


NATS Plus Implementation Plan

Strategic Modelling of Joint Core Strategy

September 2009

Norfolk County Council

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Content

1. Introduction

1.1 Background

The Greater Norwich Development Partnership (GNDP) is the body through which Broadland District Council, Norwich City Council, South Norfolk Council, Norfolk County Council, and the Broads Authority are working together to manage delivery on the Government's housing and job growth targets. Together they are preparing a plan for the area which is called the Joint Core Strategy (JCS), a spatial planning strategy. The JCS forms part of the Local Development Framework which will guide how development takes place over the next 20 years.

Transport is an integrated element of the JCS and it is important that the transport infrastructure is in place to support development aspirations. To understand the impacts of the JCS on the transport network in the greater Norwich area, and determine whether the future transport network within the greater Norwich area is capable of containing the quantum and spatial location of development proposed as part of the JCS, a study is being carried out by Norfolk County Council and its strategic partner Mott MacDonald, to develop the transport strategy, the Norwich Area Transportation Strategy (NATS), into an achievable and deliverable implementation plan. In undertaking this study, an assessment has been taken of the transport infrastructure improvements currently included in the Norwich Area Transportation Strategy (NATS).

NATS was developed by Norfolk County Council, working with Norwich, Broadland and South Norfolk Councils and covers the built up area of Norwich plus the surrounding ring of villages and was adopted in October 2004. It sets out how the transport system should be developed to overcome current and future problems. The NATS Implementation Plan contains a wide range of transport interventions and measures, which are at various stages of development. A key element of this is the Northern Distributor Road (NDR).

The NATS interventions are currently being tested in the NATS strategic transport model for a 2026 scenario including all Joint Core Strategy growth areas. Specifically, all the initial proposals for the city centre, potential Bus Rapid Transit (BRT) routes, improvements to railway facilities and services and the Northern Distributor Road (NDR) have been modelled to date.

An Implementation Plan is being developed for the Norwich Area Transportation Strategy (NATS). This will include the Northern Distributor Road (NDR) and Norwich Growth Point projects that come

under the Greater Norwich Development Partnership (GNDP). Together these are known as 'NATS Plus'.

1.2 Purpose of Report

The purpose of this report is to present the findings of the initial transport modelling as part of the NATS Implementation Plan. At this stage of the plan development, the work has been focussed on addressing three main areas, namely:

- The extent to which the NATS supports and compliments the planned growth proposed in the Joint Core Strategy
- Understand the role of the NDR as part of NATS Plus.
- Understand the inter-relationships of the NDR and the other NATS Plus interventions.

It should be noted that this report contains the findings based on an initial assessment of the NATS Implementation Plan.

1.3 Structure of Report

This report provides:

- a summary of the transport modelling system used to assess the strategy
- The findings of analysis carried out to date
- Conclusions that can be drawn
- Indication of what further work needs to be done to develop the NATS implementation Plan

2. Modelling Framework and Assumptions

2.1 Overview

The assessment of transport options has been carried out using a transport modelling system set up for NATS. This consists of three main elements:

- A Demand model
- A Highway model
- A Pubic Transport model.

Together with procedures to determine future growth in travel demand, these models provide a picture of the performance of the highway and public transport networks in the future and how transport demand reacts to changes in land use and network performance.

2.2 Modelling Years and Time Periods

The transport modelling system represent three time periods: AM peak hour (08:00-09:00), average inter peak hour (10:00-16:00) and PM peak hour (average of 16:00-18:00). The base year for the model is 2006 and for the purposes of these initial assessments a future year of 2026 is used, a time when it has been assumed that all elements of the NATS and JCS will have been implemented.

2.3 Demand Model

Both the highway model and public transport model can reflect future changes in routing and network performance. However on their own they can not represent decisions on mode choice, i.e. whether people travel by car or public transport, and also destination choice, i.e. where people travel to in the future.

The demand model fulfils this function determining whether people will take car or public transport for a journey based on the relative “cost” of using both forms of transport. (Costs include a combination of time and monetary costs.) The demand model also takes into account the relative cost of travelling to different destinations.

2.4 Highway Model

The highway model is a computer representation of transport supply, travel demand and travel behaviour.

Transport supply is a representation of the existing highway network. This includes roads and their characteristics, e.g. length and number of lanes and characteristics that effect of the speed on the road for a given

traffic flow. Junction details are also included, e.g. type of junction and physical layout of junction, and where appropriate traffic signal timings information.

Base year highway demand, i.e. where people want to travel to and from and the number of people travelling has been developed from a series of road side interview surveys and traffic counts carried out in 2006.

Travel behaviour is the importance people put on time and distance when determining which route they use to get from one point to another on the highway.

The result of combining these elements is a model which represents base year travel demand, travel behaviour, and network performance. Outputs are a representation of network conditions in the form of traffic flows on roads, speed on roads and queues and delays at junctions. This is calibrated to represent actual conditions.

A future year version of the highway network model has been developed representing scenarios with and without the NATS transport interventions.

2.5 Public Transport Model

The public transport model has the same elements as the highway model but represents bus and rail supply, demand and behaviour.

The public transport supply model includes a representation of the highway network overlayed with bus services. Each individual bus service is represented including route, bus stops, service frequency journey time and fares. Similar information is presented for rail services.

Public transport demand has been developed from electronic ticketing information from both bus and rail operators.

Standard behavioural parameters have been used to determine which routes and services persons use to get from origin to destination. These include the relative importance of access time, waiting time, interchange, in vehicle time and fare.

Again, as well as the base model, future years networks have been developed both with and without the NATS transport interventions.

2.6 Future Year Demand and Forecasting Procedures

The forecasting of future year travel demand is a two step process. The first step is to determine the number of persons that would like to travel by each mode of transport and where they would like to travel to. The second step is to adjust this to reflect the constraints imposed by the capacity and performance of the transport networks.

Future year travel demand has been developed in line with Department for Transport (DfT) guidance which ensures a consistent approach to forecasting.

Future growth forecasts of increase in travel demand by all modes of transport and for all journey purposes are obtained from the Trip End Model Program (TEMPRO) database maintained by the DfT. These growth factors take into account future changes in population, housing composition, car ownership and car availability. TEMPRO is consistent with demographic growth included in statutory planning documents. However changes are only represented at the district level, and it does not explicitly identify specific developments or development locations.

Where specific areas of growth are known, both in size and location, as with the JCS, these individual developments have been modelled explicitly but overall growth for the area as a whole has been controlled to TEMPRO totals.

An estimation of the number of highway and public transport trips generated by new development has been calculated based on observed trip rates from existing developments contain in the Trip Rate Information Computer System (TRICS) database. The distribution of these trips is based on existing trip distribution contained in the model.

Growth in goods vehicle trips has been increased in line with the DfT's National Transport Model (NTM) forecasts.

Forecasts produced using this methodology represent a situation where network conditions in the future year will have an impact on mode choice and destination choice e.g. increased congestion on roads may result in drivers changing route, or possibly using train or BRT instead of driving. This is done by using the traffic and public transport model to determine future year costs (i.e. a supply model) and the demand model to determine how these future year costs impact on mode choice and destination choice.

3. Initial Scenarios Tested

3.1 Base

Both the base year highway and public transport models represent transport supply, demand and network conditions in the base year, which is 2006. The base year models form the starting point for all forward projections and also act as a useful comparator when analysing travel demand and network performance.

For the highway model this includes the 2006 highway network, including road layout, traffic signal timings and travel patterns and demand.

For the public transport model this includes 2006 bus and rail services, fares, rail service patterns and travel demands.

3.2 Future Year Models

For the future year both 2026 Do Minimum and 2026 Do Something scenarios have been developed.

3.2.1 Do Minimum Model

A Do Minimum scenario is required as a reference upon which to assess the effects of the NATS Plus measures.

As such it will only include schemes and measures that have been implemented between 2006 (the model base year) and 2009 and those committed post-2009 changes to the existing transport system.

WebTAG guidance Unit 2.1: “The Overall Approach - The Steps in the Process”, states that these committed changes should be limited to those schemes to which a genuine commitment has been made from which it would be difficult to withdraw. Therefore, only those schemes that are definitely programmed for implementation and for which details of the scheme are available are included.

Any other scheme or measure, subject to the outcome of this work, may or may not be included in the NATS Implementation Plan so it is felt inappropriate to include them as otherwise their worth and contribution to the plan could not be evaluated.

In terms of the Do Minimum the schemes can be divided into three main areas:

- Junction improvements - measures to improve the operation or safety of junctions
- Pedestrian improvements - measures to facilitate pedestrian movement and safety e.g. pedestrian crossings.
- Traffic management and safety schemes – measures to reduce traffic intrusion into residential and commercial areas and reduce traffic speeds.

For the purposes of the public transport modelling it is assumed that the public transport network remains as it is in the base year.

Assumptions have been made in terms of how parking charges and bus and rail fares change in the future.

Overall, it should be noted that there are no major changes to either the highway or public transport network in the Do Minimum.

A full list of Do Minimum schemes is included in Technical Note 02

3.2.2 The Do Something Model Scenario

The Do Something scenario represents a scenario with all of the identified NATS interventions in place.

A large number of potential interventions have been developed. These were prioritised for modelling based on

a. which part of the NATS strategy it was supporting
b. the deliverability of an individual measure
c. the ability of the measure to be modelled

The major elements of the NATS Implementation Plan are:

- city centre pedestrian, cycle, bus priority and traffic management schemes;
- Bus Rapid Transit;
- improvements to rail facilities and services;
- the Northern Distributor Road and associated traffic management schemes;
- traffic signal priority for buses for signals on radial routes outside of the Inner Ring Road;
- off-board public transport improvements, e.g. through ticketing, pre-boarding purchase;
- traffic management and speed reductions in residential areas.

The strategy also includes a whole series of measures that are very difficult to represent in a traffic model e.g. soft 'Smarter Choices' measures; such measures will be taken into account as part of non-modelling appraisal.

The representation of the Do Something scenario required changes to both the highway and public transport model. Highway schemes have been coded explicitly into the highway model, including bus priority measures. The impacts of these schemes on bus journey times have been passed from the highway model to the public transport model. New bus services have been coded explicitly into the public transport model.

4. Initial Findings

4.1 Impact of Do Minimum

The assessment of results should bear in mind that demand for travel and network performance will change significantly between the base year and the assessment year without doing anything to the transport network.

It is important to understand the level of these changes.

Base year (2006) travel demand for both highway and public transport trips in the Greater Norwich area is typically the same in each of the AM and PM peak hours, with comparatively reduced traffic flows in an average inter peak hour. Overall mode split is similar in all time periods with private transport, and specifically cars, making up the vast majority of traffic and with public transport making the remainder.

Going forward in time to 2026, not taking into account constraints imposed by the transport network (or future improvements including NATS), highway demand is forecast to increase significantly with public transport forecast to increase also, but at a much lesser rate. This is as a result of increased population, changes to the composition of households and increases in car ownership and car availability, i.e. both the number of households owning cars and the number of cars owned per household. Given the relative size of the existing travel demand segments this will result in a large increase in car trips throughout the area and a much smaller increase in PT trips.

In terms of changes in highway network performance between 2006 and 2026, average network speed is forecast to reduce markedly over the whole of Greater Norwich. Total travel time on the network is forecast to increase significantly with a comparably lesser increase in vehicle kilometres. Queuing and delays are forecast to increase significantly.

Public transport journey times, which are to a certain extent affected by highway journey times are also forecast to increase significantly.

4.2 Impact of Do Something

4.2.1 Highway Network Performance

In the Do Something scenario there is substantial movement of traffic on to the NDR. Most traffic uses the road through more than one junction.

Analysis indicates that the NDR is used by traffic travelling around the city, including access to employment areas. This is instead of travelling through the city, using residential roads in the northern suburbs, the Outer Ring Road or even Inner Ring Road to cross the city.

The NDR removes traffic from a number of key radial routes and the Outer Ring Road.

Generally, roads in the north of the city show a reduction in traffic when the NDR is included in the Implementation Plan. This includes the Outer Ring Road and the main radial routes, but also on residential minor roads, such as through the Heartsease estate.

As a result of the NDR, minor roads also show reductions in traffic resulting from a combination of extra capacity on key radials and the Outer Ring Road and the proposed traffic calming introduced on roads through the residential areas, with traffic transferring from the residential roads to more strategic routes.

Overall the implementation of NATS results is an increase in average speed on the traffic network compared to the Do Minimum scenario, although both future year predicted future year average speeds remain below the 2006 level in peak periods.

Comparisons of travel conditions in the Inner and Outer Ring Road and key corridors were carried out between the Do Minimum and Do Something. This included looking at the journey times for vehicles travelling along these routes, the total amount of delay incurred and the average travel speed.

For all sections of the Inner Ring Road, in both directions, the travel time increases from the Do Minimum to Do Something scenario. The introduction of bus priority and traffic management inside the Inner Ring Road are considered to be the cause of these changes, with these measures decanting through traffic from the city centre to the Inner Ring Road.

The results for the Outer Ring Road indicate that there are reductions in travel time and delay compared to the Do Minimum scenario. The main reason for this is the construction of the NDR, which causes traffic to transfer from the Outer Ring Road to the NDR.

In comparing the results for the northern and southern parts of the Outer Ring Road, it is evident that changes in vehicle time, delay and speed on the northern part are much larger than the southern part,

consistent with the impact of the NDR which relieves the northern part of the city.

On radial routes, analysis indicates that there are significant traffic improvements with the Do Something scenario, with a reduction in travel time and delays and an increase in travel speed experienced on the majority of radial routes. The likely explanation of this is due to the proposed NDR whereby trips originating from the eastern and north-eastern areas of outer Norwich can now avoid passing through the city area and / or using the Outer Ring Road by using the NDR, thus alleviating traffic on five radial routes.

4.2.2 Public Transport Network Performance

The key changes in network performance on the public transport network are a reduction in bus journey times compared to the Do Minimum scenario. This is a result of a number of reasons including increased bus priority, impacts of city centre traffic management reducing delays to buses on the Inner Ring Road and the NDR reducing general traffic delays on key radial routes.

Note that improved level of network performance will result in improvements in reliability of public transport services, however it is difficult to capture the impact of this in the transport model so the increased use of public transport is probably underestimated.

4.2.3 Overall Impact on Demand

The highway measures in the Implementation Plan improve the highway network's performance and car journey times on key radial and orbital routes. At the same time, the introduction of measures favouring buses in the city centre and on the BRT routes, would lead to a shift in mode from car use to public transport.

Further work is required to optimise the public transport network efficiency within the overall NATS Implementation Plan by considering additional bus lanes and selected vehicle detection at junctions maximising benefits public transport. Such work would involve detailed consideration of priority measures e.g. consideration of effects of bus / BRT lanes at individual junctions including impacts on driveways and on-street parking.

Note that the results discussed above are preliminary and subject to change pending the completion of ongoing model output checking.

5. Conclusions

5.1 Approach

The initial work presented in this report has concentrated on assessing three main areas namely:

- The extent to which the NATS supports and compliments the planned growth proposed in the Joint Core Strategy
- Understand the role of the NDR as part of NATS Plus.
- Understand the inter-relationships of the NDR and the other NATS Plus interventions.

The conclusions presented here concentrate on how well the analysis to date can answer these questions.

5.2 Impact of NATS Interventions

Section 4 provided a description of the impact of NATS interventions on highway and public transport network performance and mode split.

Initial findings show that the introduction of the measures favouring buses in the city centre and on the BRT routes would lead to a shift in mode from car use to public transport.

Analysis also indicates that the performance of the highway network improves significantly with the implementation of the NATS Implementation Plan and there are reductions in traffic compared to a Do Minimum scenario on inappropriate roads through residential areas in the northern suburbs.

The shift in trips from cars to buses and trains is relatively small, which may reflect the limited number of interventions modelled. Further work is being undertaken on interventions that give buses additional priority.

The current modest change demonstrated by the model in mode split reflects the early stage of development of the NATS Plus interventions. Further detailed development of the implementation plan is required, to optimise the use of road space between private cars and other road users.

It is noted that it is not possible to assess the effectiveness of all NATS interventions using the models and there are a number of smarter choice interventions that should lead to reducing the need to travel and transfer to public transport, cycling and walking. These are likely to include not only BRT schemes, but also pedestrian and cycling infrastructure improvements that will not only make Norwich more attractive for vulnerable users, but will also improve road safety for

pedestrians and cyclists. An appropriate supplementary appraisal methodology will be applied to understand the impact of the smarter choice interventions.

5.3 Impact of NDR

The analysis of change in highway network conditions between the base year and future year indicates that there will be a significant deterioration in the level of service on the highway network if no interventions are introduced.

The deterioration on the highway network will also have a significant impact on the operation and reliability of the public transport network which in Norwich is almost exclusively bus based, running on the main highway network with limited priority. The deterioration in network performance will also impact on the movements of goods and services around the city.

With the introduction of the NDR as part of the NATS Implementation Plan there is a significant reduction in through traffic on the network, resulting in a reduction in traffic flows and improvement in journey time on key radials and the Outer Ring Road. The NDR also results in a reduction in traffic on residential roads that would otherwise increase without the NDR in place.

Therefore the NDR appears to be successful in ensuring the network can continue to function effectively.

5.4 Relationship between NDR and NATS Interventions

Generally, the NDR provides additional capacity on the radial routes in the northern suburbs. In the current implementation plan, some of this additional capacity is taken up by bus priority, some by a decanting of traffic from more minor routes through residential areas and some of this additional capacity remains available compared to the Do Minimum situation. This is highlighted by the reduced traffic volumes and reduced delays on these corridors. Further sensitivity testing indicates that with the NATS Implementation Plan in place, but without the NDR, the performance of these radial routes in terms of journey times and delays would be worse than the Do Minimum. This indicates that the NDR does provide additional capacity on these corridors. Further work is required to optimise the use of road space.

6. Summary

Analysis to date confirms that in overall terms the proposed NATS strategy implementation plan manages the increased travel demand from the planned growth proposed in the Joint Core Strategy works, the NDR achieves its objectives and allows other NATS interventions to be implemented. However, it is acknowledged that the NATS Plus measures are at an early stage of development and there is more work and testing to do. This would include:

- optimise individual measures
- understand the impact of interventions not currently modelled, plus non modelled appraisal impacts
- optimise the overall package and
- understand phasing issues

Phasing of interventions to date and analysis has concentrated on a 2026 scenario with all interventions included. Continuing work is being undertaken to assess the impacts in the forecast years 2016 and 2031 to assist with phasing.