THE DEPARTMENT OF TRANSPORT

2707

LIGHT RAPID TRANSIT SYSTEMS

A BRIEFING NOTE BY THE PUBLIC TRANSPORT METROPOLITAN DIVISION OF THE DEPARTMENT OF TRANSPORT - MAY 1992

1. This note provides general background information on light rapid transit systems, including light rail, tramways and guided buses. It is produced in response to the many requests received for information on the subject and replaces the previous version dated November 1991.

Light Rapid Transit

2. A "rapid transit" system is a method of public passenger transport which uses a special infrastructure to give a greater capacity and/or more rapid movement of people than can be achieved by using buses on ordinary roads.

3. Rapid transit systems are categorised as "heavy" or "light" in terms of the capacity to carry passengers rather than in the weight of the equipment. Heavy rapid transit systems are frequent-interval electrified railways and include the London and Glasgow Undergrounds. Light rapid transit systems include light rail, tramways, monorails, guideways, peoplemovers and guided buses. This note deals with the systems in that order and follows with trolleybuses, other related systems and museums. A further note on definitions is at **Annex** 1.

4. It is possible, starting from a position of buses running in traffic on ordinary roads, for systems to be upgraded: where space allows, buses can run on exclusive roads (eg Runcorn busway) or, particularly where clearances are restricted, can be converted to operate on a guided system (eg as proposed in Leeds). Busways can be converted to light rail (eg Nantes) and guided bus systems could be considered as a first stage to light rail, particularly where electric traction is involved (eg GLT system). Many tramways have gradually been converted to light rail standards (eg Hannover, Karlsruhe) and others have had trunk lines modernised to a 'pre-metro' stage and then by a change of rolling stock have been converted to heavy rapid transit (eg Stockholm, Vienna and Brussels). Developments are also taking place on through-running between mainline railways and light rail systems; further details may be obtained from British Railways, LRT Project Group, 'Meridan', 85 Smallbrook Queensway, Birmingham B5 4HX.

Light Rail

5. The traditional electric street tramway, whilst virtually eliminated in the United Kingdom, has been developed and modernised in many other countries into a form of light rapid transit known as light rail. It continues the flanged steel wheel on steel rail tramway/railway technology and has the ability to fit into existing street patterns either by sharing roads with other traffic or by using its own reserved tracks. An overhead electric power supply with pantograph pick-up is normally employed, but conductor rails can be used for entirely segregated systems (eg Docklands Light Railway). In capacity terms it lies between heavy rapid transit and bus services but overlaps both of those modes to the extent that it can replace both local railway services and heavily-used bus arteries. Although technical standards can vary between

operators, light rail is a common system in worldwide use and operators are able to take advantage of competitive tendering for the equipment. Further details about light rail systems may be obtained from the Light Rail Transit Association, Albany House, Petty France, London SW1H 9EA, or from the Light Rail Commission of the International Union of Transport (UITP) Avenue de L'Uruguay 19, B-1050 Brussels, Belgium.

Light Rail Vehicle (LRV)

6. The light rail vehicle or modernised tramcar is typically an electrically powered, capacious, articulated vehicle, well able to traverse sharp curves and steep gradients and possesses the technical requirements (braking, acceleration, lighting etc) of other road vehicles; being track-bound and clean it is particularly appropriate for serving pedestrianised areas in city centres. A steady, smooth and quiet ride quality is welcomed by passengers and recent low floored designs of LRV, which incorporate same-level access, enable mobility-impaired people to use public transport with ease.

Light Rail/Tramway Systems

7. There are 323 urban light rail/tramway systems in operation in the world and 11 systems under construction. Listed by country and number of systems they are (with those under construction in brackets): Argentina 1 : Armenia 1 : Australia 2 : Austria 5 : Azerbaijan 2 : Belgium 5 : Brazil 3(1) Bulgaria 1 : Byelorussia 2 : Canada 4 : China 3 : Croatia 2 : Czechoslovakia 10 : Egypt 4 : Estonia 1 Finland 1 : France 5(3) : Georgia 1 : Germany 54 : Hong Kong 2 : Hungary 4 : India 1 : Italy 5 : Japan 19 : Kazakhstan 4 : Latvia 3 : Mexico 3 : Netherlands 4 : Norway 2 : North Korea 1(1) : Paraguay 1 : Philippines 1 : Poland 13 : Portugal 2 : Romania 14(1) : Russia 77(1) : Spain 1 : Sweden 4 : Switzerland 7 : Tunisia 1 :Turkey 2 : Ukraine 23 : UK 4(1) : USA 15(3) : Uzbekistan 1 : Yugoslavia 2.

New Light Rail systems

8. Included in the figures in paragraph 7 are 41 new light rail systems constructed since 1978 and together with the 11 under construction (in brackets) they are: Argentina - *Buenos Aires* : Brazil - *Campinas, Rio de Janeiro, (Salvador)* : Canada - *Calgary, Edmonton, Vancouver* : Egypt - *Helwan* : France - *Grenoble, Nantes, (Paris), (Rouen), (Strasbourg)* : Hong Kong - *Tuen Mun* : Italy - *Genova* : Mexico - *Guadalajara, Monterrey* : Netherlands - *Utrecht* : North Korea - *(Daesong), Pyongyang* : Philippines - *Manila* : Romania - *(Botosani), Brasor, Cluj, Constanta, Craiora, Ploeisti, Resita* : Russia - *Krasnoarmeisk, Mosyr, Stary Oskol, (Togliatti), Ust-Ilimsk* : Spain - *Valencia* : Switzerland - *Lausanne* Tunisa - *Tunis* : Turkey - *Istanbul, Konya* : UK - *London Docklands, Manchester, Newcastle-on-Tyne, (Sheffield)* : USA - *(Baltimore), Buffalo, (Dallas), Detroit, Los Angeles, Portland, Sacremento, (St Louis), San Diego, San Jose.*

British Light Rail systems

9. The three operating light rail systems are: (i) Tyne and Wear Metro, (ii) Docklands Light Railway and (iii) Greater Manchester Metrolink. (The fourth system included in the list of systems in paragraph 7 is the Blackpool tramway.) In addition the South Yorkshire Supertram is under construction. Details of British Light Rail schemes, including proposals, are at **Annex 2.**

Manufacturers of Light Rail Systems

10. Light rail is a non-proprietary system and there are many manufacturers of systems, vehicles and components worldwide. Information may be obtained from reference publications and from the technical

press. Further information may be obtained from the Department of Trade and Industry, 151 Buckingham Palace Road, London SW1W 9SS, or from the Railway Industry Association, 6 Buckingham Gate, London SW1E 6JP.

British Tramways

11. Tramways were first introduced into this country, at Birkenhead, in 1860. The tramcars were hauled by horses at first, then operated variously by steam, cable, compressed air, batteries and internal combustion engines until most systems were electrified, commencing in 1885 at Blackpool (conduit system) and in 1891 at Leeds (overhead wire system). British tram systems reached their peak in the 1920s with about 15,000 tramcars and over 100 systems but they were then replaced by trolleybuses and buses. The largest cities finally withdrew their trams in 1949 (Manchester), 1950 (Cardiff and Newcastle), 1952 (London), 1953 (Birmingham), 1954 (Belfast), 1956 (Edinburgh), 1957 (Liverpool), 1959 (Leeds), 1960 (Sheffield) and 1962 (Glasgow). Further details on the history of tramways may be obtained from the National Tramway Museum, Crich, near Matlock, Derbyshire, DE4 5DP. The following are the surviving tramways in the British Isles:

(a). **Blackpool**. A 18.5 km standard gauge tramway, mainly on reserved tracks, operates daily from Starr Gate, Blackpool to Fleetwood. There are over 80 tramcars including double-deck, single-deck and open-top types, of varying ages ranging from modern British-built vehicles to turn-of-the century museum pieces. The tramway is operated by Blackpool Transport Services Ltd, the local public transport company which also operates bus services. The tramway itself (but not the vehicles) is owned by Blackpool Borough Council. Further details may be obtained from Blackpool Transport Services Ltd, Rigby Road, Blackpool, Lancs FY1 5DD

(b). **Isle of Man**. The Manx Electric Railway (3 ft gauge) and the Snaefell Mountain Railway (3 ft 6 in gauge) operate over 50 tramway-type vehicles between Douglas, Laxey (for Snaefell) and Ramsey on 36.2 km of reserved tracks. In addition Douglas Corporation operate about 30 horse trams in the summer on its 2.8 km sea-front (3 ft gauge) line. Further details may be obtained from Isle of Man Transport, Terminus Building, Strathallan Crescent, Douglas, Isle of Man.

(c). **Llandudno (Great Orme)**. A 1.5 km tramway (3ft 6in gauge) operates from Llandudno to the top of the Great Orme. The line is in two parts and the lower section incorporates some street running. Four cable-hauled tramcars are operated. Further details may be obtained from Aberconwy Borough Council, Town Hall, Llandudno, Gwynedd LL30 2UY.

Guideways/Peoplemovers

12. These systems are proprietary systems of transport which do not use the flanged steel-wheel on two-steel-rails railway technology. Full automation and elevated rights of way are common features of these systems but the supporting structures, necessary to avoid level crossings, can give rise to environmental problems.

13. Guideway systems use horizontal guide-wheels bearing against vertical guides on each side of the track, with special arrangements for electrical pick-up and to guide the vehicles through junctions. Lines of this type operate in France (Lille, Paris-Orly), Japan (several places) and the USA (Texas). There are also peoplemover shuttles at many airports worldwide, including Gatwick and Stansted. Manufacturers of guideway systems include AEG-Westinghouse (AGT system) of Pittsburgh USA; Briway Transit Systems (Bricar system) of Cranleigh, Surrey; Kawasaki Heavy Industries (Portliner system) of Tokyo,

Japan; Matra Transport (VAL system) of Montrouge Cedex, France; Nigata Engineering (AGT system) of Tokyo, Japan; and Nippon Sharyo (Voria system) of Tokyo, Japan.

14. Other peoplemover systems operate on a horizontal elevator or lift system (Otis shuttle system manufactured by Otis of Farmington USA) or by cable haulage (SK system manufactured by Soulé of Bagnères-de-Bigorre, France; and Poma 2000 System manufactured by Poma of Puteaux, France).

15. Beam monorails are similar to guideways but the vehicles straddle the track. Lines of this type operate at Merryhill in the West Midlands, in Australia (Sydney), Japan (several places) and the USA (Seattle). In addition shuttles operate in airports and in various pleasure centres (eg Alton Towers, Blackpool Pleasure Beach, Chester Zoo, National Motor Museum (Beaulieu) and in Disneyworlds). Methods of monorail systems employed include the Safege and Alweg types and current manufacturers include Bombardier of Orlando, USA; and Von Roll of Thun, Switzerland.

16. Magnetic levitation (MAGLEV) is an electromagnetic support and guidance system and a line of this type operates at Birmingham Airport. Trials have also taken place in Berlin and a system is under construction in Las Vegas. Manufacturers of MAGLEV systems are AEG Westinghouse (M Bahn system) of Starnberg, Germany; and GEC Alsthom of Manchester. The system is being developed for longer distance journeys in the USA, Germany and Japan.

17. Suspended peoplemovers are similar to beam monorails but the vehicles hang below an elevated guideway. Lines of this type operate in Dortmund, Germany and the USA (various places). Manufacturers include Siemens (H Bahn system) of Erlangen, Germany; and Titan (Astroglide System) of New Jersey, USA. Similar in concept but using tramway technology are the hanging railways (Schwebebahnen) in Wuppertal and Dresden, Germany.

Guided Buses

18. Guided bus systems use conventional buses adapted to run on a guideway. These buses can revert to normal street operation for other sections of their route. The use of articulated buses to increase capacity, of electric (trolley) buses to operate in tunnels, and of dual-powered buses (duobuses) to combine guided electrical operation and on-street diesel operation is also possible.

19. There are three basic guided bus systems:

(a). The first method uses a mechanical guide system to guide the buses by horizontal guide wheels which engage with a rail or deep kerb on each side of the busway. The guide wheels are linked to the vehicle's steering. Known as the O-Bahn system, it is in operation in Australia (Adelaide) and Germany (Essen). A similar system, known as 'Tracline 65' was installed in Streetly Road, Birmingham by the West Midlands PTE and operated by normal double deck buses fitted with guide wheels. However the bus operator which tendered successfully for the evening and weekend service did not have buses equipped to use the guideway so to avoid confusion for passengers the experiment was terminated. Further information may be obtained from West Midlands PTE (Centro), 16 Summer Lane, Birmingham B19 3SD.

(b). The second method uses a guide rail or rails in the road surface. Systems include the guided light transit (GLT) system promoted by Bombardier-BN of Belgium. The GLT vehicle (an articulated single deck bus) is guided by a single central rail (with grooves both sides) installed in the road or by a single rail when on reserved track (together with roadways required by the tyres). The guidance mechanism follows the rail and is connected to the vehicle's steering. The GLT

vehicle is electrically driven from a light rail/tramway type overhead system with electrical return via the guiderail. In addition a diesel generator provides power for off-wire operation. A double articulated version of the GLT vehicle is 2.6m wide, 24.6m long and weighs 26 tonnes. Two vehicles operate a summer service in Rochefort (Belgium). Another similar system is the Briway Transit "Britram" in which the vehicle is guided by a single central flanged wheel following a centre grooved rail (or closely spaced pair of rails). As so far developed, an electrically driven vehicle, taking power from an overhead tramway type electric supply with earth return through the guide wheels (but with the weight carried by pneumatic tyres) is envisaged, using single deck articulated vehicles. The promoters have a Britram guideway test track in operation.

(c). The third method uses guidance from electric wires or cables buried beneath the road surface. Experiments concerning this system have been carried out in Germany, in the USA and at the Transport and Road Research Laboratory. Further information on the system may be obtained from the Laboratory at Crowthorne, Berks RG11 6AU.

20. There are several proposals for guided bus schemes in Great Britain and Government funding has been announced for bus priority measures including guided bus schemes. As part of these measures approval for development work for the infrastructure for a feasibility study into a scheme for York Road, Leeds has been approved. The current position is outlined in **Annex 3**.

Trolleybuses

21. The system is related to rapid transit systems particularly when trolleybuses are equipped so as to run as guided buses (eg Essen). Trolleybuses are often articulated single deck vehicles and they can be fitted additionally with diesel engines for off-wire use (eg Nancy). Vehicles so equipped are usually referred to as "duobuses". Trolleybuses can be coupled together and run in multiple (eg St Petersburg and Kiev) or haul trailers (eg Lausanne and Montreaux). The rapid acceleration, quietness and emission-free qualities of trolleybuses can be can be particularly effective where steep hills are encountered.

22. Although trolleybuses last ran in the UK in 1972 (in Bradford), 354 systems are in operation overseas with 20 systems under construction. Listed by country and number of systems they are (with those under construction in brackets): Afghanistan 1 : Argentina 3 : Armenia 2 : Austria 4 : Azerbaijan 4 : Belgium 1 : Brazil 7(2) : Bulgaria 12(10) : Byelorussia 7 : Canada 4 : Chile 1(1) : China 27 : Columbia 1 : Czechoslovakia 14(1) : Estonia 1 : France 6 : Georgia 13 : Germany 7(1) : Greece 2 : Hungary 3 : Italy 13(4) : Japan 1 : Kazakhstan 7 : Kirghizia 2 : Latvia 1 : Lithuania 2 : Mexico 2 : Moldavia 3 : Mongolia 1 : Nepal 1 : Netherlands 1 : New Zealand 1 : North Korea 8 : Norway 1 : Poland 6 : Portugal 2 : Romania 10 : Russia 88(1) : Switzerland 15 : Tadzhikistan 2 : Turkey 1 : Turkmenistan 1 : Uruguay 1 Ukraine 48 : USA 5 : Uzbekistan 8 : Vietnam 1 : Yugoslavia 2.

23. There has been a revival of interest in these vehicles in the British Isles and the South Yorkshire PTE has obtained Parliamentary powers to operate trolleybuses in Doncaster and Rotherham; one experimental trolleybus, jointly sponsored by the PTE, Balfour Beatty, GEC and Insul-8, is being tested at Doncaster. Further details may be obtained from South Yorkshire PTE, Exchange Street, Sheffield S2 5SZ. The West Yorkshire PTE has powers to operate trolleybuses in Bradford and the Department of Transport has agreed to provide credit approvals to cover the cost of the infrastructure (overhead system and power supply) of an experimental route from central Bradford to Buttershaw. Further details may be obtained from West Yorkshire PTE (Metro), Wellington House, 40/50 Wellington Street, Leeds LS1 2DE. General information about trolleybuses may be obtained from the National Trolleybus Association, 10 Compton Close, Flitwick, Beds MK45 1TA.

Other Systems

24. Short tramways or railways operated by tramway-type vehicles operate at Seaton (miniature tramway); Brighton (Volks Electric Railway); Hythe, Hampshire (pier tramway); and Shipley Glen, Bradford (cable tramway). There are other funicular lines and pier railways of various types throughout the country and they employ their own distinctive rolling stock. A heritage tramway is under construction in the Wirral and plans also exist for other lines in Gloucester and Swansea. In other countries there are many rural tourist and heritage tramway type lines, including some which use the rack system in hilly areas.

Museums

25. The National Tramway Museum operates a tramway museum at Crich (Derbyshire). In addition preserved tramcars operate at Heaton Park (Manchester) and in museums at Beamish (County Durham), Carlton Colville (Suffolk), Coatbridge (Strathclyde) and Dudley (West Midlands). Preserved trolleybuses also operated at Sandtoft (Humberside), Carlton Colville and Dudley. Similar museum operations take place in other countries notably in the USA, most European countries and in Australia/New Zealand.

Further Information

26. Reference books which include light rapid transit systems provide detailed information on systems and manufacturers: Examples are "Janes Urban Transport Systems" published by Janes Information Group, Coulsdon, Surrey; "Railway Directory" published by Railway Gazette International, Haywards Heath, Sussex; and "Rapid Transit Monitor" published by the Transport Advisory Service, Preston, Lancs. The fourth report of the Transport Committee of the House of Commons (The Light Rail Option) and the third special report of the same Committee (Government observations), both published by HMSO, also cover the subject in depth. Technical magazines such as "Coach & Bus Week"; "International Railway Journal"; "Light Rail & Modern Tramway"; "Light Rail Review"; "Modern Railways"; and "Rapid Transit and Urban Transport International" all report the current developments of the various form of light rapid transit.

27. Further advice on light rapid transit systems including funding arrangements, legal and safety matters are available from the Department or from HM Railway Inspectorate, Baynards House, 1 Chepstow Place, Westbourne Grove, London W2 4TF. Further copies of this paper are available from PTM Division, Room S15/07, Department of Transport, 2 Marsham Street, London SW1P 3EB (Telephone number 071-276 4997). Please send comments and contributions to E. C. Dawes at the same address.

DEFINITIONS

Definitions of the types of railed or guided forms of public transport are generally indistinct, and different countries view the situation in their own ways. The various forms can merge from one to another, even within the same system. In addition terms such as 'Metro' and 'Supertram' are used in a presentational way rather than with any direct legal or engineering significance and overlap the definitions to some extent. The following is offered as a tentative guide:

Railway

In the UK section 67 of the Transport and Works Act 1992 defines a railway as meaning a "system of transport employing parallel rails which - (a) provide support and guidance for vehicles carried on flanged wheels, and (b) form a track which either is of a gauge of at least 350 millimetres or crosses a carriageway (whether or not on the same level), but does not includes a tramway". This definition encompasses the normal urban and interurban railway as operated by mainline railway operators carrying both passengers and freight. New passenger rolling stock is built at least to UIC (International Union of Railways) standards and requires compatibility of buffing and drawgear.

Heavy Rapid Transit

Similar technically to a conventional railway, but usually understood to mean a high capacity, frequent interval, electric, mainly segregated, urban railway, often underground and using heavy duty rolling stock. Some French-built rubber-tyred Metro systems of this type use guideway technology. Systems have full signalling and conventional stations with platforms.

Light Rapid Transit

A guided transit system used for the carriage of passengers where the characteristics of the vehicles do not conform to those of main line railways. Light rapid transit includes the following systems:

Light Rail (or Light Rail Transit). A light rapid transit system employing flanged steel-wheel on steel-rail railway technology: It has been developed technically from the tramway. The light rail vehicles are lighter than normal railway or heavy rapid transit rolling stock and if adapted can run in the street, where legally in Great Britain they become tramcars. In practical terms the dividing line between "heavy rail", "light rail" and a "tramway" is indistinct but the term "light rail" has come to mean a new system with all the best features of a modernised tramway. The UITP definition of light rail is "A rail-borne form of transport, which can be developed in stages from a modern tramway to a form of transport operating underground or on viaducts. Each stage of development can be the final stage, but should permit further development to the next higher stage."

Tramway. In the UK section 67 of the Transport and Works Act 1992 defines a tramway as meaning "a system of transport used wholly or mainly for the carriage of passengers and employing parallel rails which - (a) provide support and guidance for vehicles carried on flanged wheels, and (b) are laid wholly or mainly along a street or in any other place to which the public has access (including a place to which the public has access only on making a payment)". Although the same technically as light rail, tramways are understood to be traditional street-based

systems using rails flush with the road surface. The vehicles used are tramcars or in North America, streetcars.

Tramroad. Parts of a tramway system where (ballasted) railway type track is used. These sections cannot be used by other vehicles.

Guideways (Peoplemovers). Proprietary systems of transport which do not use the flanged steel-wheel on two-steel-rails railway technology. Systems include monorails, maglevs, hanging railways (Schwebebahnen) and other guided transit systems. If automatically driven they are known as AGT (Automatic Guided Transit) or VAL (Véhicule Automatique Léger). In the UK section 67 of the Transport and Works Act 1992 defines guided transport as "transport by vehicles guided by means external to the vehicles (whether or not the vehicles are also capable of being operated in some other way)".

Guided buses. Normal buses adapted to be guided for part of their journey either (a) by horizontal guide-wheels bearing against rails/deep kerbs in a bus-only road, (b) by guides/rails in the road surface or in a bus-only road or (c) remotely from wires or cables buried beneath the road surface. When in the guided mode they would be considered as being "guided transport" and covered by the Transport and Works Act definition above.

Trolleybuses

Buses which are electrically driven; their power is collected by trolley poles from a twin overhead contact wire system. They can also be operated in guided mode. Section 67 of the Transport and Works Act 1992 defines a trolley vehicle system as "a system of transport by vehicles constructed or adapted for use on roads without rails under electric power transmitted to them by overhead wires (whether or not there is in addition a source of power on board the vehicles);".

NB: Not included above are "light railways" of the heritage or miniature variety so called because they were authorised by Light Railway Orders. It should be noted that some British electric tramways were authorised by Light Railway Orders (as was the Seaton miniature tramway) and although legally light railways they were to all intents and purposes tramways. In England and Wales the Light Railway Order system will shortly be replaced by the procedures under the Transport and Works Act 1992.

ANNEX 2

BRITISH LIGHT RAIL SYSTEMS

1. This annex provides brief details of British light rail systems in operation or under construction, with parliamentary authorisation, seeking parliamentary authorisation or being planned.

2. It should be noted that unless otherwise mentioned all systems are, or are planned to be, built to the *usual light rail standards* i.e to 1435mm (standard) gauge, with 750v dc overhead electrical equipment and with level access for mobility impaired people. The systems are, or will be, operated by manually driven light rail vehicles (LRVs) of the articulated, double-ended type, capable of running together in multiple and able to run with other traffic on-street.

Light Rail systems in operation

Tyne and Wear Metro

3. (a) The Tyne and Wear Metro is owned and operated by the Tyne and Wear Passenger Transport Executive (PTE).

(b) The Metro is a high platform, 1500v d.c overhead electric light rail system. No street running is involved.

(c) The system is 58.5 km long and serves 46 stations. Ex-BR lines were taken over and joined by 13 km of new construction, mainly in tunnel under Newcastle and Gateshead central areas but partly by the Queen Elizabeth II bridge across the River Tyne. The stations range in scale from large underground complexes in the centre of Newcastle and Gateshead to small wayside halts in outlying areas. The hub of the system is the underground Metro interchange at Monument, where north-south and east-west lines intersect and there is a major interchange with BR at Newcastle Central Station. The stations at Four Lane Ends, Regent Centre, Gateshead and Heworth, which are located on the main highway corridors, include major purpose-built facilities for interchange between Metro and bus services, as well as parking areas for motorists transferring to the Metro. Five other stations - Byker, Wallsend, North Shields, Jarrow and Chichester - also serve as focal points for Metro/bus interchange. The depot and control centre for the system is at Gosforth. A recently opened extension has also linked the system to Newcastle International Airport. Construction of the Metro commenced in 1974 and the system opened in sections as follows: Haymarket-Tynemouth 11 August 1980 (official opening 7 August 1980); South Gosforth-Bankfoot 10 May 1981; Haymarket-Heworth 15 November 1981; St James-Tynemouth 14 November 1982; Heworth-South Shields 24 March 1984; and Bankfoot-Newcastle Airport 17 November 1991.

(d) The Metro rolling stock consists of 90 six-axle, high-floored LRVs derived from the German Stadtbahnwagen B design. The cars are numbered 4001 to 4090 and were built by Metro-Cammell in Birmingham (now GEC-Alsthom) and incorporated Duewag and GEC equipment. They are 27.4m long, 2.65m wide, weigh 39 tonnes, and have a total capacity for over 200 passengers with seating for 84.

(e) The construction cost of the original system was £284m, some two thirds of which was met by Central Government grant. £9m was also received from the European Regional Development Fund (ERDF) for the Heworth to South Shields section. The cost of the Newcastle Airport extension, in excess of £12m, was met by the PTE with a 20% contribution from the ERDF.

(f) An extension to the system is being planned, from Pelaw to Sunderland, possibly via Washington but details have not yet been submitted to the Department.

(g) The following Acts detail the statutory powers for the system: (i) Tyneside Metropolitan Railway Act 1973 (initial system); (ii) Tyne and Wear Passenger Transport Act 1979 (additional measures for the initial system); and (iii) Tyne and Wear Passenger Transport Act 1989 (Newcastle Airport extension).

(h) Further information on the system may be obtained from the Tyne and Wear PTE, Cuthbert House, All Saints Centre, Newcastle-upon-Tyne NE1 2DA.

Docklands Light Railway (London)

4. (a) From 1 April 1992 the Docklands Light Railway (DLR) is owned and operated by the London Docklands Development Corporation (LDDC): Prior to that date it was owned and operated by a subsidiary of London Transport.

(b) The DLR is a high platform, 750v dc under-running third-rail (under-running) electric light rail system. The LRVs normally run automatically under central computer control with a train attendant ("captain") closing the doors and giving the starting signal. Should the automatic control not perform correctly the train captain can drive the train. The existing computer controlled automatic train operation system installed by GEC General Signal Ltd, is being replaced by the SELTRAC system manufactured by Alcatel of Canada, giving a higher capacity and more flexibility.

(c) The DLR at present is 13.5 km long and serves 16 stations (excluding West India Quays, temporarily closed). New construction, ex-BR tracks and old railway formations were used in the system's construction. The initial system consisted of a 3-leg configuration from Tower Gateway and Stratford to Island Gardens at the south end of the Isle of Dogs. The depot and control centre for the system is at Poplar. Since the DLR opened there has been so much new commercial and residential development in Docklands that the original system has had to be rebuilt to cater for longer trains and to accommodate extensions to the system. The first extension runs westwards through twin tube tunnels to Bank in the City of London and connects directly with the London Underground and Waterloo and City lines. Construction of the DLR commenced in 1983 and opened in sections as follows: Tower Gateway/Stratford/Island Gardens 31 August 1987 (line opened by HM the Queen on 30 July 1987); Bank extension 29 July 1991 (first platform) and 28 November 1991 (second platform).

(d) The DLR rolling stock consists of six-axle, high-floored LRVs. The original class P86 cars were numbered 01 to 11 and were built by Linke-Hoffman-Busch of Salzgitter, Germany with electrical equipment by GEC Transportation Projects (now GEC-Alsthom). These cars are unsuitable for running through the tunnels to Bank and have been sold to the Essen (EVAG) transport undertaking in Germany where they will be rebuilt with driver's cabs and run on that city's light rail line. The next ten DLR cars, numbered 11 to 21, are of class P89, were built by British Rail Engineering Ltd at York and allow coupled cars to be run to increase capacity. To operate the Beckton extension (see below) and replace the P86 cars, 70 cars numbered 22 to 91 of classes B90 and B92 (Alcatel ATP fitted) are entering service at the present time. Both classes are being built by Bombardier-BN in Bruges, Belgium, with electrical equipment by Hawker Siddeley. The P86 and P89 LRVs are 28m long, 2.65m wide, weigh 38.4 tonnes and have a total capacity for over 200 passenger with seating for 84; the P90 and P92 LRVs are 28.8m long, 2.65m wide, weigh 39.3 tonnes and have a total capacity for 284 passengers with seating for 70.

(e) The construction cost of the original system was £77m and was funded by London Transport, with Government assistance. The Bank extension and upgrading of the system cost £294m and the replacement

of the automatic train equipment is estimated to cost £26m. Olympia and York, the developers of Canary Wharf, contributed £68m towards these costs.

(f) An 8 km eastern extension of the system from Poplar through the Royal Docks to Beckton is under construction and is due to open at the end of 1992. Eleven new stations are to be served with two more planned to be built as development in the area increases. The majority of the estimated £256m cost is being paid by the LDDC from land sales. A new depot is being provided at Beckton. The second extension is for a 4.5 km line from Island Gardens via a tunnel under the Thames to Greenwich and Lewisham. Parliamentary powers for the extension are being sought at the present. The extension is to be taken forward by the private sector as a design, build, own, toll and transfer concession. The cost is estimated at £130m and subject to Royal Assent the extension could be open by early 1996.

(g) The following Acts and Bills detail the statutory powers for the system: (i) London Docklands Railway Act 1984 (Tower Gateway-Island Gardens); (ii) London Docklands Railway Act 1985 (Poplar-Stratford); (iii) London Docklands Railway (City Extension) Act 1986 (Bank extension); (iv) London Docklands Railway (Beckton) Act 1989 (Beckton extension); (v) London Docklands Railway Act 1989 (North Quay Junction alterations and quadrupling to Canary Wharf); (vi) London Docklands Railway (Lewisham etc) Bill-submitted 1990 (Lewisham extension); and (vii) London Docklands Railway (Lewisham etc) (No 2) Bill-submitted 1991 (further detailed arrangements for Lewisham extension).

(h) Further information may be obtained from the Docklands Light Railway, PO Box 154, Poplar, London E14 0DX

Greater Manchester Metrolink

5. (a) The Greater Manchester light rail system, known as Metrolink is owned by the Greater Manchester PTE. The system is operated by Greater Manchester Metro Ltd. The company is owned by the GMA group, which is a private sector consortium comprising GEC-Alsthom, Mowlem, AMEC and Greater Manchester Buses Ltd. The GMA group successfully bid for the design, build, operate (for 15 years) and maintain franchise.

(b) The Metrolink is constructed to usual light rail standards. Access for mobility impaired people is provided by level access from high platforms on most of the system. At stops on the street running section, the platform is profiled to allow level access at the centre pair of doors.

(c) Phase 1 of the system is 30.9 km long and serves 24 stations/stops. Ex-BR services from Bury to Manchester (Victoria) and from Altrincham to Manchester (Deansgate) have been converted to light rail. The two lines are linked by a street-running section through the city centre, which will also serve BR's Manchester (Piccadilly) Station. The depot and control centre for the system is at Queens Road, Cheetham Hill. Construction of the Metrolink commenced in 1990 and the Bury - Victoria Station section of the system opened on 6 April 1992 followed by the Victoria Station - G Mex section on 27 April 1992. Other sections are due to open as follows: G Mex - Altrincham 1 June 1992; and Piccadilly Gardens - Piccadilly Station in July 1992.

(d) The Metrolink rolling stock consists of 26 six-axle high-floored LRVs (with sliding steps below doors for use at low level stops). The cars are numbered 1001 to 1026 and were built by Firema Consortium Engineering of Italy with electrical equipment supplied by GEC-Alsthom. They are 29m long, 2.65m wide, weigh 45 tonnes, and have a total capacity for over 200 passengers with seating for 82.

(e) Financial approval for the £135m Metrolink system (phase 1) including infrastructure and rolling stock was given in October 1989. More than £50m of Government grant under s56 of the Transport Act 1968 has been be provided, together with borrowing approval for other approved costs. The costs of subsequent phases have yet to be assessed.

(f) Extensions to the system are being planned and parliamentary authorisation has been obtained by the PTE for extensions to Salford Quays, East Didsbury, Oldham and Rochdale, and is at present being sought for an extension to Trafford Park/Dumplington. The PTE envisages that in the longer term the following BR or ex-BR routes in Greater Manchester could be converted to light rail: (i) Piccadilly to Glossop and Hadfield; (ii) Piccadilly to Rose Hill and Marple; and (iii) Guide Bridge to Ashton-under-Lyne and Stalybridge.

(g) The following Acts and Bills detail the statutory powers for the system: (i) Greater Manchester (Light Rapid Transit System) Act 1988 (Manchester city centre); (ii) Greater Manchester (Light Rapid Transit System) (No 2) Act 1988 (Bury and Altrincham); (iii) Greater Manchester (Light Rapid Transit System) Act 1990 (Salford Quays); (iv) Greater Manchester (Light Rapid Transit System (No 2) Act 1990 (Didsbury, Oldham, Rochdale, Cornbrook Junction and Salford Quays); (v) Greater Manchester (Light Rapid Transit System) Act 1991 (Rochdale town centre, East Didsbury, Salford Quays and Bury); (vi) Greater Manchester (Light Rapid Transit System) (No 4) Bill - submitted 1989 (Dumplington, Oldham, Rochdale and Manchester city centre); and (vii) Greater Manchester (Light Rapid Transit System) Bill-submitted 1990 (Oldham town centre).

(h) Further information on the system may be obtained from the Greater Manchester PTE, PO Box 429, 9 Portland Street, Manchester M60 1HX or from Greater Manchester Metro Ltd, Metrolink House, Queens Road, Manchester M8 7RY.

Light Rail system under construction

South Yorkshire Supertram

6. (a) The South Yorkshire Supertram is owned by the South Yorkshire PTE. The design and construction of the system is being carried out by South Yorkshire Supertram Limited (SYSL), a company owned by the PTE. The system will be operated by another subsidiary and it is planned that in due course it will be transferred to the private sector.

(b) The Supertram will be constructed to usual light rail standards.

(c) The 29 km 50 stop system comprises two lines: Line 1 runs from Middlewood, Malin Bridge and Hillsborough in north-west Sheffield, through the city centre to Herdings and Halfway in the south-west. Line 2 (which is being constructed first) runs from a junction with Line 1 in Sheffield city centre through the Lower Don Valley to Meadowhall in the north-west. The depot and control centre for the system will be at Nunnery on the Meadowhall route. It is intended that the Meadowhall route will open in late 1993, with the other routes following in 1994 and 1995.

(d) The Supertram rolling stock will consist of 25 eight-axle partly low-floored cars built by Duewag (a subsidiary of Siemens) in Dusseldorf, Germany with electrical equipment supplied by Siemens. They will be 34.75m long, 2.65m wide, weigh 44.5 tonnes, have a total capacity of 250 passengers with seating for 150; they will not run in multiple.

(e) Financial approval for the £230m Supertram system including infrastructure and rolling stock was given in December 1990. Government grant under s56 of the Transport Act 1968 will be provided, together with borrowing approval for other approved costs. Contributions will also be made by the developers of the Meadowhall complex, Sheffield City Council and Sheffield Development Corporation.

(f) Extensions to the system are proposed and a route from Meadowhall to Rotherham, possibly via Sheffield Airport, is being studied but details have not yet been submitted to the Department.

(g) The following Acts and Bills detail the statutory powers for the system: (i) South Yorkshire Light Rail Transit Act 1988 (Middlewood, Malin Bridge to Herdings/Halfway); (ii) South Yorkshire Light Transit Rail Act 1989 (Park Square to Meadowhall Interchange); (iii) South Yorkshire Light Rail Transit Act 1990 (amendments to earlier Acts including City Road and Meadowhall); and (iv) South Yorkshire Light Rail Transit Bill-submitted 1991 (detailed changes to scheme).

(h) Further information on the scheme may be obtained from the South Yorkshire PTE, Exchange Street, Sheffield S2 5SZ or from South Yorkshire Supertram Ltd, 11 Arundel Gate, Sheffield S12 PN.

Light Rail systems with parliamentary authorisation

Midland Metro

7. (a) The Midland Metro scheme is being promoted by the West Midlands PTE. It is anticipated that a design, build, operate and maintain franchise will be used at the appropriate time.

(b) The Midland Metro scheme is planned to be constructed to usual light rail standards.

(c) The total scheme is planned to extend to 200 km. Line 1 will operate from Birmingham Snow Hill to Wolverhampton Bilston Street. It will be 21 km long, serve 28 stops and run mainly on the trackbed of a former BR line but with a 1.8 km street-running section in Wolverhampton. It is proposed to extend Line 1 further into the Birmingham city centre. Line 2 is planned to operate between Birmingham (Five Ways) to Birmingham Airport via the National Exhibition Centre. It will be 26 km long, serve 34 stops and include a city centre tunnel. The route of line 2 would be altered to serve the new Birmingham Heartlands station, should that proposal proceed, and a branch to serve Castle Vale is also proposed. Line 3 is proposed to link Wolverhampton via Walsall, Wednesbury (connecting with Line 1) and Dudley to Brierley Hill. It will be 30.5 km long and share some of its alignment with an existing BR freight line. A separate system is being considered in the long term for Coventry and consultations have taken place on a route between Binley/Willenhall and Warwick University/Tile Hill via the city centre. The anticipated opening dates of the system are subject to the approval of the funding arrangements.

(d) Preliminary specifications for the Midland Metro rolling stock indicate that 19 (Line 1), 24 (Line 2) and 11 (Line 3), six-axle, LRVs with level access will be required. They would be 30m long, 2.65m wide, and have a total capacity of 225 passengers with seating for 75.

(e) The cost of Line 1 is expected to be £80m and the PTE has applied for s56 grant. The Government has approved £4.5m development funds to allow detailed work to be carried out. If the scheme meets the appraisal criteria, in due course it will be considered for main funding.

(f) Plans for future extensions exist for further routes in Birmingham, the Black Country and Coventry.

(g) The following Acts and Bills detail the statutory powers for the scheme: (i) Midland Metro Act 1989 (Line 1); (ii) Midland Metro (Penalty Fares) Act 1991 (Penalty Fares); (iii) Midland Metro Bill-submitted 1989 (Lines 2 and 3); (iv) Midland Metro (No 2) Bill-submitted 1990 (Line 3-Dudley to Brierley Hill and Wolverhampton connecting loop); and (v) Midland Metro (No 3) Bill - submitted 1991 (Birmingham city centre and Castle Vale extensions)

(h) Further information on the scheme may be obtained from the West Midlands PTE (Centro), 16 Summer Lane, Birmingham B19 3SD.

Advanced Transport for Avon (Bristol)

8. (a) A light rail scheme for the Bristol area has been promoted by Advanced Transport for Avon Ltd (ATA) a private company formed for the purpose, but now in liquidation. Avon County Council and Bristol City Council have undertaken studies on the proposed routes and funding arrangements. Future developments on the scheme are awaited. The following are the details of the scheme as planned by the company.

(b) The ATA scheme was planned to be constructed to usual light rail standards.

(c) The first phase of the scheme was to be a 52 km network with roughly 30 stops and planned to run from Portishead via Wapping Wharf and Bristol city centre to Temple Meads Station with branches to (a) Filton, Bristol Parkway and Bradley Stoke and (b) Lawrence Hill, Mangotsfield and Yate.

(d) Preliminary specifications for the ATA rolling stock indicated that 45 six-axle LRVs would be required. They were to be 30m long, 2.65m wide, have total capacity of 180 passengers with seating for 60 and not run in multiple.

(e) The cost of the first phase of the scheme was estimated at over £200m. The promoters expected that a significant part of the cost would be financed through developer contributions and revenue. ATA was preparing an application for s56 grant towards other capital costs.

(f) ATA plans for future extensions exist for the following lines: (i) Bristol-Avonmouth and Seven Beach; (ii) South Bristol loop - Temple Meads via Knowle and Hartcliffe; (iii) Filton - M4/A32 Interchange; (iv) South-east Bristol into Bristol Development Corporation area; (v) Bristol-Bath via Hanham and Keynsham; and (vi) Bath local network.

(g) The following Acts and Bills detail the statutory powers for the scheme: (i) Avon Light Rail Transit Act 1989 (Portishead to Wapping Wharf), (ii) Avon Light Rail Transit (Bristol City Centre) Bill-submitted 1989 (Bristol City Centre) and (iii) Avon Light Rail Transit Bill-submitted 1989 (Bradley Stoke and Yate routes). Bill (ii) was declared premature in April 1991 and was not proceeded with and Bill (iii) was withdrawn in January 1991. It was anticipated that after amendments to take account of objections to the routes, these Bills would be reintroduced again in 1992.

(h) Further information on the scheme may be obtained from Avon County Council, Avon House, The Haymarket, Bristol BS99 7DE.

Systems seeking parliamentary authorisation

Croydon Tramlink (London)

9. (a) The Croydon Tramlink scheme is being promoted jointly by London Transport and the London Borough of Croydon. The London Boroughs of Bromley, Merton and Sutton support the scheme in principle. Operation of the line will be franchised.

(b) The Tramlink scheme is planned to be constructed to usual light rail standards.

(c) The 28 km, 32 stop scheme comprises three main branches. The first will run from Beckenham Junction and Elmers End via Addiscombe to Croydon, the second will run from New Addington to Croydon and the third will run from Wimbledon via Mitcham Junction to Croydon. The branches will be linked in the centre of Croydon and serve both East and West Croydon BR stations. BR services between Wimbledon and Croydon, Addiscombe and Elmers End, and Birkbeck and Beckenham Junction will be replaced. Construction is expected to take up to 2½ years starting in late 1993 assuming Royal Assent in mid-1993. The Wimbledon branch and the central Croydon area section are due to open in late 1995, the Beckenham branch in early 1996, and the New Addington branch by mid-1996.

(d) Preliminary specifications for the Tramlink rolling stock indicate that up to 30 eight-axle LRVs will be required. They will be 29m long, 2.65m wide, have a total capacity of 220 passengers with seating for 77.

(e) The cost of Tramlink is estimated at £135m and be taken forward by a private sector joint venture which would design, build and operate the scheme. It is expected that the scheme will require some Government grant.

(f) Plans for future extension of the scheme exist for a branch from Mitcham Junction to Mitcham town centre and to Colliers Wood or Tooting Broadway.

(g) The following Bill details the statutory powers for the scheme: (i) Croydon Tramlink Bill - submitted 1991 (Croydon to Wimbledon, Beckenham Junction, Elmers End and Addington).

(h) Further information on the scheme may be obtained from London Transport (Light Rail Development), 55 Broadway, London SW1H 0BD or the London Borough of Croydon, Economic and Strategic Development Unit, Taberner House, Park Lane, Croydon CR9 3JS.

Leeds Supertram

10. (a) West Yorkshire PTE initially proposed to build a light rail line from Leeds city centre to the eastern suburbs. However Leeds City Council were not content with the proposal and proposed a segregated and automated scheme serving east and south Leeds instead. This in turn attracted opposition and was withdrawn. A joint review between the West Yorkshire Passenger Transport Authority, Leeds City Council and Leeds Development Corporation has since taken place of all options for the city and its conclusions favour a combination of light rail and guided bus. The light rail scheme is the Leeds Supertram and is being promoted by the PTE. Operation of the system will possibly be carried out by franchise under a design, build and operate contract.

(b) The Supertram scheme is planned to be constructed to usual light rail standards.

(c) The 10.6 km route (Line 1) will run from Cookridge Street in Central Leeds via City Square, Leeds Bridge, the proposed Royal Armouries Museum at Clarence Dock, Hunslet, Belle Isle to Middleton Park Avenue with branches to Stourton (park and ride) and to Tingley (park and ride). Subject to parliamentary authorisation and funding arrangements it is hoped to commence services in 1996.

(d) Preliminary specifications for the supertram rolling stock indicate that over 20 LRVs will be required. They would be 30m long, 2.65m wide, have a total capacity of 180 passengers with seating for 80.

(e) The cost of the Leeds Supertram is estimated at £100m and the PTE is preparing an application for s56 grant.

(f) Plans for future extensions exist for routes from Leeds City Centre to Seacroft (Line 2), Headingley and Weetwood (Line 3) and to Moortown (Line 4).

(g) The following Bill details the statutory powers for the scheme: (i) Leeds Supertram Bill - submitted 1991 (Leeds to Tingley and Stourton).

(h) Further information on the scheme may be obtained from West Yorkshire PTE (Metro), Wellington House, 40/50 Wellington Street, Leeds LS1 2DE

Greater Nottingham Rapid Transit

11. (a) The Nottingham Light Rapid Transit scheme is being promoted by Greater Nottingham Light Rapid Transit (GNLRT) which is a joint venture between Nottinghamshire County Council, Nottingham City Council and Nottingham Development Enterprise.

(b) The GNLRT scheme is planned to be constructed to usual light rail standards.

(c) The 14 km, 19 stop scheme comprises a main route from Nottingham station via the city centre, Basford, Bulwell to Hucknall with a branch to Babbington (park and ride). The northern section may involve track-sharing with BR. The opening of the scheme is subject to parliamentary authorisation and funding arrangements.

(d) Preliminary specifications for the rolling stock indicate that 15 LRVs will be required. They will be up to 32m long, up to 2.4m wide and have a total capacity of about 250 passengers.

(e) The cost of the scheme is estimated at £68m and GNLRT is preparing an application for s56 grant.

(f) Plans for future extension of the scheme exist for lines to (i) Beeston and Toton, (ii) Carlton and Gedling, (iii) West Bridgford, and (iv) Basford via the west side of the city.

(g) The following Bill details the statutory powers for the scheme: (i) Greater Nottingham Light Rapid Transit Bill-submitted 1991 (Nottingham to Babbington and Hucknall).

(h) Further information on the scheme may be obtained from Greater Nottingham Light Rapid Transit, Trent Bridge House, Fox Road, West Bridgford, Nottingham NG2 6BJ.

Systems being planned

12. Unless otherwise mentioned planning for all these systems is at an early stage and they are being designed to the *usual light rail standards*.

13. **Belfast.** A light rail scheme for Belfast is being considered by Northern Ireland Railways and the Northern Ireland Department of the Environment. The proposal is to construct a new line to Andersontown on the south-west side of the city and connect it via street operation in the city centre to a line running on the alignment of the Belfast and County Down Railway to Dundonald in the east, and to replace the existing railway service to Bangor in the north-east. Further information may be obtained from the Northern Ireland Department of the Environment, Transport Division, Northland House, 3-5a Frederick Street, Belfast BT1 2NR.

14. **Brighton.** A light rail scheme for Brighton is being considered by East Sussex County Council, Brighton District Council and Hove District Council. Several routes are being examined and consideration is also being given to trolleybuses and guided buses. Further information may be obtained from East Sussex County Council, Pelham House, St Andrew's Lane, Lewes BN7 1UN.

15. **Cambridge.** A light rail scheme for Cambridge is being considered by Cambridgeshire County Council and Cambridge City Council. The 10 km route runs from Oakington via the city centre to Trumpington serving park and ride areas at the termini. Nine LRVs would probably be required. The scheme is provisionally costed at £68m. Alternative bus based schemes are also being considered. Further information may be obtained from Cambridgeshire County Council, Castle Court, Shire Hall, Castle Hill, Cambridge CB3 0AP.

16. **Cardiff.** A light rail scheme is being considered by South Glamorgan County Council and Cardiff Bay Development Corporation. Several routes are being evaluated and consideration is also being given to other forms of light rapid transit. Further information may be obtained from South Glamorgan County Council, County Hall, Atlantic Wharf, Cardiff CF1 5VW.

17. **Chester.** A light rail scheme for Chester, known as 'TRAC21', is being considered by Cheshire County Council and Chester City Council. A 14.6 km network is planned with the first route running from Chester Zoo via Northgate and Chester station to the city centre and possibly on to Wrexham Road serving park and ride car parks at the termini. The second route would also serve Chester Zoo but via a different alignment. Preliminary specifications indicate that a narrow gauge is being considered, and that the LRVs (9 of which would probably be required) would possibly be narrower than normal. The scheme is provisionally costed at £55m and studies have been carried out on other routes to Blacon, Great Boughton and Saltney. The scheme is at present deferred awaiting the outcome of the Cheshire County Council structure plan and the publication of the City's local plan. Further information may be obtained from the TRAC21 Project Team, Cheshire County Council, Backford Hall, Chester CH1 6QA.

18. **Cleveland.** A light rail scheme for Cleveland, known as 'Cleveland Advanced Transit', is being promoted by Cleveland County Council. Public consultations were conducted in 1991 on options for lines from (i) Stockton to Saltburn, (ii) Hardwick to Ormesby, (iii) Middlesbrough to Coulby Newham, and (iv) Middlesbrough to Ingleby Barwick. As a result a 13.5 km route is planned to run from Stockton via Middlesbrough to Ormesby as the first phase of the system. Twelve LRVs would probably be required. The scheme is provisionally costed at £68m and a design, build and operate franchise is to be considered. Alternative guided bus options are also being studied. Further information may be obtained from Cleveland County Council, PO Box 77, Gurney Street, Middlesbrough TS1 1JL.

19. **Dartford**. A light rail scheme is being considered by Dartford Borough Council. Links between the town centre and new developments to the north are being evaluated and consideration is also being given to guided buses. Further information may be obtained from Dartford Borough Council, Civic Centre, Home Gardens, Dartford, Kent DA1 1DR.

20. **Gloucester**. A scheme known as the 'Severn Vale Light Rail' is being considered by Gloucestershire County Council. A 45 km system with a core line between Quedgeley via Gloucester and Cheltenham to Bishops Cleeve is being evaluated. The scheme is provisionally costed at £165m. Further information may be obtained from Gloucestershire County Council, Shire Hall, Gloucester GL1 2TH.

21. **Lancaster**. A light rail scheme for Lancaster is being considered by Lancashire County Council and Lancaster City Council. A 25 km route from Heysham via Morecombe and Lancaster to Galgate is being considered. Further details may be obtained from Lancashire County Council, County Hall, Preston PR1 8XJ.

22. **London-(Barking)**. A light rail scheme for Barking is being considered by London Transport and the London Borough of Barking. The routes being considered are Beckton to Barking, Barking to Ilford and access to Barking Reach. Further details may be obtained from Barking Borough Council, Civic Centre, Dagenham, Essex RM10 7BN.

23. **London-(Haringay)**. A light rail or tramway scheme for Haringay is being considered by the London Borough of Haringey. The route being evaluated would run from Wood Green via Alexandra Palace to Hornsey. Further information may be obtained from Haringey Borough Council, PO Box 264, High Road, London N22 4LE.

24. **London-(Kingston upon Thames)**. A light rail scheme for Kingston upon Thames is being considered by London Transport, the London Borough of Kingston upon Thames and Surrey County Council. Routes are being planned to connect Kingston town centre with Surbiton, Chessington and Epsom. Up to 24 LRVs would probably be required. The scheme is provisionally costed at £80m. Further information may be obtained from London Transport (Light Rail Development), 55 Broadway, London SW1 0BD, the London Borough of Kingston upon Thames, Guildhall Two, Kingston upon Thames, Surrey KT1 2EU or Surrey County Council, County Hall, Penrhyn Road, Kingston upon Thames, Surrey KT1 2DN.

25. **Lothian (Edinburgh)**. A light rail scheme for Edinburgh is being considered by Lothian Regional Council. Two lines are proposed: Line 1 would be a 18.5 km north to south route running from Davidson's Mains, with a branch from Muirhouse Cross, via the city centre, Waverley Station, Newington to Cameron Toll and two branches to Burdiehouse Parkway and to Ferniehill Parkway. The city centre section would make use of abandoned railway tunnels and also incorporate new tunnelling. Line 2 would be a 19.3 km east to west route from Wester Hailes Station, the city centre, Haymarket to Leith. 31 (for line 1) and 47 (for line 2) LRVs would probably be required. Line 1 of the scheme is provisionally costed at £300m but the costs of Line 2 have yet to be assessed. Work on the scheme is suspended awaiting consideration of a report on the general future of transport in Edinburgh (the JATES report). Further information may be obtained from Lothian Regional Council, 12 St Giles Street, Edinburgh EH1 1PT.

26. **Maidstone/Medway Towns**. A light rail scheme for Maidstone and the Medway Towns is being considered by Kent County Council. Four routes are being examined and consideration is also being given to other forms of light rapid transit. Further information may be obtained from Kent County Council, County Hall, Maidstone ME14 2LQ.

27. **Merseyside (Liverpool).** A light rail scheme for Liverpool is being considered by Merseyside Development Corporation, Merseyside Passenger Transport Executive and Liverpool City Council. The route being examined would link waterfront redevelopments with a city centre loop. Consideration is also being given to other forms of light rapid transit. Further information may be obtained from Merseyside Development Corporation, Royal Liver Building, Pier Head, Liverpool L3 1JH.

28. **Oxford.** A light rail scheme for Oxford is being considered by Oxfordshire County Council. General route options are being evaluated and consideration is also being given to other forms of heavy and light rapid transit. Further information may be obtained from Oxford County Council, County Hall, Oxford OX1 1ND.

29. **Peterborough.** A light rail scheme for Peterborough is being considered by the city council. Further information may be obtained from Peterborough City Council, Town Hall, Bridge Street, Peterborough PE1 1HG.

30. **Plymouth.** A light rail scheme for Plymouth is being considered by Devon County Council and Plymouth City Council. General route options are being evaluated and consideration is also being given to other forms of light rapid transit. Further information may be obtained from Devon County Council, County Hall, Topsham Road, Exeter EX2 4QD.

31. **Preston.** A light rail scheme for Preston is being considered by Lancashire County Council. General route options are being evaluated. Further information may be obtained from Lancashire County Council, County Hall, Preston PR1 8XJ.

32. **Reading/Bracknell.** A light rail scheme for Reading is being considered by Berkshire County Council. A possible £26m, 12.8 km system serving the Basingstoke and Bath Road corridors is being evaluated. Further information may be obtained from Berkshire County Council, Shire Hall, Shinfield Park, Reading RG2 9XD.

33. **Southend-on-Sea.** A light rail scheme for Southend-on-Sea is being considered by Essex County Council. General route options and types of rapid transit are being evaluated. Further information may be obtained from Essex County Council, County Hall, Chelmsford, Essex CM1 1LX.

34. **South Hampshire Metro (Portsmouth-Fareham).** A light rail scheme for South Hampshire is being considered by Hampshire County Council which has taken over from a now-defunct private sector company, South Hants Metro. The 14 km route is planned to run from the centre of Portsmouth via a tunnel under Portsmouth Harbour, the Gosport to Fareham railway (used to Frator for freight trains) to Fareham Station and town centre. Consideration is also being given to a guided busway. If light rail is used, 15 LRVs would probably be required. The scheme is provisionally costed at £65m. Further information may be obtained from Hampshire County Council, The Castle, Winchester S023 8UD.

35. **Strathclyde (Glasgow).** A light rail scheme for both north and south Glasgow is being considered by Strathclyde PTE. A 100 km system is proposed combining existing BR services, old railway alignments and new construction. The South Glasgow scheme envisages conversion of the existing railway services to Neilston, Newton and the Cathcart Circle and extensions to Castlemilk, Pollok and Newton Mearns. The North Glasgow scheme envisages lines from Drumchapel, Maryhill, Balornock, Easterhouse and Tollcross. On-street operation in the city centre would connect all lines. 60 LRVs would probably be required. The scheme is provisionally costed at £400m. Further information may be obtained from Strathclyde PTE, Consort House, 12 West George Street, Glasgow G2 1HN.