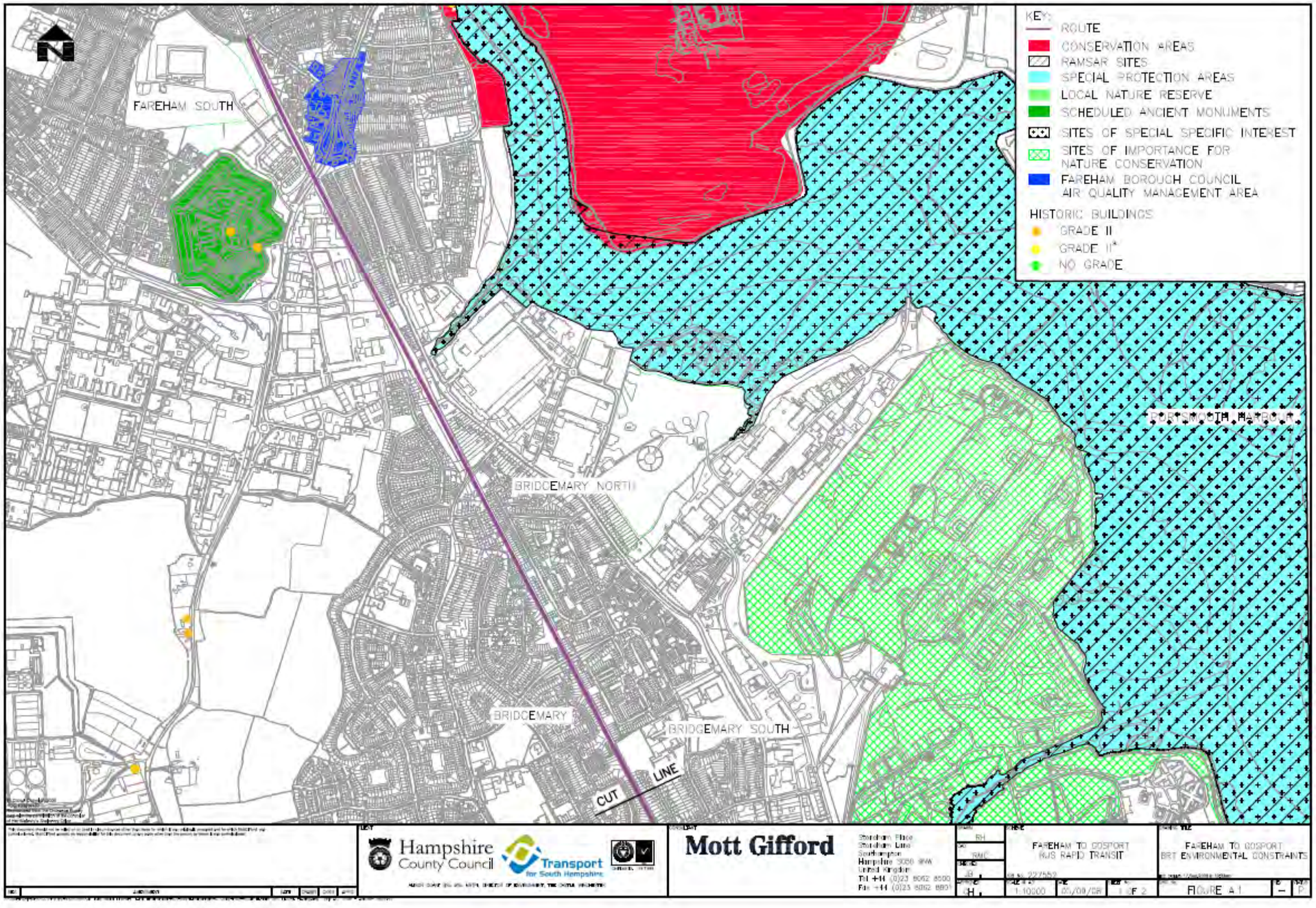
G – ENVIRONMENTAL CONSTRAINTS MAPS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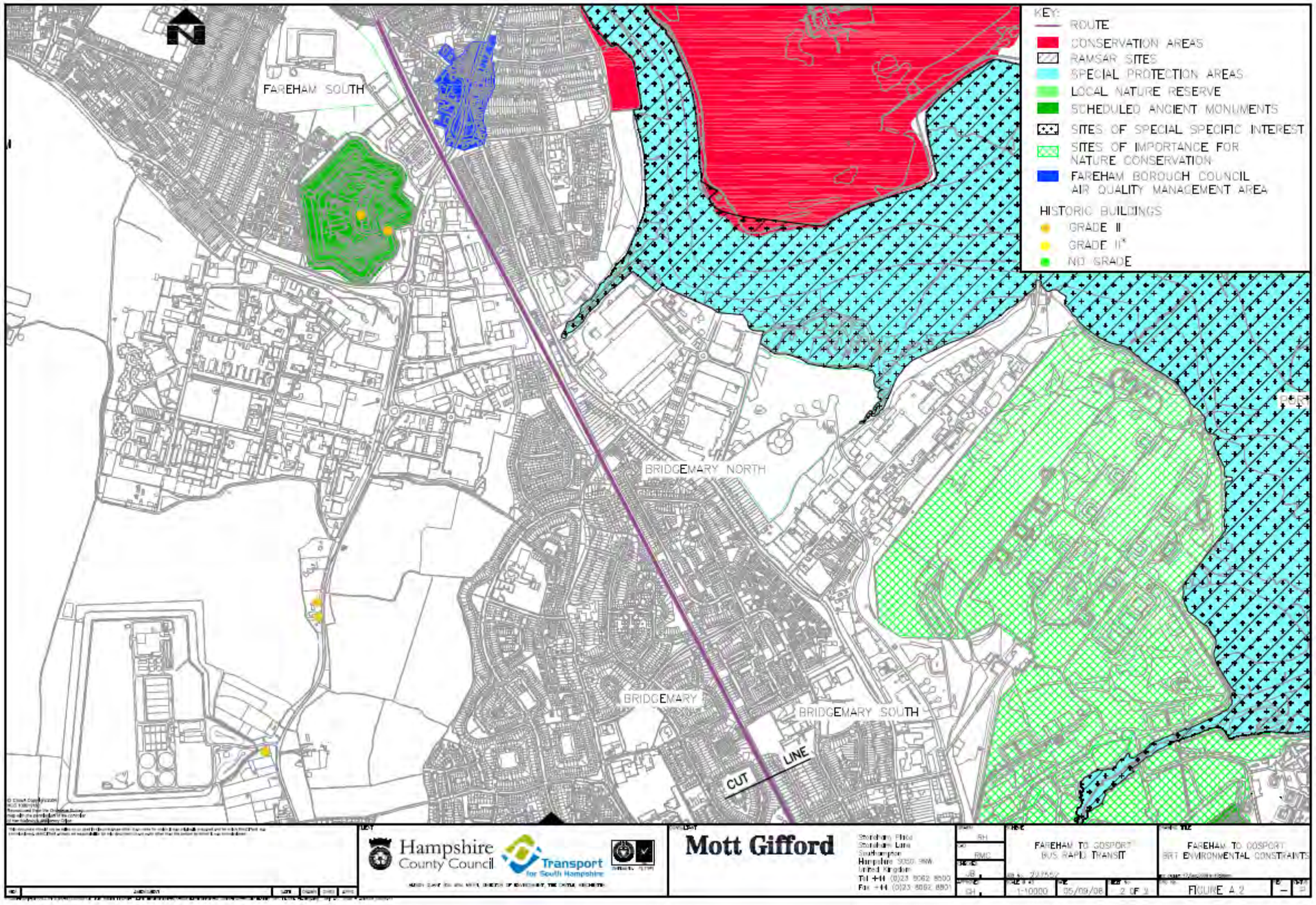
CONSERVATION AREAS
RAMSAR SITES
SPECIAL PROTECTION AREAS
LOCAL NATURE RESERVE
SCHEDULED ANCIENT MONUMENTS
SITES OF SPECIAL SPECIFIC INTEREST
SITES OF IMPORTANCE FOR NATURE CONSERVATION
FAREHAM BOROUGH COUNCIL AIR QUALITY MANAGEMENT AREA
HISTORIC BUILDINGS
GRADE II
GRADE II*
NO GRADE
FAREHAM SOUTH
BRIDGEMARY NORTH
BRIDGEMARY
BRIDGEMARY SOUTH
CUT
LINE
Hampshire County Council
Transport for South Hampshire
Mott Gifford
FAREHAM TO GOSPORT BUS RAPID TRANSIT
FAREHAM TO GOSPORT BRT ENVIRONMENTAL CONSTRAINTS
FIGURE A1


KEY:
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FAREHAM TO GOSPORT BRT ENVIRONMENTAL CONSTRAINTS
FIGURE A.2

H – DEMAND FORECASTING

Demand Forecasting

This Annex summarises the approach taken to estimate the likely demand for the proposed new services. This approach is based upon the use of existing data, wherever possible, together with up to date estimates of trip costs. The mode choice models used are described below, together with the results of the modelling.
This Annex continues with a summary of the economic appraisal of the scheme, setting out the key aspects of the appraisal framework, and summarising the results of the appraisals.

Forecasting Approach

Use of SSTM

The time and budget available for the completion of this business case have restricted the methodology for completing demand and revenue forecasts. It has been necessary to utilise, as far as possible, existing data sets and models, as there was no opportunity to collect new data or undertake original research. The sections below summarise how this data was utilised, including how it was updated or amended for the purposes of this assessment.

Key to the demand forecasting was the use of existing transport models for the study area. The key model was the Solent Strategic Transport Model (SSTM) which was developed by Atkins on behalf of Hampshire County Council. This includes modules for highway traffic and public transport. The highway model within SSTM is a fully validated strategic traffic model, based upon the SATURN suite. The model was developed on behalf of Transport for South Hampshire, specifically to allow the testing of a variety of highway scheme and to predict the impact of major development proposals for the area. The model itself was developed during 2005 with model years for 2004 and 2026.

Within this assessment the highway elements of SSTM have been utilised to provide the following inputs:

- Trip data
- Assigned flows and route choice data
- Highway speeds and journey times

The public transport elements of SSTM are based upon the EMMEII package. Whilst some model development has been undertaken, the public transport model has not been validated. As such it has not been possible to utilise as much of the data from SSTM for public transport. However, some elements of the model are considered to give a good representation of public transport in the study area. In particular, it is considered that the trip matrix is fit for purpose and this has been used as the basis for this demand assessment.

Whilst the highway and public transport models within SSTM it has been possible to develop a unified zone system for the two, with only minimal aggregation and dis-aggregation of existing zones.

Updating to 2008

As stated above, the SSTM models were developed for 2004. It has therefore been necessary to update the models to give a 2008 base year. In developing factors to do this a number of data sources were considered. For highway trip growth, two options were available:

- Using locally derived growth factors, from traffic counts; or
- Using TEMPRO to identify factors based upon committed development plans.

Having reviewed the traffic data available within the study area, a number of deficiencies were identified, including missing periods, very limited coverage and in many cases a lack of recent data. It was therefore concluded that the use of TEMPRO factors would be more appropriate for this purpose. An analysis of the TEMPRO database identified the following factors which were used.

Table of TEMPRO factors (2004 – 08,V5.1)

Area	AM		OP	
	Origin	Destination	Origin	Destination
GB	1.042	1.042	1.047	1.047
Hampshire	1.041	1.042	1.045	1.045
Fareham	1.031	1.044	1.053	1.052
Gosport	1.048	1.046	1.061	1.060
Portsmouth	1.060	1.046	1.059	1.061
Southampton	1.054	1.044	1.054	1.055

For the purposes of identifying changes in bus patronage an alternative approach was considered. As specific data for the study area bus services is not available, it was considered that a wider analysis was required. Having reviewed the TEMPRO derived factors above, it was considered that these were inappropriate for forecasting bus demand, as they would lead to a significant growth in flows, against current reported trends. It has therefore been assumed that there was no change in bus demand in the study area between 2004 and 2008.

Use of South Hampshire Rapid Transit models

As part of the development of the business case for the SHRT proposals during 2004 (a Light Rapid Tram proposal for the Fareham-Gosport-Portsmouth corridor), a number of studies were undertaken to inform the demand forecasting. These studies included the development of a TRIPS based demand forecasting model, the completion of original stated preference surveys to estimate utility functions for LRT, bus and car, and the completion of economic appraisals for the scheme.

Whilst much of this work has been superseded by other work, such as the SSTM, the mode choice models developed from the SP survey data were considered to represent the most appropriate method of assessing the likely transfer to the scheme.

Although the SHRT models were designed for a LRT scheme, it is considered appropriate to use them for the scheme, as BRT is expected to represent the highest possible quality of bus service, incorporating many of the aspects of LRT, and the models themselves can be used to allow the derivation of utility functions alone, rather than diversion curves.

The mode choice models used were based upon the following functions and parameters:

PT Utility = a^1 * *in-vehicle time (minutes)*
+ a^2 * *one way fare (pence)*
+ a^3 * *average headway (minutes)*
+ a^4 * *walk time (minutes)*

Car Utility = a^1 * *in-vehicle time (minutes)*
+ a^2 * *travel cost (pence)*
+ a^3 * *walk time (minutes)*

Variable	Value for Car	Value for Bus	Value for Scheme
a^1 - in-vehicle time	-0.05	-0.05	-0.05
a^2 - one way fare		-2.55	-2.55
a^3 - headway		-0.05	-0.05
a^4 - walk time		-0.09	-0.09
a^2 - cost of travel	-0.56		
a^3 - walk time	-0.09		

Source: South Hampshire Rapid Transit Stated Preference Survey – SDG, 2004

Development of Forecast Years

For the purposes of this assessment, it was necessary to develop forecast year matrices for 2011 (opening year) and 2026 (design year). It was also necessary to forecast trip growth up to 2071.

For the purposes of assessing growth it was necessary to adopt different approaches for the highway and bus elements of the trip matrices. In other words, TEMPRO growth factors have been utilised to predict the future highway demand for each year, while it is considered appropriate to assume that bus trip making would be stagnant throughout the study period. This is in line with current trends, where excluding the one-off effect of free concessionary travel, bus patronage is either stagnant or falling. It is considered that this represents a worst case scenario.

Fares Assumptions

Whilst bus trip making has been assumed to be stagnant throughout the appraisal period, it has been assumed that bus fares will rise during this period. For the purposes of this analysis a nominal increase of 2.5% per annum has been included in the analysis. Whilst this is lower than recent increases, such long term trends are difficult to predict and therefore this assumption has been included to show increase, although this may reflect the lower end of any likely scale of increase.

Operating Assumptions – run times, fares, frequency

In order to forecast the likely effect of the proposed busway scheme on car and bus patronage, it was necessary to build up data on the service characteristics of all three modes. These characteristics were identified based upon the requirements of the mode choice models and therefore the attributes identified included:

- In-vehicle time
- Frequency and hence service headway
- Access/egress time
- Fare

In-vehicle time was estimated based upon the sample timetables set out in Section 5 of this document. For those trips involving external zones, additional in-vehicle time was added to reflect the time spent on the Gosport – Portsmouth ferry, on connecting bus services, or on connecting rail services for long distance trips.

Service frequency was estimated based upon the proposed timetable. An unbiased ‘rooftops’ approach was used to estimate average wait time from frequency. This led to the assumption that average headway equalled half the time difference between services. Overall it is expected that service frequencies will be largely similar to existing bus service frequencies.

Access/egress time was estimated based upon measurements of the walk distance between each zone centroid and the closest busway bus stop. These measured

distances were then converted to time, using an average walk speed of 5 kilometres per hour.

It was assumed for the purposes of this analysis, that there would be no increase in fares for the services using the busway, over and above the existing bus fares.

Demand Forecasting Results

Table E.1 Central Case AM Peak and Off Peak Demand 2011

	AM Peak	Interpeak
Fareham - Gosport	85	5
Fareham - Bridgemary	9	10
Fareham - Portsmouth	0	0
Fareham - Southampton	0	0
Fareham - East Hampshire	17	0
Fareham - Rest of Hampshire	0	0
Gosport - Bridgemary	9	9
Gosport - Portsmouth	154	6
Gosport - Southampton	0	0
Gosport - East Hampshire	49	0
Gosport- Rest of Hampshire	55	0
Bridgemary - Portsmouth	0	0
Bridgemary - Southampton	0	0
Bridgemary - East Hampshire	0	0
Bridgemary- Rest of Hampshire	0	0
Portsmouth - Southampton	0	0
Portsmouth - East Hampshire	0	0
Portsmouth - Rest of Hampshire	0	0
Total	377	31

As would be expected the majority of demand for the services using the busway comes from within the corridor directly affected. However, an interesting aspect of this assessment is that it predicts significant mode transfer for trips to and from Portsmouth and to the areas to the north and east of Portsmouth. It would appear that this is a direct result of the likely improvements in integration between the busway scheme and rail services, over the current situation. These improvements particularly result from alterations to service routing in and around Fareham that take advantage of the busway.

Table E.2 Central Case 2011 revenue (in pounds £)

	AM Peak	Interpeak
Fareham - Gosport	299	0
Fareham - Bridgemary	8	0
Fareham - Portsmouth	0	0
Fareham - Southampton	0	0
Fareham - East Hampshire	38	0
Fareham - Rest of Hampshire	0	0
Gosport - Bridgemary	0	0
Gosport - Portsmouth	503	11
Gosport - Southampton	0	0
Gosport - East Hampshire	246	0
Gosport- Rest of Hampshire	1053	0
Bridgemary - Portsmouth	0	0
Bridgemary - Southampton	0	0
Bridgemary - East Hampshire	0	0
Bridgemary- Rest of Hampshire	0	0
Portsmouth - Southampton	0	0
Portsmouth - East Hampshire	0	0
Portsmouth - Rest of Hampshire	0	0
Total	2148	11

Table E.3 Central Case Time Savings (in minutes)

	AM Peak	Interpeak
Fareham - Gosport	-1100	0
Fareham - Bridgemary	-26	0
Fareham - Portsmouth	0	0
Fareham - Southampton	0	0
Fareham - East Hampshire	462	0
Fareham - Rest of Hampshire	0	0
Gosport - Bridgemary	0	0
Gosport - Portsmouth	6743	178
Gosport - Southampton	0	0
Gosport - East Hampshire	-334	0
Gosport- Rest of Hampshire	-591	0
Bridgemary - Portsmouth	0	0
Bridgemary - Southampton	0	0
Bridgemary - East Hampshire	0	0
Bridgemary- Rest of Hampshire	0	0
Portsmouth - Southampton	0	0
Portsmouth - East Hampshire	0	0
Portsmouth - Rest of Hampshire	0	0
Total	5154	178

Table E.4 Central Case Annual Demand and Revenue

	2011	2026
Fareham - Gosport	472,190	832,323
Fareham - Bridgemary	50,510	52,596
Fareham - Portsmouth	0	0
Fareham - Southampton	754	754
Fareham - East Hampshire	92,967	101,467
Fareham - Rest of Hampshire	19	19
Gosport - Bridgemary	50,085	50,085
Gosport - Portsmouth	853,654	972,695
Gosport - Southampton	866	866
Gosport - East Hampshire	269,948	299,391
Gosport- Rest of Hampshire	306,059	337,541
Bridgemary - Portsmouth	0	0
Bridgemary - Southampton	0	0
Bridgemary - East Hampshire	0	0
Bridgemary- Rest of Hampshire	40	40
Portsmouth - Southampton	0	0
Portsmouth - East Hampshire	0	0
Portsmouth - Rest of Hampshire	0	0
Total Annual Demand	2,097,091	2,647,775
Total Annual Revenue (£)	11,940,839	13,809,948

I – ECONOMIC APPRAISAL

Economic Appraisal

Background

The cost benefit analysis undertaken for this business case has been designed to meet the requirements of the Major Scheme Business Case guidance as modified for the CIF submission. In particular, results have been calculated to allow the completion of the NATA AST, and the Economic Efficiency, Public Accounts and Monetised Costs and Benefits tables.

Appraisal Framework

In completing the economic appraisal, a number of key assumptions have been made. These include:

- Opening year for appraisal 2011;
- All costs in 2002 prices, and discounted to 2002;
- Project life – 60 years from opening, with asset lives being assumed to equal this time period;
- Discount rate 3.5% per annum up to 2037, 3.0% per annum thereafter;
- Demand and revenue build up – 100% in year 1;
- National average values of time used;
- Parking rates assumed to be static over time;
- Fuel duty rates and resource costs used in line with latest WebTAG guidance; and
- Bus fare rates assumed to be static over time.

For the purposes of this appraisal, a spreadsheet based approach was adopted. This spreadsheet has been supplied to DfT for approval.

Appraisal Inputs and Outputs

Transport Demand, Revenues and Benefits

The demand for the proposed services have been estimated for two years, 2011 and 2026, as set out in Annex E of this document. Demand has been estimated in two elements, transfer from car and transfer from existing, traditional bus services.

These assessments have resulted in estimates of travel time savings, vehicle operating cost savings and increased bus operator revenues. Travel time savings have been calculated by comparing total travel time (incorporating walk, wait and in-vehicle time) for car travel and travel using the proposed scheme. The resulting savings in total travel time have been valued using the national average value of time.

Vehicle operating cost savings have been estimated in two ways. Firstly changes in bus VOC's have been estimated as discussed in 7.3.2 d) below. Savings in car VOC's have been estimated for those transferring to the scheme. This has been done by estimating the number of vehicle trips removed from the network and valuing these trips based upon average VOC's estimated on the basis of the relationships set out in WebTAG Unit 3.5.6.

Changes to local Government and transport operator revenues have been estimated under a number of categories. As the scheme will result in an increase in bus service patronage, it is expected that there will be a corresponding increase in revenue. Bus operator revenues have, in both the existing and future cases, been estimated on the basis of the fare calculations used in the mode transfer models. These calculations were based upon average fare rates and measured travel distances.

Another result of trips being transferred from car to bus would be a fall in parking revenue for local Government. This has been estimated on the basis of published parking charges and estimates of the numbers of trips being transferred to the proposed services.

Scheme Costs

a) Investment Costs – Central Government

Central Government's investment costs in relation to this scheme, relate to the CIF funding for the construction of the busway. Also included in this amount is Central Government's contribution to scheme development costs. These costs have been estimated in line with the scheme definition set out in Section 1.8.

It has been assumed that all investment costs related to the provision of replacement or additional vehicles for the operation of the planned services will be borne in their entirety by bus operators.

b) Investment Costs – Local Government

Local Government's investment costs have been taken to represent two elements of costs, scheme development costs and the costs of capital maintenance of the busway. For the purposes of this appraisal, capital maintenance includes recurrent maintenance, planned replacement of equipment and repairs to infrastructure.

c) Operating Costs – Local Government

For the purposes of this appraisal it has been assumed that the full cost of operating the proposed busway would fall upon Hampshire County Council as the highway authority. These costs include routine maintenance, utilities, cleaning etc. The costs have been estimated as an annual amount, based upon the design of the scheme and the expected costs of its operation.

It has been assumed that all costs related to vehicle operation will be borne in their entirety by private sector bus operators.

d) Bus Vehicle Operating Costs

To assess changes in bus VOC's, estimates of bus mileage were developed. These were based upon the existing and proposed future bus timetables. From these the length of routes and number of services run were identified. The resulting change in total bus mileage was multiplied by average VOC's per kilometre, estimated on the basis of the relationships set out in WebTAG Unit 3.5.6.

Indirect Tax Revenues

The impact of the scheme on indirect tax revenues should be restricted to the effect on reduced car mileage, which will result in reduced fuel use and therefore reduced fuel duty receipts for central Government. These have been estimated based upon estimates of the reduction in car mileage and average fuel consumption. Fuel consumption and fuel duty rates were estimated based upon the methodology set out in Webtag Unit 3.5.6.

Appraisal Results

Have been presented in Section 5.16 in the main business case document.

Sensitivity Tests

To test the robustness of the appraisal results, a series of sensitivity tests have been completed, assessing the appraisal results based upon amended growth assumptions, construction and maintenance costs, and mode transfer relationships. The results of these analyses, presented as the Monetised Costs and Benefits table, are shown below.

Increased Construction Costs

This test has been undertaken assuming construction costs 10% higher than estimated.

Reduced Demand Growth

The central case has been assessed on the basis of the growth estimates produced by the TEMPRO database. However, to test the impact of reduced growth in the study corridor, these growth figures have been suppressed by 10%.

Reduced Mode Transfer

Models developed for the SHRT scheme have been used to assess the likely level of transfer to the proposed scheme. These were used due to their direct applicability to the study corridor. However, the new mode within these models was described as an LRT scheme and whilst the proposed scheme will represent a high quality alternative to LRT, to test the robustness of the results to this assumption, the transfer estimates produced have been suppressed by 10%.

J – ACCESSION MAPS AND METHODOLOGY

Fareham Gosport BRT: Accessibility Planning Future Route Assumptions

Introduction

This note explains the assumptions and methodology used in constructing the Accession model used in the Fareham Gosport BRT study. For buses using the base model, it has been possible to use existing timings and speeds based on these. The difficulty was to estimate timings for the future case model which utilised the busway and changes to the bus network.

General Assumptions

On Highway

Buses that use the highway and thus mix with other traffic in the future case model can reasonably be expected to travel at approximately the same speed as buses today. By using the GIS to measure the route distances we can therefore calculate speeds for and timings for given sections of route where these cannot be taken from existing schedules. There are only a few sections of route where this applies and the longer of these is between Fareham bus station and the stop at Westley Grove – thus we took the average of the time taken between these points from existing service 87 journeys. This resulted in an average speed of 20km/h that was then applied to all on highway sections.

On Busway

Buses using the new busway benefit from a congestion free road built to a design speed of 64km/h. Although the busway is being designed for a maximum of 64km/h, we have used a lower speed to allow for stopping at bus stops, queuing, bunching, crossing highways etc. and therefore all busway timings were calculated using a speed of 48km/h.

Fareham bus station to Busway

The timing for this section of route is derived from two sources. The existing bus routes 87/87B run along the route between Fareham bus station and the stop at Westley Grove and therefore existing service 87/87B timings have been used between these points.

The existing 87/87B timings that have been used are –

Westley Grove to Fareham bus station = 4.0 minutes (1400m)
Fareham bus station to Westley Grove = 3.0 minutes (1300m)

The distances shown above are those taken from the data supplied and used in Accession. Between Westley Grove and Fareham bus station, this data has a small difference in distance (100m). This is explained by the model's use of distances that were derived from the National Public Transport Data Repository supplied by DfT.

However, when the same section is measured in GIS (using the centreline of the road using the Integrated Transport Network (ITN) map layer), this resulted in a distance of 1455m in each direction, which would take 4 minutes 22 seconds to traverse at the assumed average speed of 20km/h.

The section of route between Westley Grove and the start of the busway at Redlands Lane is not currently served by bus and the timing must therefore be estimated. The distance between Westley Grove and Redlands Lane was calculated in G.I.S at 602m. At a speed of 20 km/h this gives a timing of 1 minute 48 seconds.

The 1 minute timetable difference between the Northbound and Southbound routes is the reason why all subsequent timings for routes 33, 36, 87/87B, 85, 86 and 88/88A show a 1 minute variation.

Assumptions for routes using the busway

Routes 81, 82 and 83

Routes 81, 82 and 83 all access the future busway from the A32 Fareham Road via Tichborne Way and a spur onto the busway. As previously mentioned, buses will not now serve the Northbound bus stop at Frater and it has been assumed that buses will run Northbound from the existing stop at Holbrook Ice Rink to the busway stop at Tichborne Way. Southbound buses will still be able to use the stop at Frater. It is suggested that consideration is given to a replacement stop for Northbound buses nearer to the A32 in the future.

The timings for 81, 82 and 83 routes between Holbrook Ice Rink and Tichborne Way have been created manually with an assumed speed of 20km/h. The timings along the future dedicated Busway between Tichborne Way and Redlands Lane have been created manually and assume a speed of 48km/h. The route between Redlands Lane and Westley Grove assumes a speed of 20km/h. The section of route between Westley Grove and Fareham Bus Station assumes timings from the current 87 timetable.

Consistent timings for 81, 82 and 83 future routes are –

Fareham bus station to Holbrook ice rink (SB) = 11.2 minutes
Holbrook ice rink to Fareham bus station (NB) = 12.8 minutes

Routes 81, 82 and 83 show a 1.6 minute variation between the Northbound and Southbound routes. This can be explained by the section of route between Westley Gove and Fareham bus station having a difference of 1 minute and the section of route between Holbrook Ice Rink and Tichborne taking a further 0.6 minutes.

This is due to the fact the Northbound route does not use the Frater bus stop. Therefore a new timing of 2.8 minutes between Holbrook Ice Rink and Tichborne Way has been calculated. For the Southbound route a manual calculation has been done between Tichborne and Frater, giving a new timing of 1.2 minutes. Frater to Holbrook Ice Rink then uses the existing timetable timing of 1 minute. This is actually 0.6 minutes quicker than a manual calculation result.

Routes 33, 36 and 87/87B

Routes 33, 36 and 87/87B all access the future Busway via a spur from Newgate Lane onto Palmerston Way. For comparable equivalent future route timings between Northbound and Southbound routes, the stop to be used should be Collingwood Retail Park.

The timings for routes 33, 36 and 87/87B between Collingwood Retail Park and Westley Grove have been created manually. On road routes assume a speed of 20km/h, future dedicated Busway routes assume a speed of 48km/h. The timings between Westley Grove and Fareham Bus Station assume timings from the current 87 timetable.

Consistent timings for 33, 36 and 87/87B future routes are:

Fareham bus station to Collingwood Retail Park (SB) = 7.1 minutes
Collingwood Retail Park to Fareham bus station (NB) = 8.1 minutes

The difference in timings of 1 minute has been explained above.

Routes 85, 86 and 88/88A

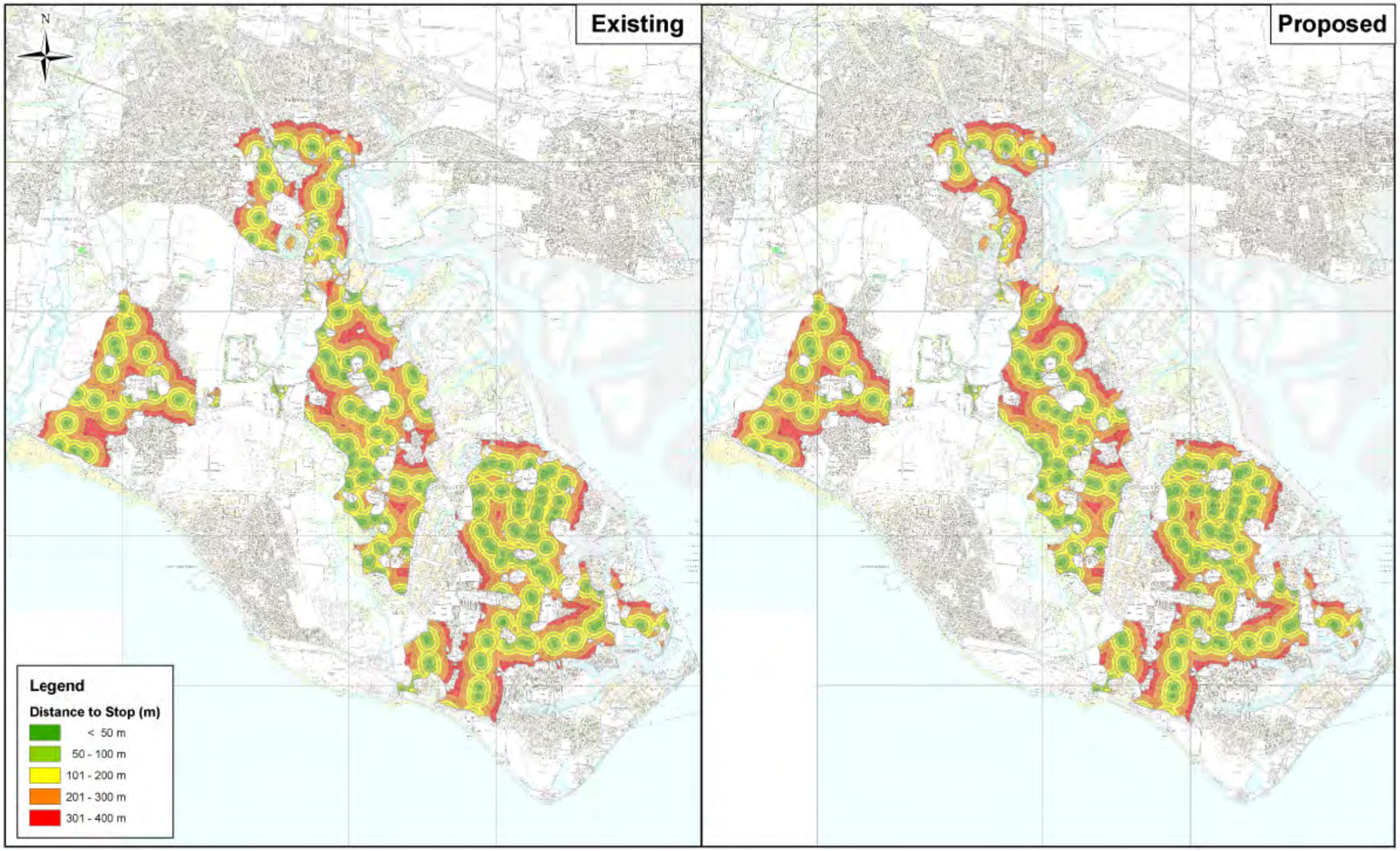
Routes 85, 86 and 88/88A all access the future Busway via a spur from Wych Lane. For comparable equivalent future route timings between Northbound and Southbound routes, the stop to be used is Meadow Walk. The timings for routes 85, 86 and 88/88A between Meadow Walk and Westley Grove have been created manually. On road routes assume a speed of 20km/h, future dedicated Busway routes assume a speed of 48km/h. The timings between Westley Grove and Fareham Bus Station assume timings from the current 87 timetable.

Consistent timings for 85, 86 and 88/88A future routes are:

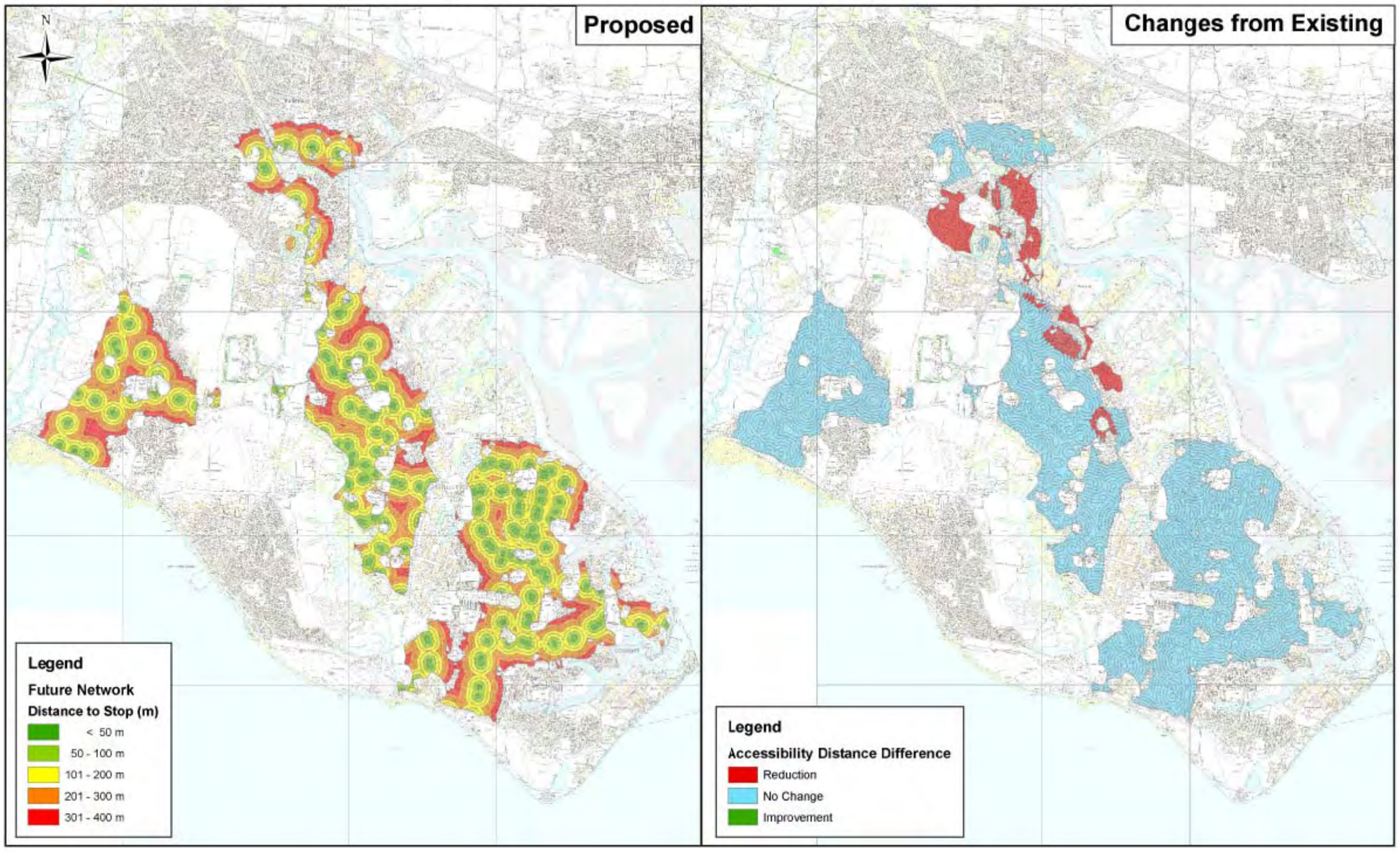
Fareham Bus Station to Meadow Walk (SB) = 7.3 minutes
Meadow Walk to Fareham Bus Station (NB) = 8.3 minutes

The difference in timings of 1 minute has been explained above.

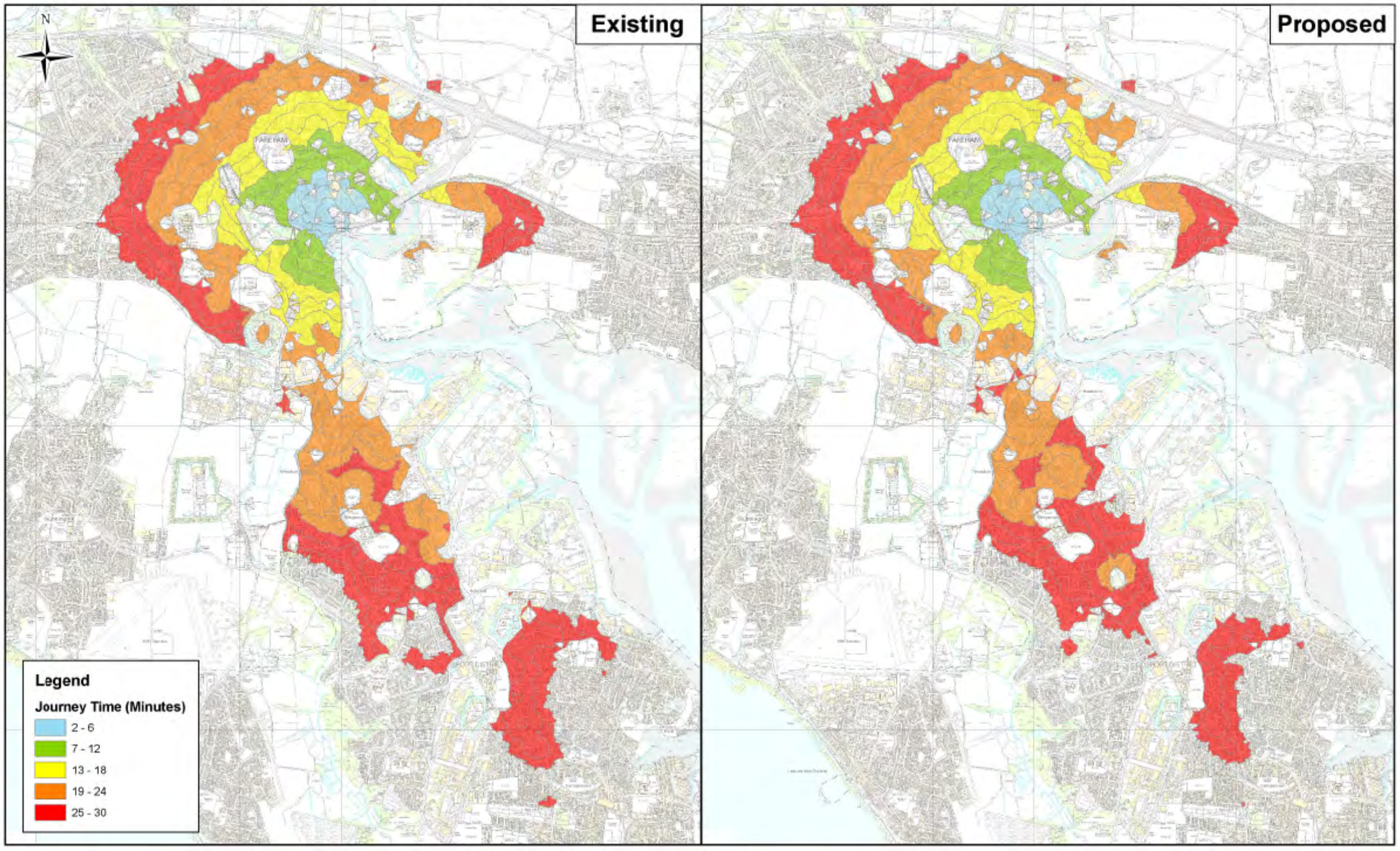
Fareham - Gosport BRT: Accessibility to Bus Stops



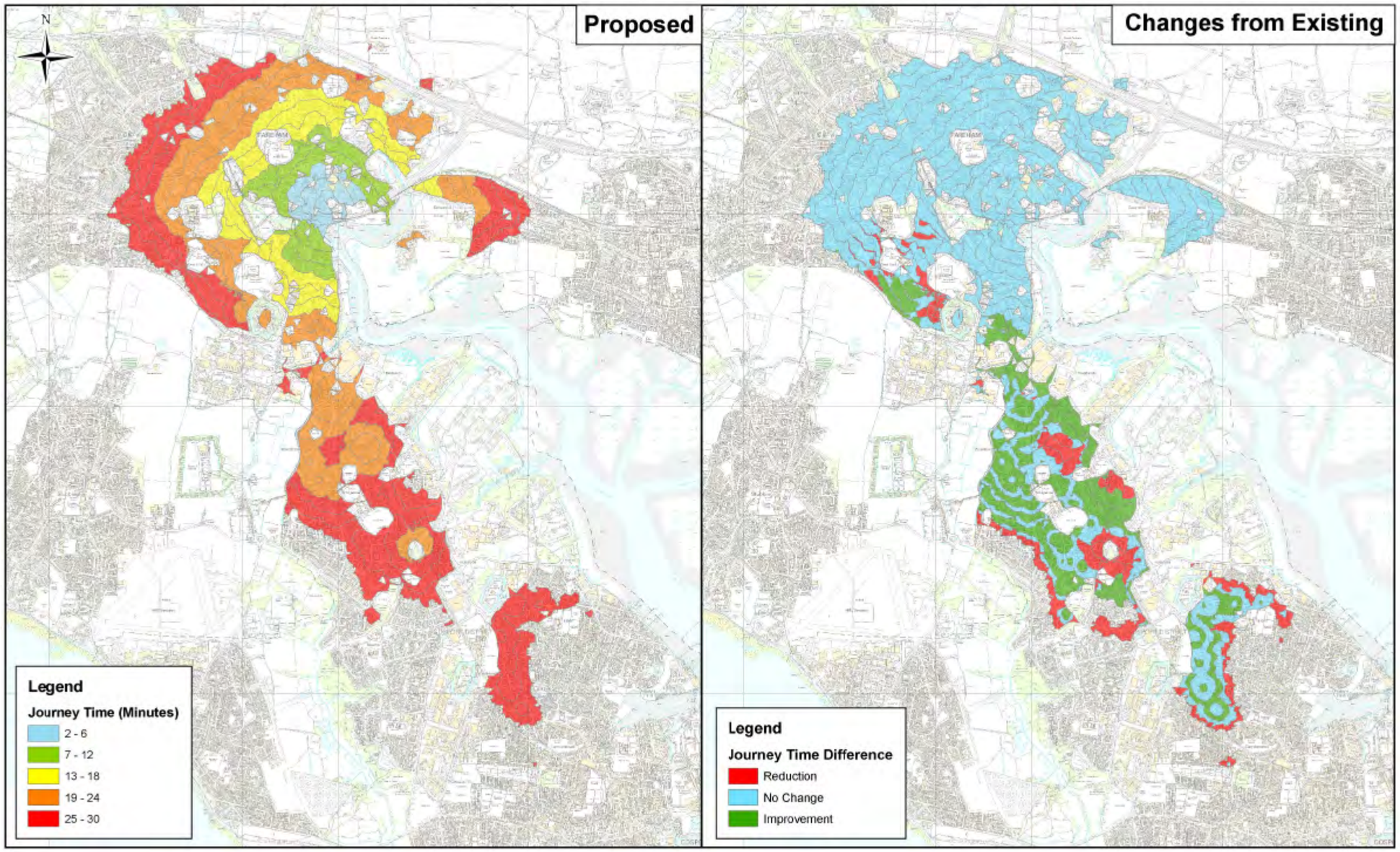
Fareham - Gosport BRT: Changes in Accessibility to Bus Stops



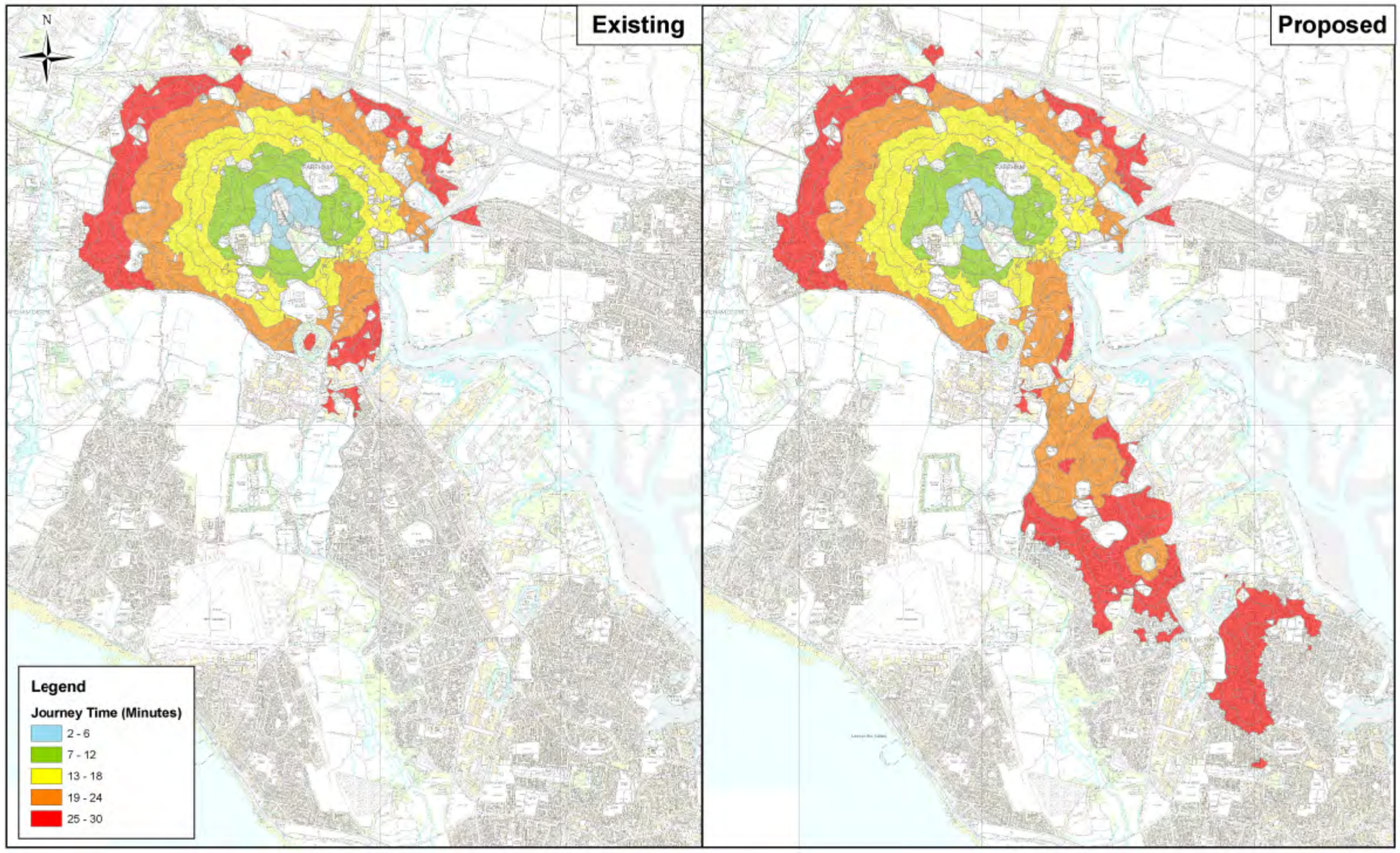
Fareham - Gosport BRT: Journey Times to Fareham Bus Station



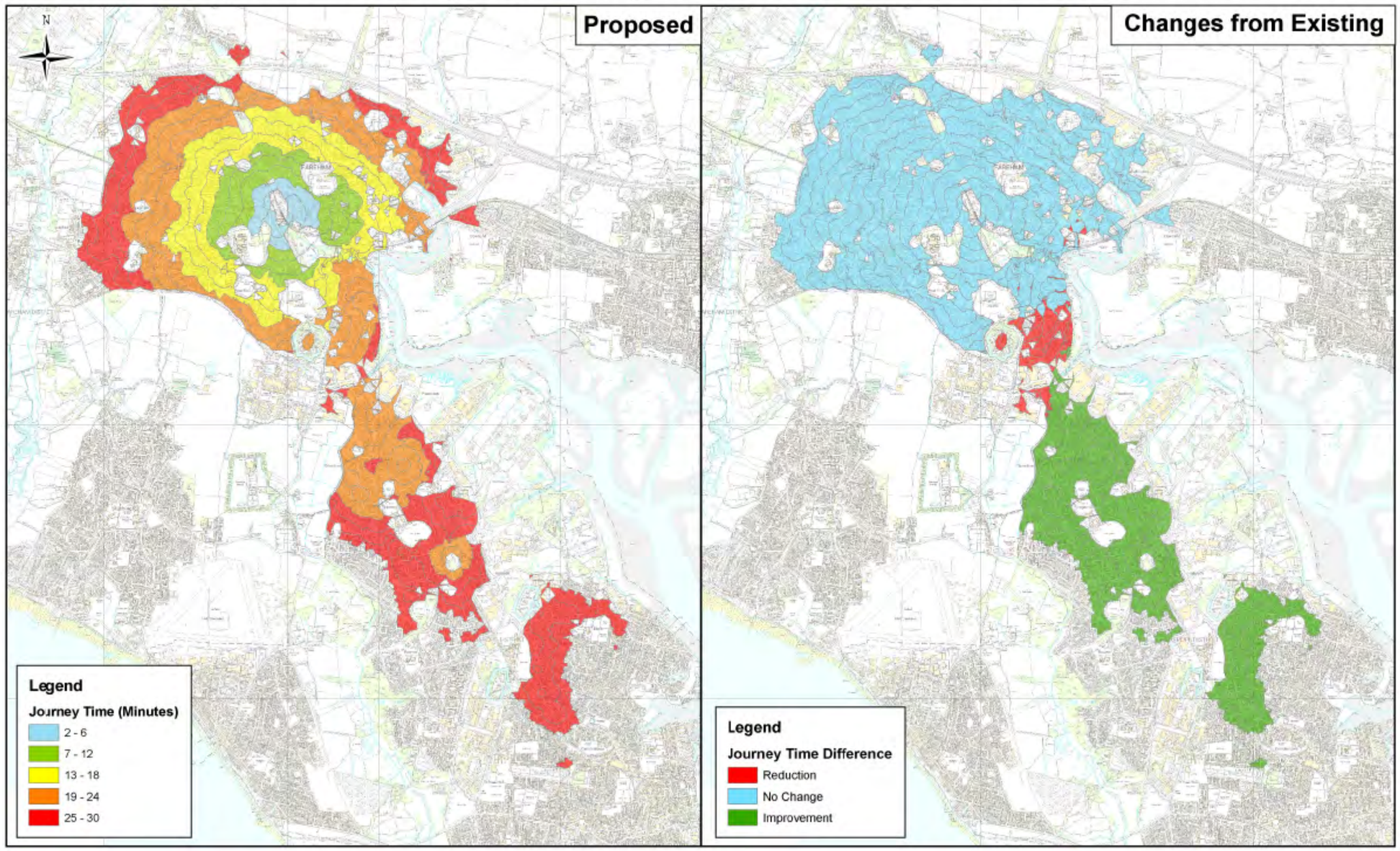
Fareham - Gosport BRT: Changes in Journey Times to Fareham Bus Station



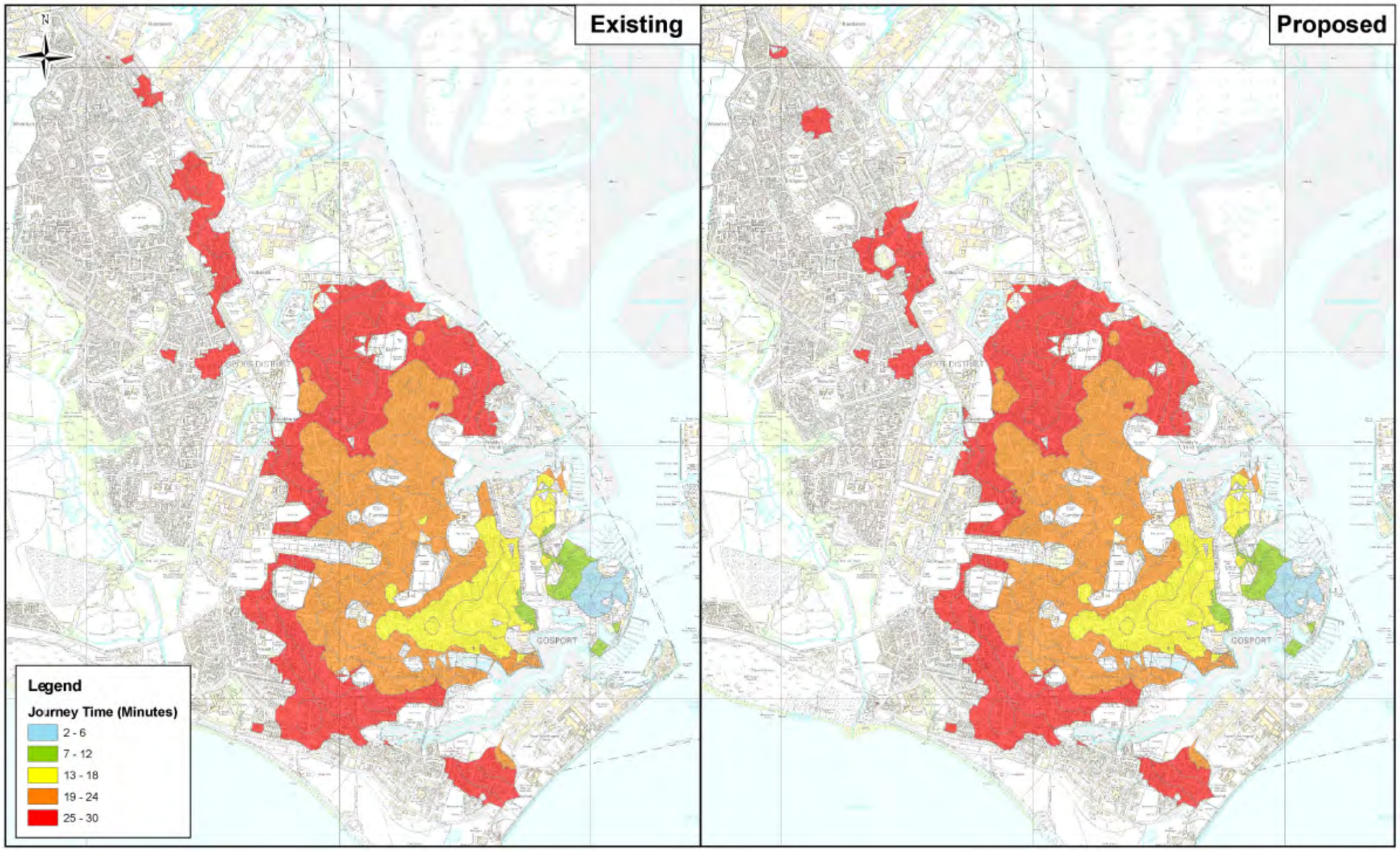
Fareham - Gosport BRT: Journey Times to Fareham Rail Station



Fareham - Gosport BRT: Changes in Journey Times to Fareham Rail Station



Fareham - Gosport BRT: Journey Times to Gosport Bus Station



Fareham - Gosport BRT: Changes in Journey Times to Gosport Bus Station