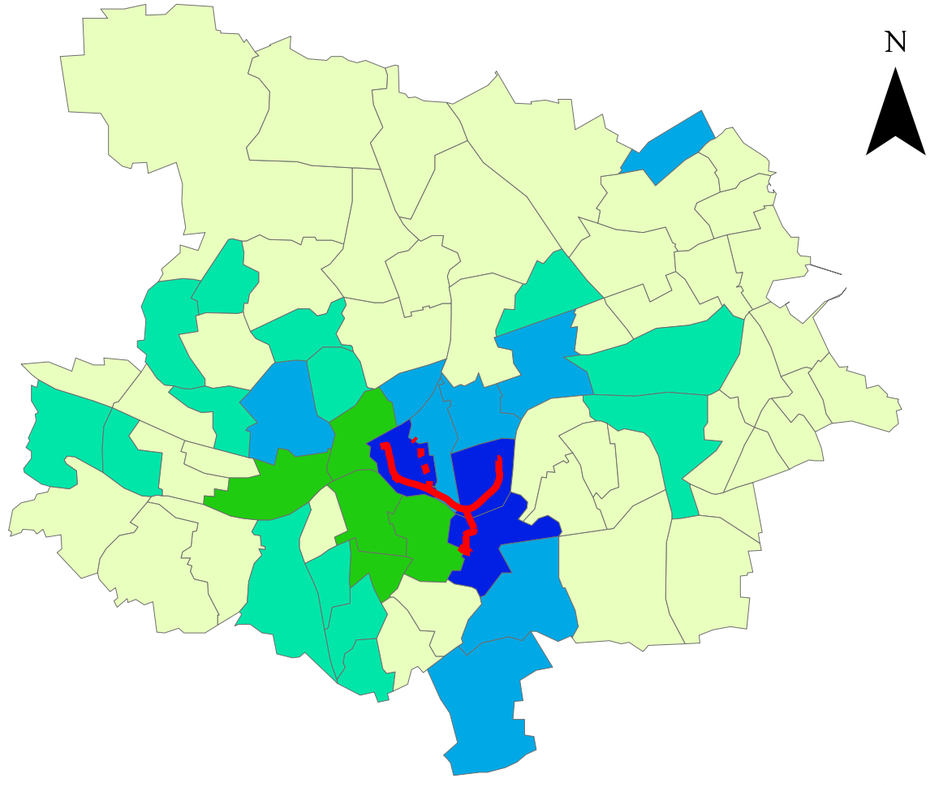
ARUP

Date	Scale	
FEB 2003	NTS	**Figure 10**

C:\maps\ntc_GOMMMS\AQ\AQ NO2 2006 results - 150103.mxd

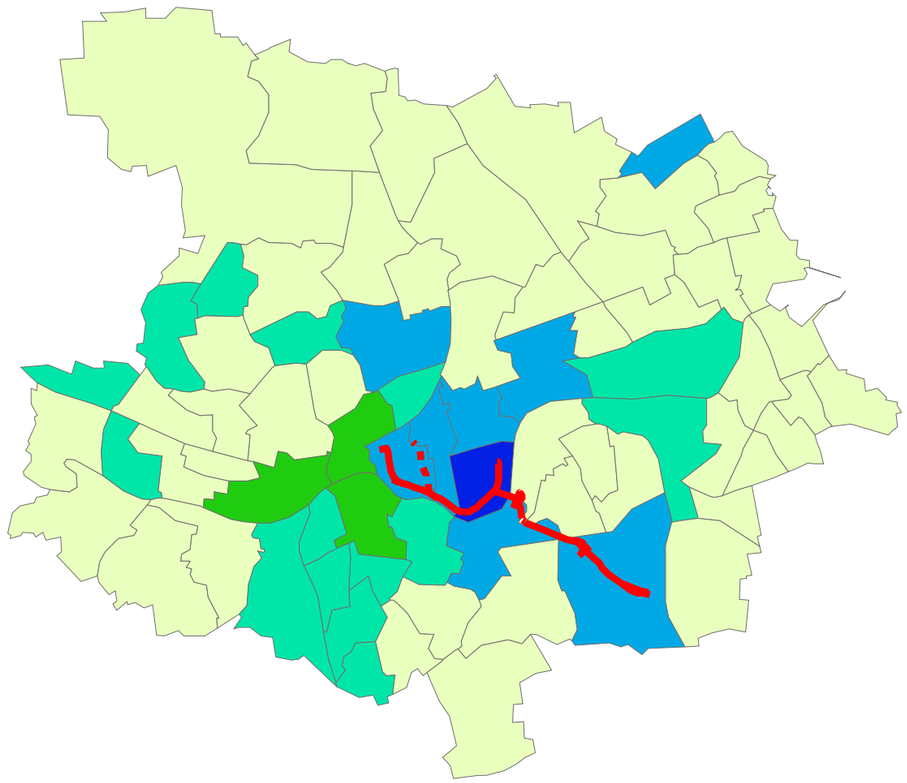


St Lawrence

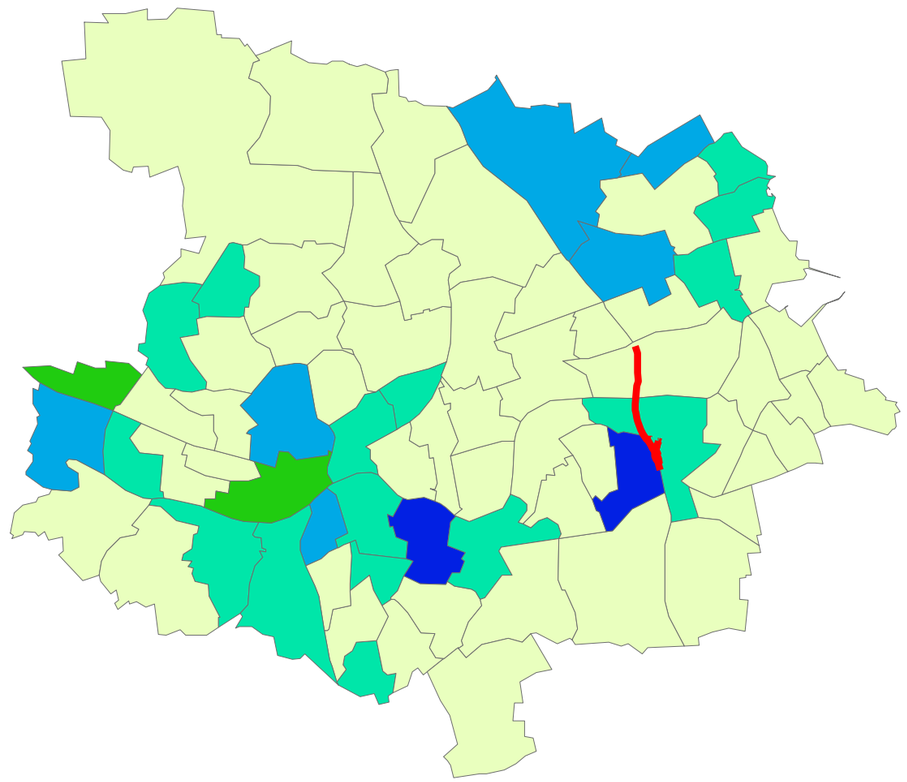


St Anthony's

N



Walker



St Bede's

Arup**Transport**

Tyne & Wear Passenger Transport Authority

New Tyne Crossing GOMMMS assessment

LEGEND

Crossing alignments

Difference in emssion estimate*

- < -25000
- -24999 - -5000
- -4999 - 5000
- 5001 - 25000
- > 25001

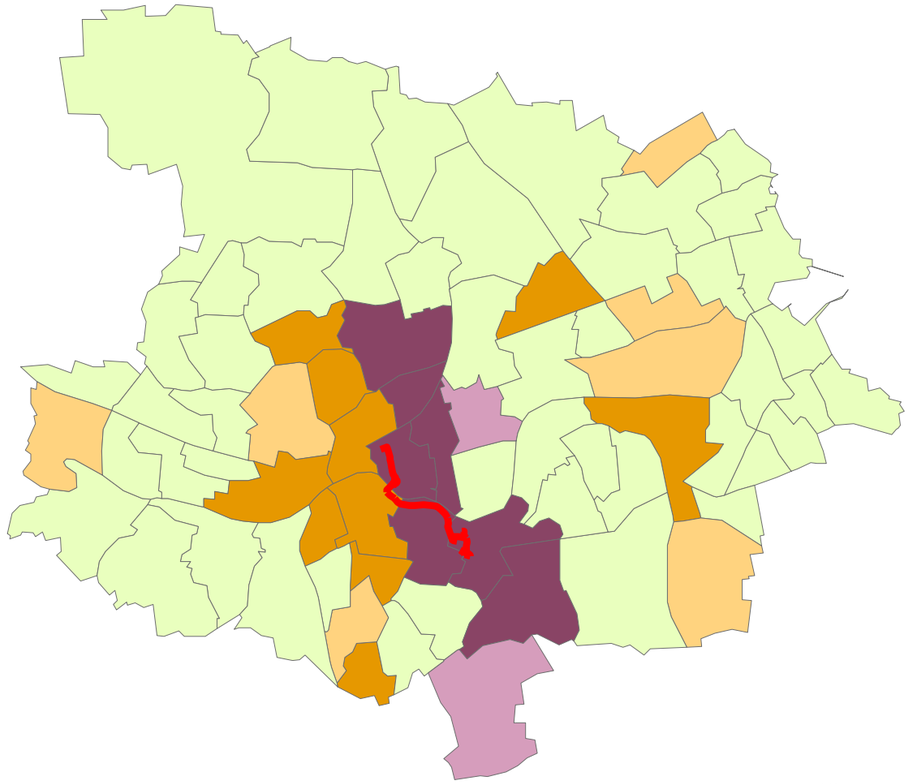
* The difference in emissions estimate is between the Do-Minumum and each Do-Something scenario. A negative value denotes an beneficial impact while a positive result denotes an adverse impact.

Difference in emissions estimates for nitrogen dioxide in 2021 compared to Do-Minimum

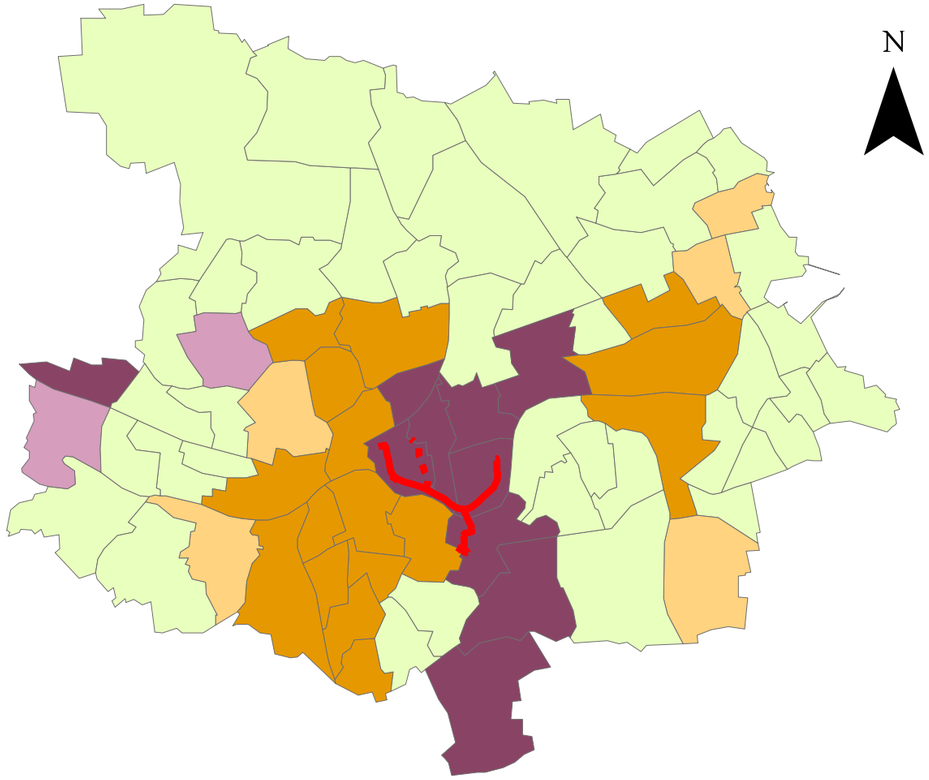
ARUP

Date	Scale	
FEB 2003	NTS	**Figure 11**

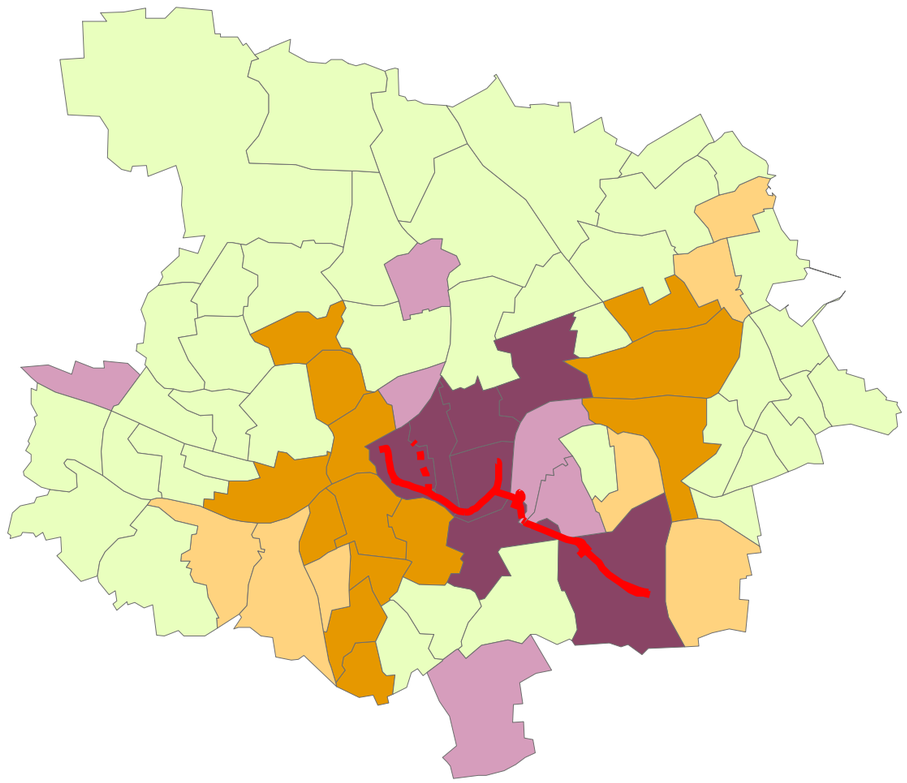
C:\maps\ntc_GOMMMS\AQ\AQ NO2 2006 results - 150103.mxd



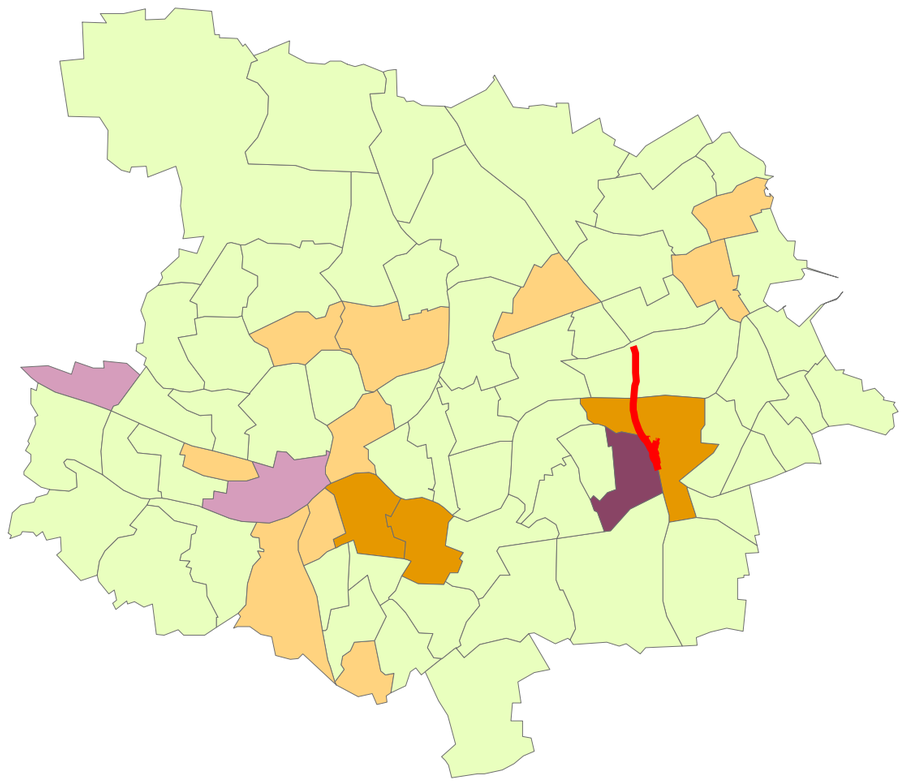
St Lawrence



St Anthony's



Walker



St Bede's

ArupTransport

Tyne & Wear Passenger Transport Authority

New Tyne Crossing GOMMMS assessment

LEGEND

Crossing alignments

Difference in emission estimate*

- < -200
- -199 - -100
- -99 - 100
- 101 - 200
- 201 <

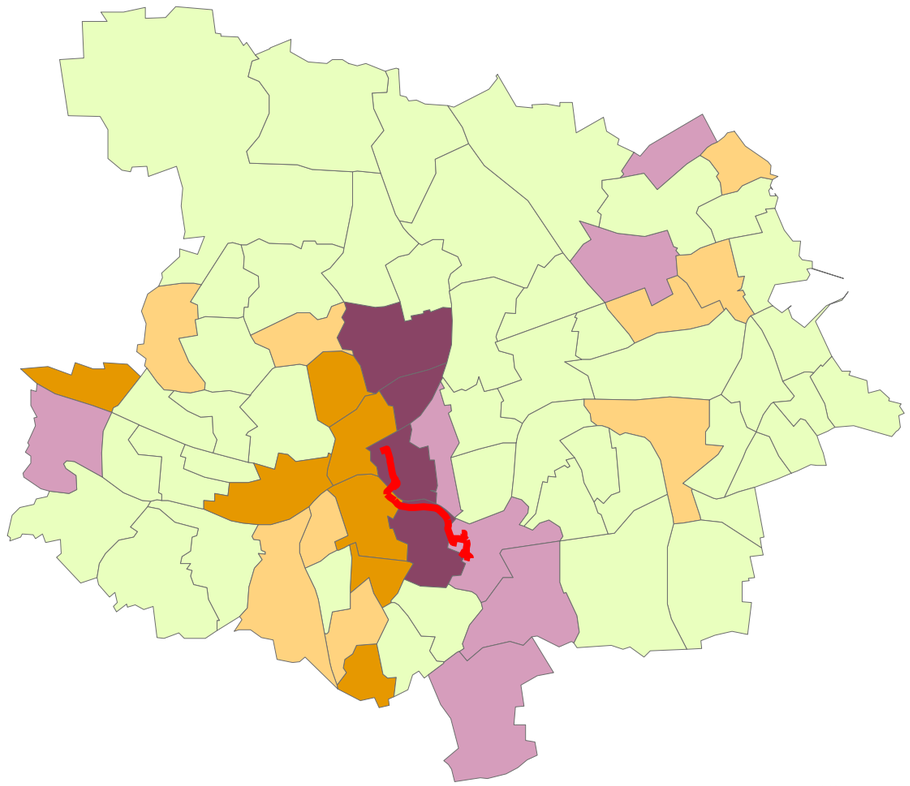
* The difference in emissions estimate is between the Do-Minumum and each Do-Something scenario. A negative value denotes an beneficial impact while a positive result denotes an adverse impact.

Difference in emissions estimates for PM10 in 2006 compared to Do-Minimum

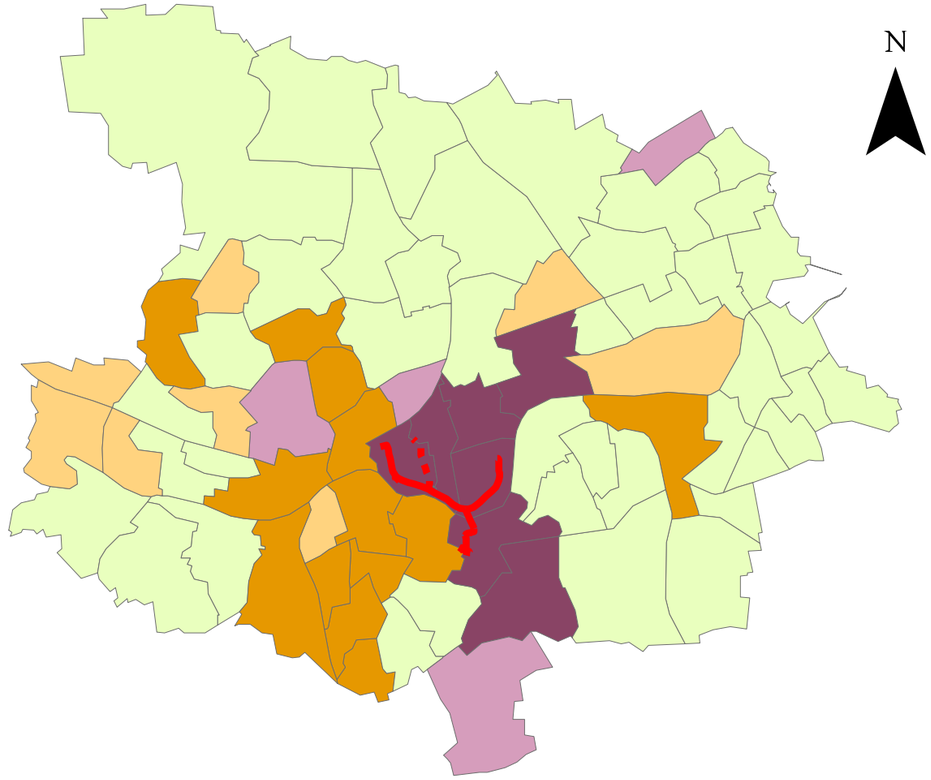
ARUP

Date	Scale	
FEB 2003	NTS	**Figure 12**

C:\maps\ntc_GOMMMS\AQ\AQ NO2 2006 results - 150103.mxd

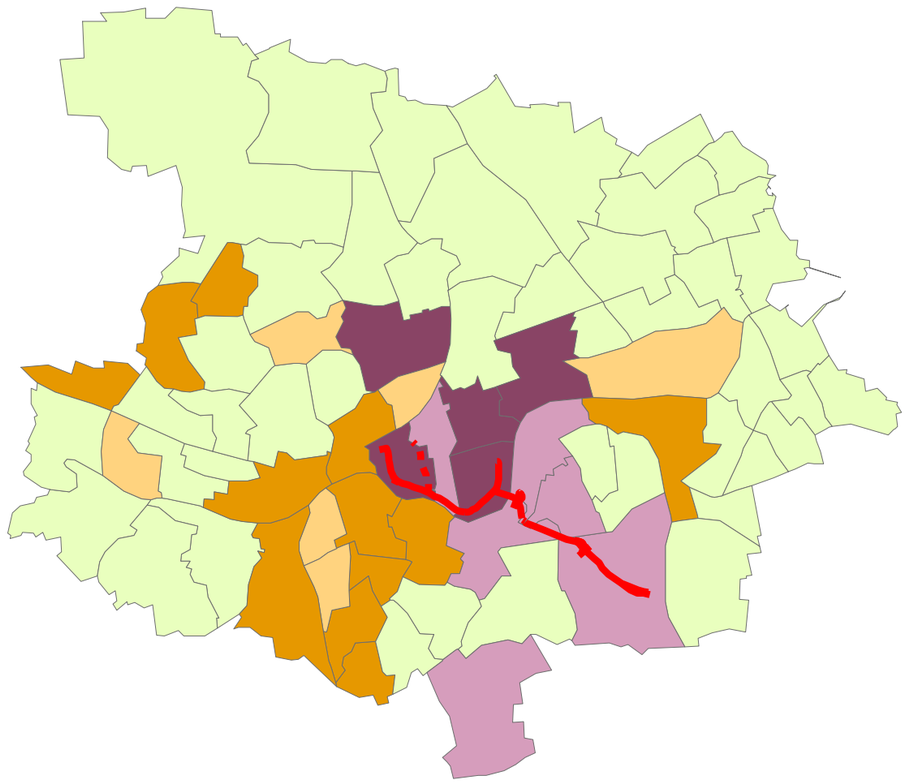


St Lawrence



St Anthony's

N



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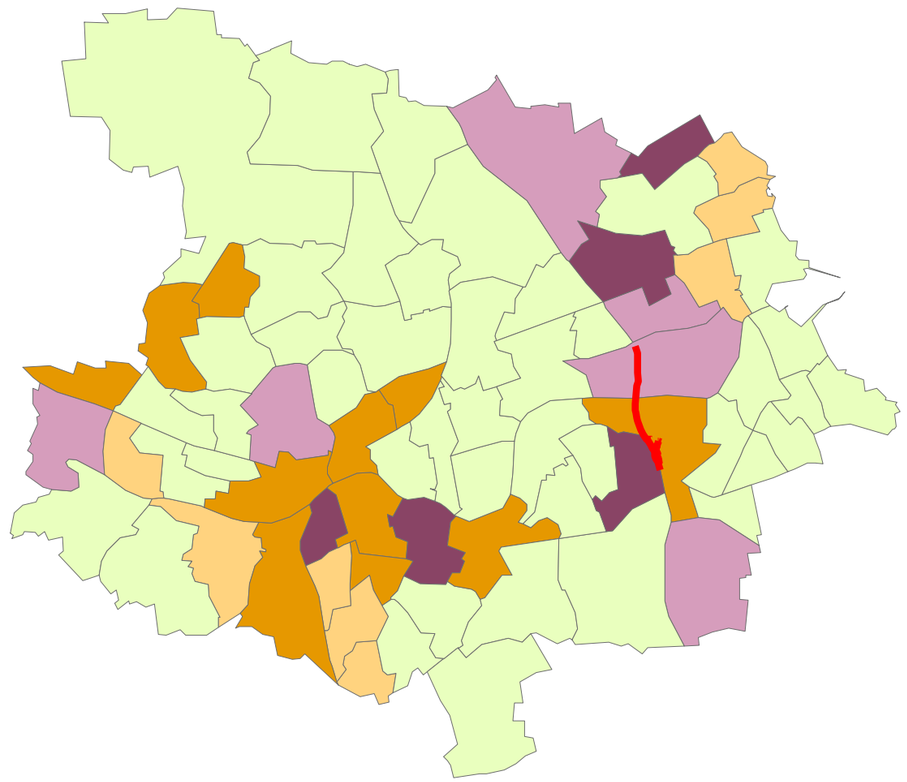

St Bede's

Arup**Transport**

Tyne & Wear Passenger Transport Authority

New Tyne Crossing GOMMMS assessment

LEGEND

Crossing alignments

Difference in emissions estimate*

- < -200
- -199 - -100
- -99 - 100
- 101 - 200
- 201 <

* The difference in emissions estimate is between the Do-Minumum and each Do-Something scenario. A negative value denotes an beneficial impact while a positive result denotes an adverse impact.

Difference in emissions estimates for PM10 in 2021 compared to Do-Minimum

ARUP

Date	Scale	
FEB 2003	NTS	**Figure 13**