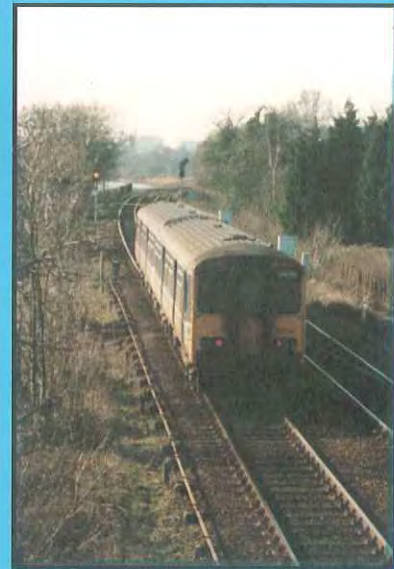


A Railway Revolution...



A Railway Revolution...

A Proposal from the East Anglia Area of the Light Rail Transit Association

Author: Chris Wood

Published: Spring 1996

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*Copies of the summary brochure can be obtained free of charge
from Chris Wood, 45 Beatrice Road, Thorpe Hamlet, Norwich
NR1 4BB, tel./fax. 01603 - 667 314.*

*Copies of the technical appendix, which gives greater detail on
the proposals, together with a complete bibliography, can also be
obtained from Chris Wood at the above address, price £10.00,
including p.&p. Important: cheques should be made payable to
C.J.Wood, not the L.R.T.A.*

Acknowledgements

The following people and organisations have helped in the development of the scheme described here and/or assisted the production of this report in various ways: Denise Carlo (N.R.A.G.) for discussions around the street route through Norwich, Siemens AG and Michael Taplin (L.R.T.A. Chair) for the provision of illustrations, Stan Sabberton (Norfolk Metro Campaign), John Woods (L.R.T.A. E.Anglia Area Officer) and all those organisations and individuals who responded to the 1994 consultation report.

Particular thanks goes to the South Norfolk Environmental Liaison Group for its support, without which the production of this brochure would not have been possible. Transport and planning research network TransPlan provided technical assistance and Gloucester-based Just-My-Type produced the maps.

Printed by Catton Printing, 13 & 14 Roundtree Close, Norwich NR7 8SX Tel. (01603) 404616.

Cover pictures (all C.Wood):	Front:	Popular trams in Gothenburg (Sweden)/local train near Norwich/view over Norwich city centre.
	Back:	Norwich, A Fine City/low-floor tram from Bremen (Germany)/local train near Norwich.

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Contents

Introduction	1
What is light rail?	2
City and region	3
Local rail to light rail in Norfolk and Waveney	3
Power, sensitivity and space-sharing	4
A light rail route through Norwich	5
Local rail to light rail elsewhere... ...other railway revolutions	6
Potential light rail routes in Norfolk and Waveney	8
Typical journey times to Saint Stephen's Street	8
Serving everybody's needs	9
How can it be done and how much would it cost?	10
Bikes too!	11
Recommendations	12
Acknowledgements	Inside front cover
About the L.R.T.A.	Inside back cover

Introduction

Thorpe station is a long way from the heart of Norwich, yet its local train services could provide a centrepiece to the region's transport network. At the same time, the city's roads are choked by motorists, for whom the trains and buses do not offer a reasonable alternative.

There is a radical solution - Light Rail. The local trains could be replaced with trams and run beyond Thorpe station on street track to serve the heart of the city!

This summary report describes how such a system could work and gives details of likely costs and journey times. Local trains currently run to Sheringham, Great Yarmouth, Lowestoft and, in a limited way, Thetford. Light rail conversion could secure the future of these services, allow new stations to be opened and even allow services to be reintroduced on other routes.

Further details of the proposals and the background to them can be found in the separate Technical Appendix.

What is light rail?

Light Rail is an extremely attractive and flexible form of transport, as Norwich's French twin city of Rouen has realised. It combines the features of tramways and conventional railways. Light Rail covers a spectrum, from modern, street-running trams to light metro systems, such as the Tyne and Wear Metro or London's Docklands Light Railway. In between is a diversity of systems, each tailored to the city or region it serves.



Above: a tram in Munich (Germany), running on a reserved track in the street.

Right: much of the South Yorkshire Supertram network runs in the streets of Sheffield, on reserved track where feasible.

Below: a tram on its own track in the western suburbs of Oslo (Norway).

A 'typical' Light Rail system is likely to include stretches of track in the street, preferably reserved from other traffic, and stretches of track for its own exclusive use. It can even use existing railway lines, converted for Light Rail use, as in Manchester, or even sharing them with ordinary trains, as in the German city of Karlsruhe. What is more, Light Rail can take local rail services into the heart of a city, beyond their traditional terminus.

The Light Rail Vehicle, or tram, is a high-performance vehicle, allowing more stops than a conventional train,

a faster journey time or even both. The ride is smoother than on a bus and more people can be carried too. With its track to guide it through the streets, the tram



can safely serve pedestrianised streets, as its path is entirely predictable. The track also lends a sense of permanence and reliability to the service. Light Rail has an 'up-market' image which attracts people out of cars in a way that buses on their own cannot. It runs on electricity in the street, so that there are no fumes, and it is quiet and accessible to many people who today have difficulty

using public transport.

Light Rail can be a complement to traffic calming and other strategies to reduce dependency on the car. The Royal Commission on Environmental Pollution's report, *Transport and the Environment* (1994), recommends Light Rail as one way of helping reduce pollution from transport. As people all over the world get together to produce Local Agenda 21 for their areas, sustainable alternatives to the car are increasingly needed.

Light Rail cannot be the whole answer on its own, of course, but it is well suited to an integrated package including cycling, walking, buses, trains and park & ride. Light Rail can be found in 300 places worldwide, including such countries as France, Germany, the Netherlands and the U.S.A.



City and region

Since the 1960s at least people in Norwich have recognised that there is not room to allow the car to dominate personal transport in the city, but that something is needed with a higher quality image than the bus. Norwich was a pioneer of pedestrianisation in 1967, with London Street, and has done much to make its centre attractive to people on foot. Building new roads is now out of favour in Norwich, and rightly so. The field is open for imaginative strategies to make Norwich a truly fine city and to give the region the transport network it needs.

There have been many proposals over the years, but little to show for them except a few measures to help buses avoid congestion and the park & ride bus programme. It is clear that

more radical traffic management measures are needed if public transport is to be improved significantly. There are a number of possibilities for removing through traffic from the city centre, without building new roads, from the (partially implemented) loop road system to the permit scheme put forward by the Norwich Road Action Group's consultants, M.T.R.U. This would allow public transport easy passage and make it far more attractive.

There is a proposal for a guided busway along the 'Victoria Railway Path' (the cutting leading to the old Victoria station), but this has become a very popular foot and cycle track and local park. The proposal would also not serve either City College or the Norfolk and Norwich Hospital, despite being nearby.

Local rail to light rail in Norfolk and Waveney

Light Rail could allow the local rail lines which radiate out from Norwich to reach the heart of the city and link up, providing the possibility of through services. Trams would replace trains on the local services from Great Yarmouth, Sheringham and Lowestoft and pass along the north side of Norwich Thorpe station and on into the city centre in the street. At Harford, the trams would join the rail lines again, providing services to Diss, Wymondham, Thetford and East Dereham.

The route through Norwich is shown on page 5. Prince of Wales Road and Castle Meadow would be restricted to trams, buses, pedal cycles and essential access traffic. General traffic would use Rose lane in both directions. Red Lion Street would be closed to general motor traffic at Orford Place and tram lines would take over one side of Saint Stephen's Street.

The Saint Stephen's roundabout would be rebuilt as a signal-controlled junction, with

surface-level pedestrian crossings replacing the subways. Trams would cross to Saint Stephen's Road, protected by traffic signals, and continue along Ipswich Road, which would become access only for cars as far as the Outer Ring Road.

Here, trams would run along Lakenham Road and turn south onto Hall Road, where they would have a reserved track on the west side, for easy access by residents. At Harford, the trams would serve the park & ride before joining the Thetford and Diss railway lines.

This scheme would provide a crucial link in the region's railway network, allowing through services to run between, for instance, Thetford and Sheringham, Lowestoft and East Dereham, or Diss and Great Yarmouth. See the map on page 8. Running two trams per hour from Sheringham, Yarmouth and Lowestoft would give a tram every ten minutes from Whitlingham, through the city, to Harford.

Power, sensitivity and space-sharing

Light Rail usually runs on electricity, but the cost of electrifying all the lines around Norwich would be prohibitive. Another option is to use trams that can run on both electricity and liquid fuel (diesel). This solution would still allow electric running in the streets of Norwich, eliminating exhaust fumes. Of course the electricity has to be generated at a power station, but pollution is easier to control from a large, single source than from a multitude of exhaust pipes. The presence of overhead wires complements the image of reliability created by the track. Siemens-Duewag has built a light-weight diesel railcar for use in Germany, first on the *Dürener Kreisbahn*, which has aroused interest outside the country too. A version suitable for Light Rail operation (2.65 metres wide) is planned. The existing vehicle, called the RegioSprinter, is pictured below. Belgian firm Bombardier is supplying trams to the new Light Rail system in Saarbrücken and has plans for a diesel/electric version too.

To be part of a sustainable transport system for a historic city like Norwich, a Light Rail line has to be sensitive to the built environment. It must not be built at the cost of demolishing people's homes or removing trees from a street. Light Rail is quite capable of being built to serve the city without cutting a swathe through it. Similarly, it must blend in



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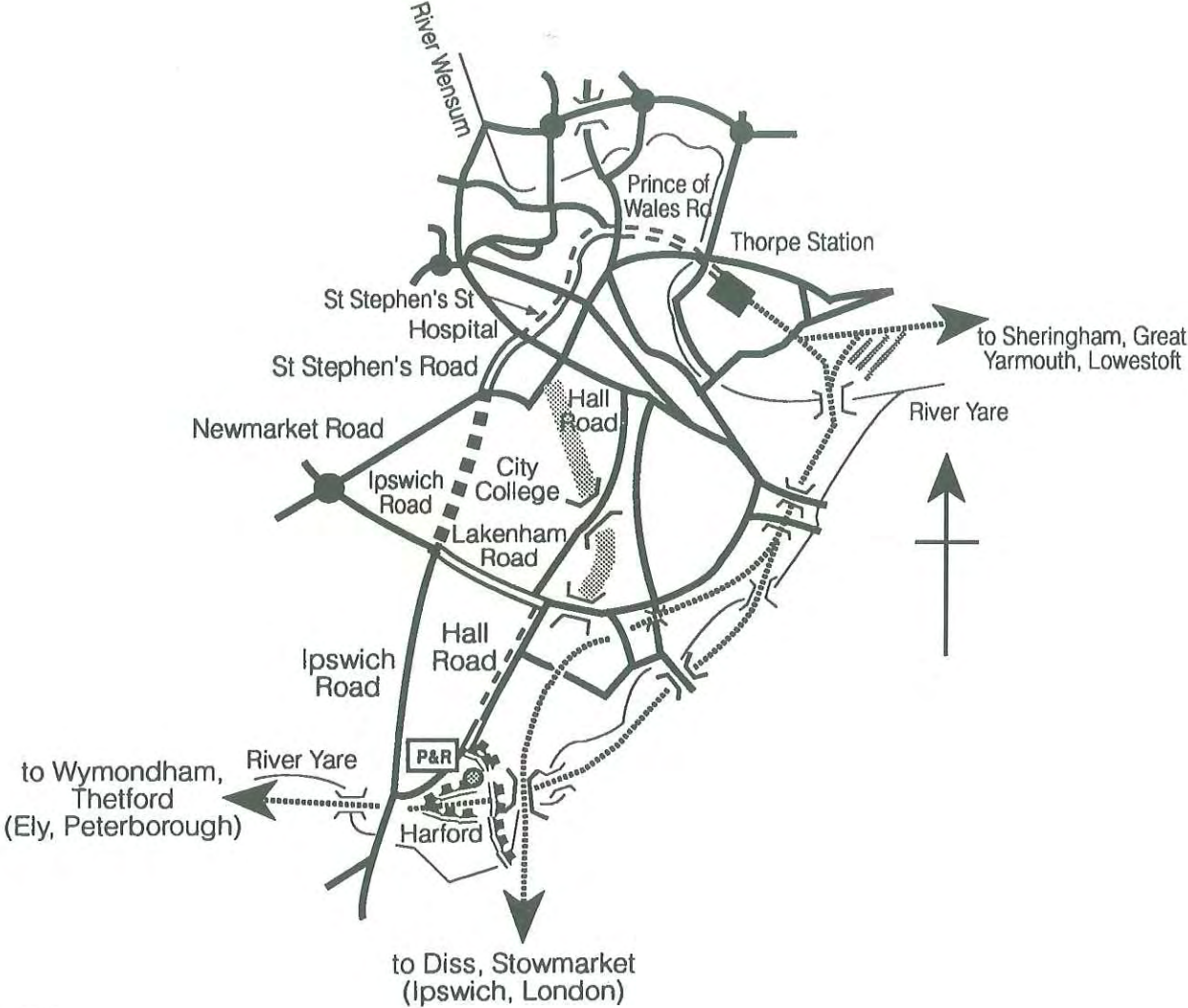
architecturally. Careful design of the poles to hold the overhead power supply is not expensive and the wires would be supported from buildings in many places in Norwich.

Trams can share space with pedestrians very readily, as their path is predictable. Thought must be given to providing space for cyclists alongside the tram, however, as well as to ensuring safe crossing of the tracks.








The trams would also be sharing space with conventional trains and a signalling system, probably Automatic Train Protection, would have to be installed to ensure trams do not come into contact with the trains, both passenger and freight, which will continue to use the railway lines of the region.

Further detail on the technology proposed for this scheme are to be found in the separate Technical Appendix, along with discussion of vehicle and platform design.

A light rail route through Norwich



KEY

-  Unsegregated street track
-  Segregated street track
-  Railtrack Lines
-  Street tracks with buses cyclists & access allowed
-  Street tracks with buses cyclists & loading allowed
-  Own track
-  Cutting

 One Kilometre

 One Mile

Local rail to light rail elsewhere...

There are schemes elsewhere in the U.K. and on the continent where local railway lines are being converted to Light Rail. In addition, there are a number of existing regional Light Rail systems around the world. These two pages show just three of the conversion schemes - others are described in the separate Technical Appendix.

Chris Wood



Manchester Metrolink

The first phase of Manchester Metrolink opened in 1993. Two British Rail lines have been converted to Light Rail operation: those to Bury and Altrincham. The stations on these lines have been adapted for easy access to the trams (*left*). Extensions are planned to the system. Already, it is estimated that between 14 and 50% of journeys to destinations served by Metrolink have transferred to it from the car.

When Metrolink trams reach the old city centre termini of the Bury and Altrincham lines, they continue across the city centre on street tracks. In the process, they link the city's central stations.

In the city centre streets, space is reserved for trams where it is needed (*right*).

The trams provide step-free access through some of their doors, but to do this, so-called profiled platforms have had to be built in the city streets, which are not popular. No other U.K. scheme is to use this arrangement. However, Metrolink provides a massive improvement to the mobility of disabled people compared with the trains and buses it has superseded.



Chris Wood

Chris Wood



The Tyne and Wear Metro

The Tyne and Wear Metro also represented a milestone in access for the whole community when it opened in 1980 (see page 9). It took over local rail lines in Newcastle and the Tyne and Wear conurbation, linking them through the city centre in tunnels, rather than in the street.

The trains are based upon a German Light Rail Vehicle design, but the system is otherwise built to conventional railway standards.

Since it was built, the Metro has been extended to Newcastle Airport and a further extension is planned to Sunderland, which will share tracks with conventional trains on the Railtrack line.

...other railway revolutions

Karlsruhe

The German city of Karlsruhe had a narrow-gauge railway running south out of the city, to Bad Herrenalb (*right*) and Ittersbach. This was taken over by the operator of the city tramway in 1957 and rebuilt to standard gauge, the service being resumed with trams. In 1979, this service was extended north from the city, partly on new track and partly sharing a freight line belonging to the state railway (now called *Deutsche Bahn AG*). Ten years later, the line was extended to serve the towns of Linkenheim and Hochstetten. In Linkenheim, the main street is served by trams on a single track, with through motor traffic excluded and the street traffic-calmed (*below*).

In 1992, Karlsruhe's second railway revolution took place. Trams began operating over *Deutsche Bahn* local passenger lines to neighbouring



Chris Wood

towns and villages, firstly to Bretten, linking into Karlsruhe's city tram network at Durlach. The service has since been expanded to serve Bruchsal, Baden Baden and Wörth am Rhein (*below*). Further extensions are planned, which will lead to many more trams in the central, pedestrianised shopping street of Karlsruhe (*Kaiserstrasse*) and a subway is planned to take the regional trams - but only for use in the peak travel periods.

Deutsche Bahn also uses the special, dual-voltage trams to run its local services to the town of Pforzheim, and still runs its conventional trains on

the same lines as those served by the regional trams (*below right*). The trams are capable of running at a speed compatible with mainline trains (95 km/h) and are separated from them by means of a system of Automatic Train Protection (A.T.P.), whereby a train or tram passing a signal at red would be stopped automatically.

The 'Karlsruhe model' is being applied elsewhere in Germany and beyond. One place adopting this strategy is Saarbrücken, where a brand-new system is being built, linking the city with Sarreguemines on *Deutsche Bahn* tracks, as well as to Lebach on a disused railway line, as a first stage.

As in Karlsruhe, the Saarbrücken trams will be capable of running on 750 V d.c. in the street and 15 kV a.c. on railway lines. Unlike Karlsruhe,

Saarbrücken will have trams with partial low-floors (in a similar layout to that used in Sheffield), to allow access for disabled people. The manufacturer, Bombardier, is also planning a version of this tram for smaller towns, capable of running on either electricity or diesel.

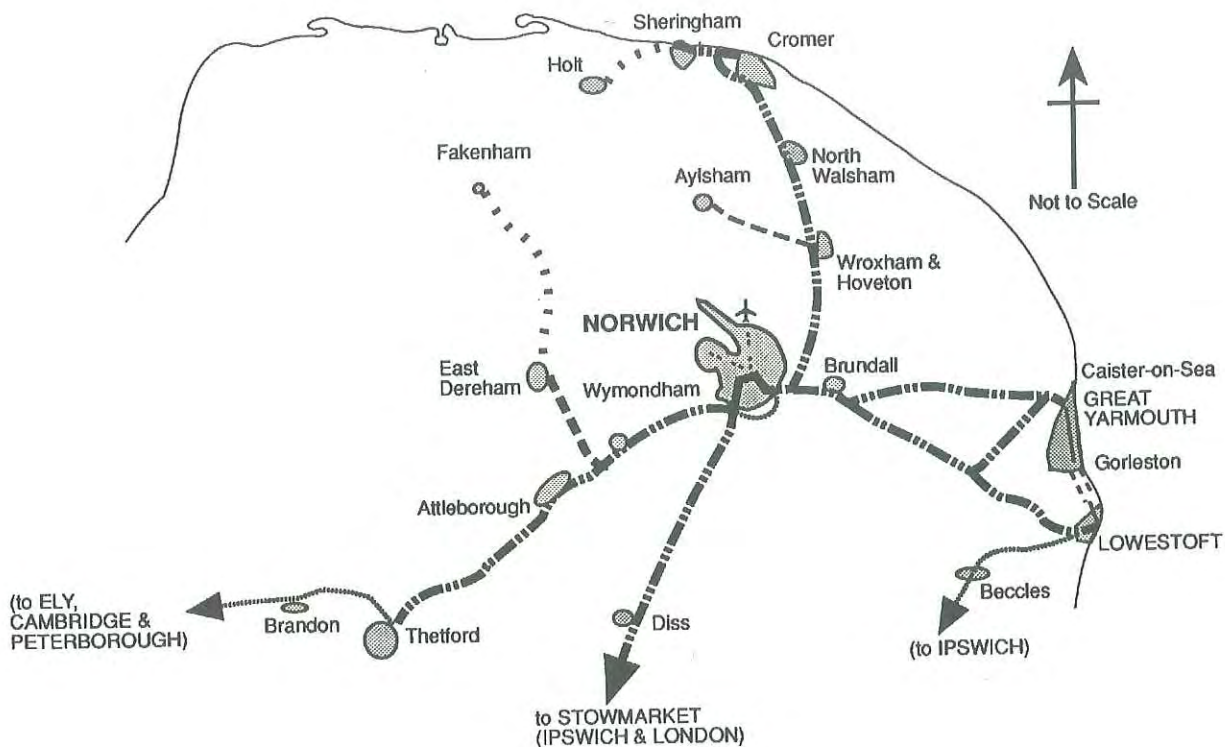


W. Vögele

M.R. Taplin



Potential light rail routes in Norfolk and Waveney



KEY	Type of line	This Proposal	Possible Extensions
	Street-running light rail		
	New light rail line		
	Light rail on Railtrack line		
	Light rail on private line		
	Other Railtrack line with passenger service		
	Other private line		

Typical journey times to Saint Stephen's Street (minutes)

From	Without new stations	With maximum new stations	Today
Diss	34	41	37*
East Dereham	42	48	45**
Great Yarmouth	35	37	43
Lowestoft	46	48	54
Sheringham	55	60	73
Thetford	55	57	56
Thorpe Station	7	7	8
Wymondham	26	28	28

* Inter-City train; ** by bus to bus station

Serving everybody's needs

Everybody experiences mobility difficulties sometimes; for many people that experience is permanent and continual. People with a wide variety of disabilities have difficulty using public transport today, whether because of the lack of step-free access to trains, stations or buses, or because information is not available in forms that, for instance, blind or deaf people can use.

It is imperative to ensure that nobody is unable to get around because of disability. Public transport, especially any new system, has to be designed for maximum accessibility. This not only helps disabled people, it makes using public transport easier and more attractive for everybody.

Light Rail is particularly well suited to this challenge, with its track to guide it into proper alignment with platforms, the near-standard provision of low floors in new trams and the smooth ride, to name but a few features.

The Tyne and Wear Metro (*right*) has opened up great travel opportunities for disabled people in and around Newcastle since its opening in 1980 (see page 6). As it does not run in the street, high-level platforms are used, which align with the train floors.



Chris Wood

There has been a veritable boom in low-floor trams over the last ten years. Here, the tram floor has been brought down to the level of the boarding platform (around 350 mm), rather than the platform being raised. The trams of the French cities of Grenoble, Rouen and Paris (*left*) have low floors for most of their length. Other designs have low-floors for their entire length, such as that first produced for the German city of Bremen (see back cover) or the British-built trams in Strasbourg (France). Britain's second modern tramway, in Sheffield, uses trams with two separate low-floor sections, allowing conventional axle arrangements to be used, although the design is less than ideal.

The current Siemens-Duewag RegioSprinter,



Chris Wood

(described on page 4) is not low-floor by the above standard, but it has most of its floor at the level of the typical continental railway station platform, which is lower than that in Britain. Assisted by a ramp, the RegioSprinter can therefore give step-free access (*right*).

A low-floor design is to be recommended for the Norwich-area scheme, especially as the trams will run in the street. This means that extra platforms would be needed at the existing Railtrack stations, although it might be possible to lower existing ones in some cases where other passenger trains will not use them.



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How can it be done and how much would it cost?

A quality transport system does not come cheap, but the scheme proposed here represents good value for money, as part of a package of measures designed to reduce dependence on the car and promote alternative means of getting about. The Light Rail scheme would provide a high-quality, attractive centrepiece to the Norwich region's transport network.

It can also be seen as a first step - Light Rail could one day provide other attractive links, such as between Lowestoft and Great Yarmouth, or perhaps a service to Holt in co-operation with the North Norfolk Railway.

However, the system as shown in the maps on pages five and eight represents the current proposal. It would link services from Sheringham, Great Yarmouth, Lowestoft, Diss, Thetford and East Dereham through the streets of central Norwich.

A full cost breakdown is to be found in the separate Technical Appendix, but the system outlined above, if built in one go, would cost in the region of £116 million (1994 prices)*. This actually represents very good value for money, covering a total of 204.4 route kilometres, for £0.56 million per kilometre. To put this in perspective, the 'improvement' of the Wymondham-Besthorpe section of the All trunk road cost £1.9 million per kilometre and the A12 Gorleston Relief Road cost £4.32 million per kilometre.

Furthermore, there is no reason why the system should not be built in stages, so spreading the cost over a number of years, rather like the current programme of providing park & ride sites around Norwich. There are various sources of funding on which such a scheme as this might draw, both public and, potentially, private.

** Certain costs are unknown, particularly for viaducts at Harford and the A.T.P. signalling system. The other costs involved have therefore been estimated generously to compensate, for instance all conceivable new stations have been included in the costing.*

A suitable way for this scheme to be furthered would be for a partnership to be formed to promote it. This partnership should have constituents from the public, private and voluntary sectors. It should also ideally involve the principal public transport operators (rail and bus) in the Norwich area.

Most of the existing track over which the Light Rail system would operate is owned by Railtrack, except the Wymondham-Dereham line, which is being sold by the British Rail Property Board, and on which the Mid-Norfolk Railway is interested in running a service.

Whilst other recent Light Rail schemes in the U.K. have been promoted as stand-alone projects, it would be ideal for the Norwich Area Light Rail system to become part of the Anglia rail franchise, with co-operation from other bodies where appropriate.

There is scope for fruitful co-operation between interested parties to promote a successful regional Light Rail network in Norfolk and North-East Suffolk, that is popular, attractive and integrated with other public transport, walking and cycling, with strong community involvement.

The Light Rail Transit Association has made a first step in this process. A consultation report was sent out to fifty organisations with a potential interest in the scheme at the end of 1994. Replies were received from twenty organisations (listed on page 12), covering the range of types of body contacted: operators, local authorities, travellers associations, environmental and transport campaign groups.

Norfolk County Council has asked the affected district-level councils whether they would be interested in forming a working group to investigate further the ideas presented in this report. At the time of writing, the results of this enquiry are not known. The L.R.T.A. looks forward to co-operating with any interested organisations or individuals.

Bikes too!

As environment-friendly as Light Rail may be, the pedal cycle is still the most environmentally benign vehicle. For this reason alone, it is important that public transport co-operates with and does not hinder the promotion of the bicycle.

Furthermore, providing for cyclists in association with public transport can extend the system's catchment area significantly and attract more people out of their cars.

Firstly, it is important to provide for cycle parking at all Light Rail stations. The picture (right) shows cycle parking at the tram and bus interchange outside the central railway station in the Swedish city of Gothenburg.

There are three levels of cycle parking provision: short-, medium- and long-term. The longer the cyclist is to be away from their bike, the more secure the parking facilities need to be. The U-shaped 'Sheffield' stand is adequate for short-term parking, but enclosed, locked provision is needed for longer term storage. Individual cycle lockers can be used, but a staffed cycle park is by far the best solution, especially if, like the Dutch and Danish station 'Cycle Centres', or the 'Bike Park' in central London, staff carry out repairs, deal with cycle hire and sell bikes and accessories.



Chris Wood

Secondly, the train and the bike should provide the ideal combination for longer journeys, with the cycle carried on-board the train. This applies equally to regional Light Rail services. Each tram should have flexible space designed in to allow carriage of several cycles, especially at peak commuting times. The picture (left) shows the arrangement for cycle carriage on the Siemens-Duewag



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RegioSprinter (see page 4). This arrangement is far from ideal, as many cyclists cannot lift their bikes into a vertical position and it cannot accommodate three-wheelers or tandems, but it does demonstrate the willingness of manufacturers to provide for cycle carriage.

Thirdly, when running in the street in mixed traffic, trams must not make cycling difficult. Unless the road is very narrow, the tracks should be positioned in the centre of the carriageway so as to provide space for a cycle lane, as in Amsterdam (right). Where the road is too narrow to allow this, traffic should be restricted and tram speeds kept low, or an equally good cycle route should be provided. Care must be taken in track positioning to ensure the grooves are not a hazard.



Chris Wood

Recommendations

This report has set out a proposal for revolutionising local rail services around Norwich: converting them to Light Rail and linking them, perhaps incrementally, through the streets of Norwich. There is much work to be done in planning, consultation and partnership building. The following recommendations are designed to move that process forward.

- 1 The statutory interests (especially Railtrack, the Office of Passenger Rail Franchising, Norfolk and Suffolk County Councils and Norwich City Council) should convene a working party to take forward the idea of Light Rail conversion of Eastern Norfolk's and North-East Suffolk's local rail services. This working party must include sympathetic operators, local government at all levels, the voluntary sector (community, disability, environment, amenity, cycling & public transport lobby groups, and railway preservation bodies) and sympathetic local business interests.**

- 2 This working party should carry out (or have carried out) a detailed feasibility study of the above proposals, including analyses of the potential for phasing implementation and for dual-mode (electric/diesel) vehicles.**

- 3 The scheme should be included in future Structure Plan reviews and Transport Policies and Programme submissions.**

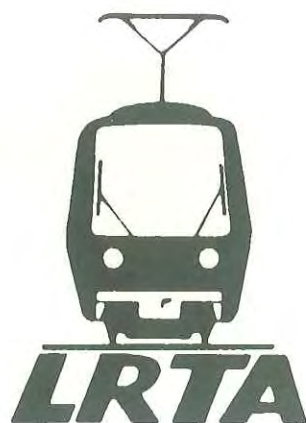
- 4 The street route through Norwich, the links from this to the railway lines, and the former/potential station sites should be protected as soon as possible to prevent development that might make these uses difficult or impossible, and to encourage uses likely to benefit from adjacent, high-quality public transport. Facilities for the existing bus services along the street route should be improved in the interim period.**

Comments

East Anglia Area Light Rail Transit Association particularly welcomes any comments readers of this brochure and the Technical Appendix may have. Please contact the author (see inside front cover). We wish to take this scheme forward in co-operation with the community; we would welcome any support in this.

The following organisations took the trouble to respond to our consultation report (first distributed at the end of 1994). Most of their responses were positive, all of them were useful. We would like to thank them and look forward to co-operating with these and other organisations and individuals in the development of a sustainable transport strategy for the Norwich region.

Anglia Railways, Breckland Line Users Association, Borough of Great Yarmouth (Dept. of Planning & Development), Broadland District Council (Forward Planning), The Broads Society, East Suffolk Travellers' Association, Ipswich & Suffolk Transport 2000, Mid-Norfolk Railway Society, Norfolk Friends of the Earth, Norfolk Green Party Metro Campaign, Norfolk Rural Community Council, The Norfolk Society, Norfolk Transport 2000, Norwich Road Action Group, Railtrack East Anglia, Rail Users' Consultative Committee (Eastern England), Railway Development Society, South Norfolk Council (Planning Dept.), Waveney Transport 2000, The Yare Valley Society.



About the L.R.T.A.

The Light Rail Transit Association was founded in 1937 to advocate modern tramways and urban light rail.

Registered national office:

Albany House, Petty France, London SW1H 9EA

It publishes the monthly colour magazine

Light Rail and Modern Tramway,

which is sent free to all members.

Membership details can be obtained from:

Hon. Membership Secretary

23 Shrublands Close, Chigwell, Essex IG7 5EA

The L.R.T.A. has a network of regional groups, called Areas, which organise meetings and other events locally.

The contact point for East Anglia Area is the Area Officer:

John Woods

89 Welsford Road, Norwich NR4 6QE



*A Proposal from
the East Anglia
Area of the Light
Rail Transit
Association*