

Manchester LRT System

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The light rail transit (LRT) system in greater Manchester, Metrolink, has employed specific design features to lessen environmental impact within the city of Manchester and to facilitate full accessibility for those with mobility impairments. An economic evaluation was undertaken for Metrolink to compare it with other transport options and funding options were weighed to reduce the financial burden on the public sector and to find a way to transfer risk to the private sector. The specific financial options chosen to meet these requirements is known as "the complete concession approach." The unique approach was taken to developing bidding and contract documentation to encompass design, build, operate, and maintain requirements and to bid evaluation and project management.

The conurbation of greater Manchester has a population of some 2.6 million people who generate approximately 350 million passenger journeys per annum on public transport. Approximately 25 million of these passenger journeys are on the 16 rail radial commuter lines.

History was made in Manchester in 1830 when the world's first passenger railway station at Liverpool Road was opened. Manchester achieved another first in early 1992 when a light rail transit (LRT) system, Metrolink, which uses both existing rail and new track within the city center, went into operation.

The LRT project began in 1982. The Greater Manchester County (GMC) Council initiated a rail strategy study with the Passenger Transport Executive (PTE) and British Rail (BR). By 1984 the rail study group had recommended a light rail solution.

The PTE, GMC Council, and BR accepted the recommendation and in November 1984 the PTE deposited a private bill in Parliament seeking powers to construct a light rail system in Manchester. Royal assent for the bill was received in February 1988 by which time the secretary of state for transport had indicated that a government grant would be available subject to private-sector capital involvement.

A two-stage bidding process was embarked upon with the issue of documentation in October 1988 and the award of the contract to the GMA Consortium in October 1989. The first phase of the system, the Bury to Manchester Victoria section, was opened for public use in March 1992. The remaining sections through the city and to Altrincham are programmed to open in April and May 1992.

RAILWAY STRATEGY FOR GREATER MANCHESTER

The full potential of greater Manchester's extensive suburban rail network has never been reached because of the lack of

city center penetration and cross conurbation links. Attempts to solve the problem date back to the birth of the railways: the first proposal for a Piccadilly to Victoria rail tunnel came in 1839. A succession of proposals over the past 150 years all failed to materialize.

When the GMC Council initiated a joint study with Greater Manchester Passenger Transport Executive (PTE) and British Rail (BR) in 1982, it was to examine a wide range of options. The options evaluated included BR-gauge central area tunnels, light rail with tunnel or surface links, and busways and guided busways. The preferred option emerged as light rail with surface links across the regional center because this offered a high level of benefits at modest cost and would therefore give the best rate of return.

As well as the technical and financial attractions of this option, public consultation exercises indicated that it would be a popular solution. Final approval was given only after examining similar systems overseas so that highway and traffic engineers, town planners, and politicians could be satisfied that such an approach would be practicable.

It was clear that it would not be feasible to build the entire 100-km LRT network as one project. Therefore a first-phase system was defined, embracing the city center sections and the two most heavily used local lines, those to Bury and Altrincham. Progress was delayed by two major changes, the abolition of GMC Council in March 1986 and deregulation of bus services in October 1986. The impact of abolition was limited. The GMC had effectively completed the strategic development of the light rail and the new Passenger Transport Authority was quick to affirm its unanimous support for LRT. Deregulation was potentially more significant. It meant the end of integrated transport planning and a new, unpredictable operating environment.

However, market research indicated that rail services would be fairly robust in the face of bus competition, and this was supported by actual experience after deregulation. Rail patronage increased as bus patronage fell.

The development of light rail was given a major boost, not just in Manchester but throughout the United Kingdom, in March 1987 by a unique demonstration of the rail industry's faith in British LRT proposals. A group of manufacturers set up a 3-week demonstration of a light rail vehicle (LRV) and associated equipment in Manchester. A Docklands Light Railway car was diverted on its way to London and fitted temporarily with a pantograph for overhead operation. A temporary timber station, part of a new low-cost station in the PTE's ongoing program, was erected, and a variety of static exhibits set out, including a section of typical sleeper and grooved rail track.

More than 10,000 people visited the demonstration, including professionals and politicians from every conurbation in the United Kingdom as well as members of the public.

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FINANCIAL FEASIBILITY OF METROLINK

Detailed comparisons and benefits of Metrolink against other transport options were developed from the original 1982 study: Metrolink versus existing rail, full bus option, and a suboption (part only of system to be converted to light rail). The financial and economic appraisals looked first at capital, operating costs, and revenues. From each option total project cost was then subtracted from the economic benefits, using the existing rail figures as a basis. Although the total estimated cost of the network was seen as extremely modest it was evident that central government would have to have an extremely convincing case put to them if they were to entertain a grant application. The financial studies culminated in an application in July 1985 for a grant. There then followed an intensive period of meetings with the Department of Transport to clarify detailed workings and assumptions. Finally in January 1988 the secretary of state for transport announced in the House of Commons that the case for an LRT system for Manchester had satisfied his department, *but* he asked for options to be investigated for private-sector contributions.

Private-Sector Options

To satisfy the secretary of state's requirements, the Department of Transport (DTp) and the Greater Manchester Passenger Transport Executive briefed merchant bankers to investigate the options for private-sector contribution for Metrolink. Some 15 possible options emerged, and after discussion on feasibility five options were developed:

- Rolling stock ownership and operation,
- Complete system ownership and operation,
- Rolling stock ownership and operation *plus* infrastructure maintenance,
- Public-sector construction, system sold on completion, and
- Public-sector construction, system franchised on completion.

Each option was then evaluated against the stated objectives of risk transfer, private-sector contribution, and grants sharing costs. It is noteworthy that cheaper than any of the above options was full public-sector ownership and operation. This fact was accepted by DTp. However, as some form of private-sector funding was being sought then, private-sector ownership and operation of rolling stock was, in the PTE's view, the best of the sub optimum solutions. This option was also akin to bus industry privatization in which the operator buys the buses but does not pay for highway maintenance.

However, this elegant solution was not to be. DTp asked their merchant bankers also to look into the question of privatization and what has come to be known as the complete concession approach was considered. This required the private sector to bid for an amount of one-off grant to design, build, operate, and maintain the system. In this way as much risk as possible was transferred to the private sector even though this was likely to be expensive. Comparing this with PTE's preferred option, the difference was the requirement of the private sector to maintain the infrastructure at its ex-

pense. DTp appears to have preferred a larger one-off grant being given to the private sector than leaving the PTA/E with the ongoing public-sector revenue cost of maintenance of the infrastructure.

Complete Concession Approach

The complete concession approach means *one contract* to design, build, operate, and maintain Metrolink was awarded. The private sector will design and construct the system with all assets remaining in the ownership of PTE. The appointed contractor will then operate and maintain the system for a predetermined period of time. The contractor in essence will assess two aspects of the bid for the contract: the cost to design and build the system, and the value the contractor will pay for the right to operate.

By deducting the operating concession value from the cost to build the contractor will ask for an amount for a one-off grant for the contract. The grant will be funded from PTA (50 percent) and from the grant from the central government (50 percent). Because the contract is to design, build, operate, and maintain, this arrangement allows the contractor to be to some extent its own customer and also allows the contractor to make certain trade-offs between revenue and capital expenditure. It also transfers fully the design risk.

As part of evaluation of the bids these aspects played a major part but the physical characteristics and maintenance issues were also reviewed in much detail. What caused more concern, because of the need to safeguard the public sector's position, is the concession agreement itself, the document that transfers the operating rights to the private sector.

Concession Agreement Provisions

The PTE will grant the rights to operate the first phase of the system, comprised of parts of the existing British Rail lines from Bury to Victoria and from Altrincham to Cornbrook together with the city center link. For such rights to be granted, PTE will have vested in it some existing British Rail track, stations and buildings along the route, and will also be granted licences by British Rail in respect to other areas of track. In the future it may be feasible to have more than one operator on the system and therefore provision is made in the concession agreement for multiple operations over common sections of the track.

PTE is to retain ownership of all assets and infrastructure. To protect its assets it will have the right to inspect any part of the system including the rolling stock at all reasonable times.

The agreement is for a 15-year term but the bidders were given the option of submitting bids on alternative periods, either shorter or longer. As the contract is for a predetermined period it is important that the assets (which are owned by the public sector) are maintained to standards that will ensure that, on reversion, the system has not been run down.

Although PTE will require the contractor to participate in the concessionary fare scheme, the contractor will nevertheless be free to determine the level of fares. Failure to meet the levels of service and reliability will result in financial pen-

alties being imposed. It is envisaged that measures of performance reliability will be determined by reference to lost train miles. These measurements will be made on a quarterly basis and can be audited by PTE.

Network expansion is a particularly complex area but the agreement will allow PTE to expand the system at any time during the period of the agreement after obtaining the necessary Parliamentary powers and the approvals of DTp and PTA. If expansion is feasible within the first 3 years then PTE will enter into negotiation with the incumbent contractor to design and build the expansion and then to operate the expanded network.

Summary of Privatization Option

Under the complete concession approach, in return for a public-sector contribution (which will be significant) and with the service frequencies set by the PTA/PTE, the contractor takes on an obligation to operate the system. In this way the public sector can capture the economic benefits. The private sector has promised to design, build, operate, and maintain a system that should be safe and reliable. The contract documents have to ensure the private sector lives up to that contractual promise.

METROLINK OVERVIEW

The requirements for Phase 1 of Metrolink can be summarized as follows:

- The modernization and conversion of the existing Bury and Altrincham suburban railway services to LRT;
- The linking of these two lines and Piccadilly Railway Station by new tracks (through the city center) laid "in street" with appropriate signaling and traffic management measures to ensure an efficient and reliable operation;
- The provision of six-axle, single articulated LRVs approximately 28 m long and 2.65 m wide (Figure 1) (LRVs must be capable of negotiating curves at 25-m radius and



FIGURE 1 A six-axle articulated LRV built for Metrolink by Firema in Italy with electrical equipment by GEC Alstom.

maximum gradients of 6.5 percent; maximum service speed should be at least 80 km/hr);

- The satisfaction of PTE's specified minimum level of service and PTE's preferred operating strategy; and
- The system to be fully accessible to those with mobility impairments.

These summary requirements were expanded into two volumes of detailed reference specifications for the bidding documentation. They were termed "reference specifications" because they provided a possible solution to PTE requirements. The selected bidders were however given the option to present in addition their own alternative solutions. To appreciate fully the extent of the total engineering works resulting from the reference specifications it is useful to outline salient aspects.

Route, Stations, and Civil Engineering Works

The Metrolink route from Bury Interchange through the city center to Altrincham Interchange is double-tracked throughout except for a short length through Navigation Road. The single-line section commences just north of Deansgate Junction, continues through Navigation Road Station, but immediately south of the level crossing becomes double again into Altrincham Station. The routes in line diagram form are as shown in Figure 2, and the Manchester city center proposed route and existing BR lines are shown in Figure 3.

The 19 existing stations on the Bury/Manchester and Altrincham/Manchester lines needed to be refurbished to make them more open and accessible. In addition five new stations needed to be built in the city center. Both the new and existing stations are to be fully accessible for those with mobility impairments.

In addition to the stations, the civil works involved in the project include the following:

- Upgrading and modifying existing track;
- Providing of new in-street track through the city center:
 - Constructing an underpass at Cornbrook Junction;
 - Renovating disused viaducts and bridges;
 - Constructing a new viaduct alongside the G-MEX Exhibition Centre; and
 - Providing depot and workshop facilities.

Power Supply and Signaling

The electrical power to the LRVs is to be a maximum of 750 volts direct current (dc) for both the on-street sections and the existing rail services. The new power supply equipment was required to be adequate for anticipated train loadings and also capable of extension to provide additional power for subsequent phases.

The defined requirements of the signaling system were automatic reporting of each train unit location via track circuits or transponders; and automatic routing of train units by activation of points using the train detection system. The signaling to be adopted must permit safe operation of trains at the specified headways.

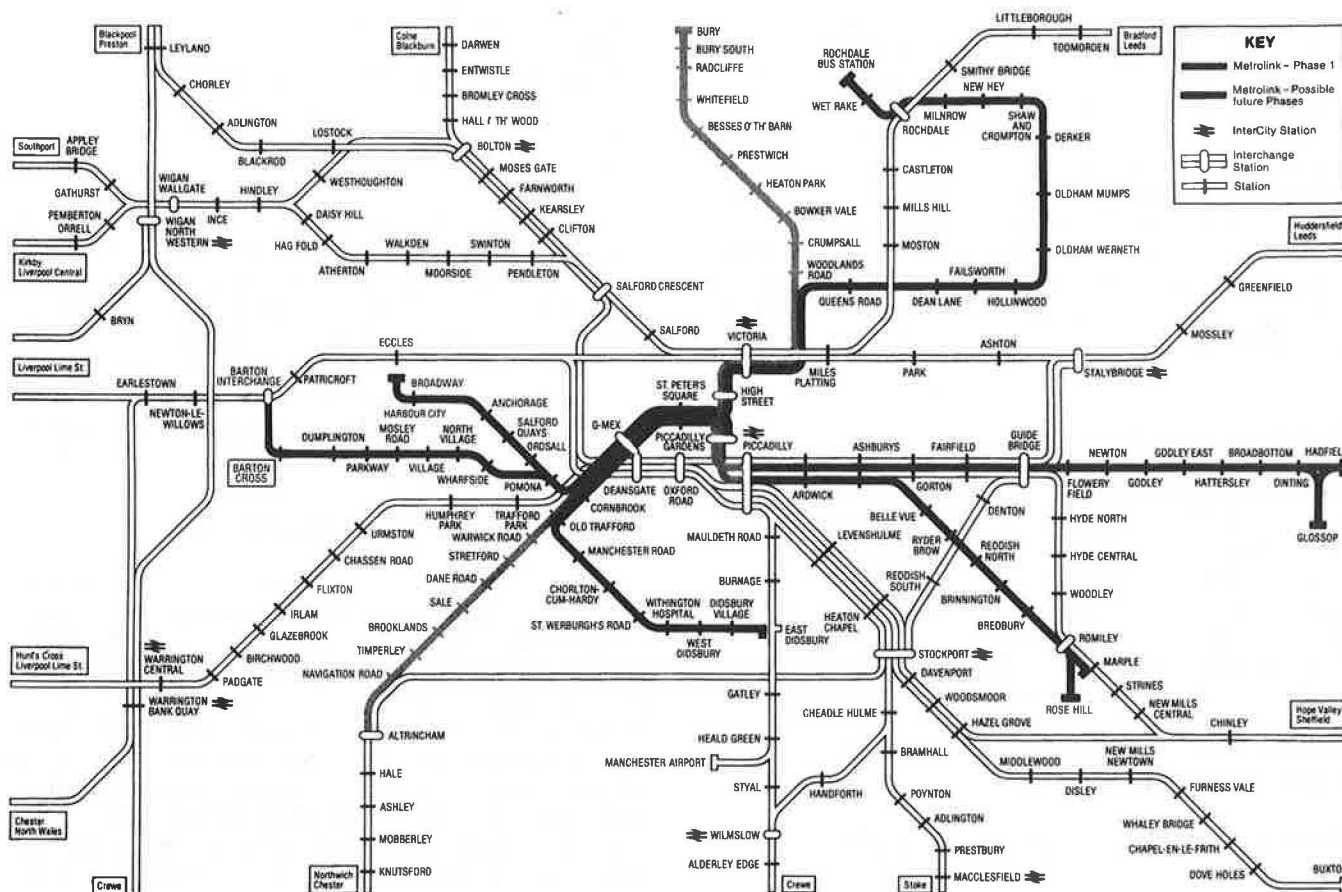


FIGURE 2 Proposed Metrolink routes.

The two rail signaling options available are conventional lineside block signaling fully track-circuited and automatic, or block signaling with cab signals. For on-street running the LRVs are to be driven by sight with drivers required to observe and obey highway signals. Stop/proceed instructions will be conveyed to the LRV drivers by means of a white semaphore indication to avoid confusion with highway red/green/yellow signals.

Train Services

Greater Manchester Passenger Transport Authority stipulated operational headways ranging from 5 to 15 min depending on location and day of the week. GMPTA also require that the Metrolink service be operated from 6 a.m. to midnight on weekdays and 7 a.m. to 11 p.m. on Sundays and holidays.

GMPTA also stipulated that the number of passengers should not exceed 130 percent of nominal load in the peak period and that no passenger should stand for more than 15 min in the peak period except by choice.

Environmental Design Aspects

A significant criterion of the design requirement was that the Metrolink system blend into the city of Manchester. Treatment of the LRT works was therefore required to be sympathetic to surroundings in terms of the surface finishes, station details, overhead line equipment, and power supply. Attention must also be given to minimizing noise levels during construction and when the system became fully operational.

The reference specification required that noise levels should not be greater than 79 dB(A) externally and 66 dB(A) internally with the LRV accelerating through 50 km/hr on ballasted track.

An additional important aspect is avoiding or at least minimizing of stray electrical currents from the operating system. The reference designs and specifications presented to the bidding contractors embraced these environmental aspects. Details of the city center station designs and outline forms of support systems for the overhead electrification system illustrate the attention given to environmental aspects. The design of all the key elements together with the corporate identity color scheme had to satisfy the city's planning committee.

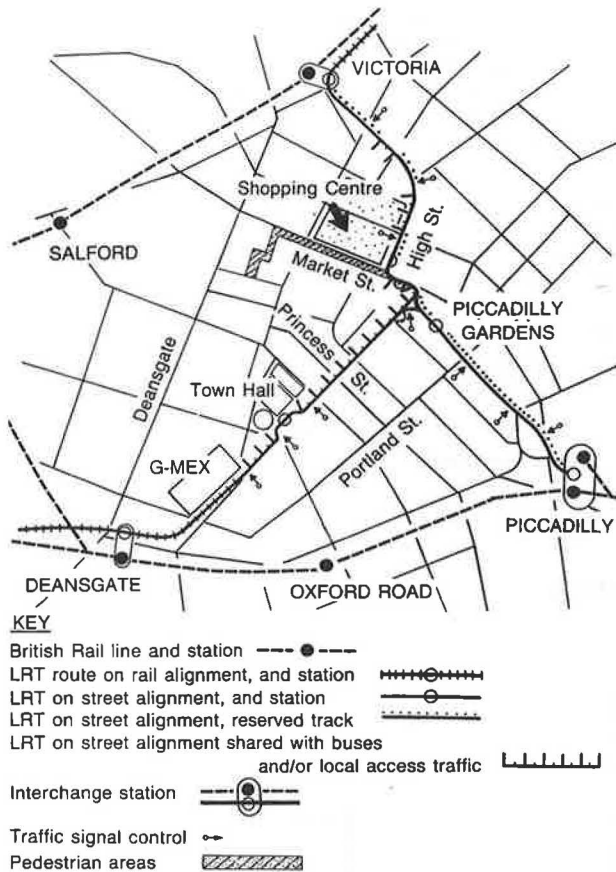


FIGURE 3 Metrolink route and preexisting BR lines in Manchester city center.

ACCESSIBILITY

GMPTA specifically required the whole Metrolink system to be accessible to those whose mobility is impaired. Included within this category are people in wheelchairs (with or without attendants), parents with baby carriages and strollers, people loaded with shopping, and others who, although ambulant, have difficulty in moving, particularly when using steps. It is estimated that in excess of 10 percent of passengers could be in this category.

In seeking a solution, the Metrolink design team studied how light rail systems in other countries had approached the problem. It was found that most LRT systems developed from older tramways did not provide full access for the disabled. High, full-length platforms would be difficult to accommodate in Manchester, particularly from the environmental design aspect. Low-floor vehicles, although an alternative, would present difficulties in modifying the high platforms at existing railway stations. Wheelchair lifts either on the vehicle or platform tend to be slow and unreliable as well as embarrassing to the user.

The reference solution presented in the bidding documentation was based upon a short-length high platform. The solution finally developed for Manchester has been termed a "profiled platform," which provides a level access to the two

center doors of the LRVs (Figure 4). The remainder of the platform is at a low height, one step up from pavement level and therefore two steps from road level. A sliding retractable step is provided at these LRV door access points to give two 250-mm (10-in.) steps from the low-platform level into the vehicle.

BIDDING AND CONTRACT DOCUMENTATION

The contract would be to design, build, operate, and maintain the Metrolink with all assets remaining in the ownership of the PTE. The successful contractor or consortium is to operate and maintain the system for a predetermined period (i.e., the concession period).

A two-stage tendering process was adopted by PTE to reduce the cost of bidding by the would-be contractors and to reduce the time and resources needed by PTE to evaluate the bids.

The work undertaken by all the bidding consortia, both at Stage 1 and Stage 2, was most commendable. The quality of all the submissions was excellent. Great care was taken to fulfill the extensive and sometimes onerous bidding conditions.

The evaluation team, with its consultant support, worked long hours to ensure that a fair and constructive evaluation was undertaken. Certainly the response from a number of unsuccessful bidders would indicate that both the bidding procedure and evaluation had achieved just that.

Documentation

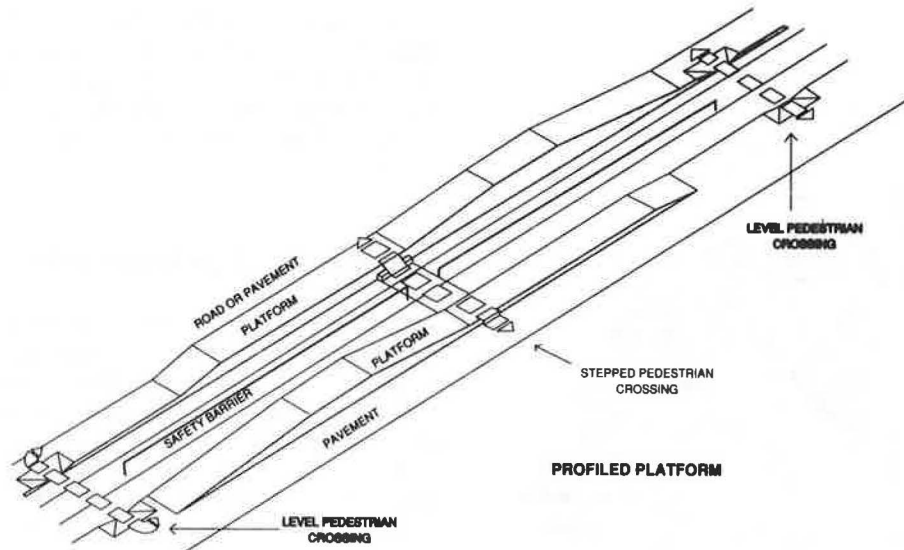
The contract between PTE and the contractor, Greater Manchester Metro Limited, was finally signed on June 5, 1990 although the contract commencement date was December 11, 1989. The design, build, operate, and maintain form of contract embraced a 2-year period and a fluctuating price at October 1989 base rates. With this somewhat unique form of contract the determination of each contract document was complex and certainly a time-consuming task. Even the logistics of the contract signing became a formidable task.

Constitution of Operating Company

The consortium established as Greater Manchester Metro Limited (GMML), the contractor appointed to build Metrolink, was a company created specifically for the contract and had therefore to create its own management structure, operating and financial contract procedures—a considerable task in itself.

Contract Program

A 2-year program was submitted as part of the tender documentation and was accepted under the terms of the contract as the contract period. The detailed works program required considerable consultation to ensure minimum disruption to



The basic layout of a station with profiled platforms.

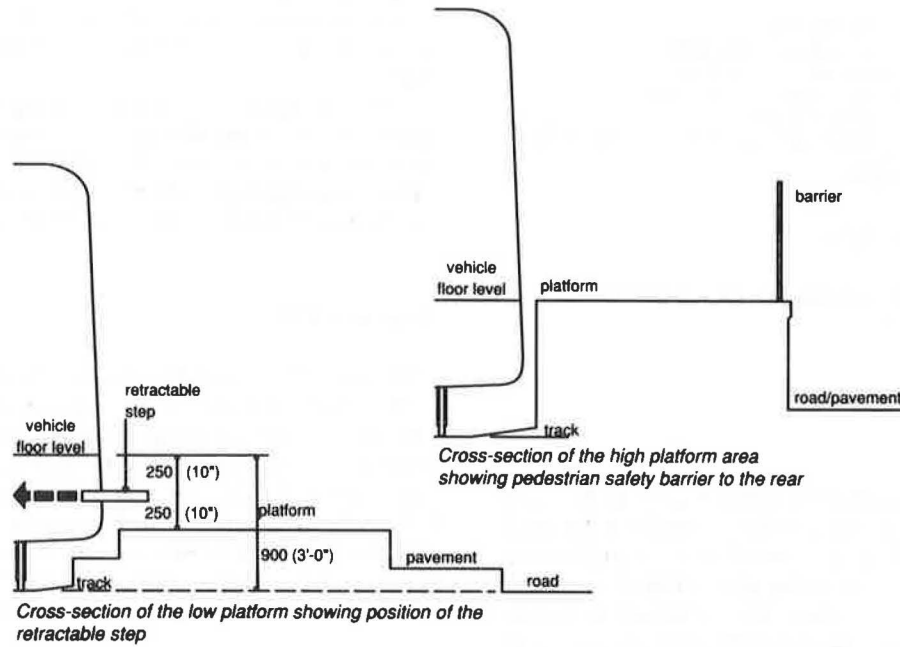


FIGURE 4 Proposed platform profile to make Metrolink accessible to those with mobility impairment.

both existing rail services and city center traffic. Emphasis within the program was given to minimizing disruption at critical periods. For example, the contractor ceased city center works for 2 weeks during the Christmas period. And during closure of the Bury Line and Altrincham Line rail services, alternative bus services were to be provided by PTE in liaison with local bus operators.

CONTRACT IMPLEMENTATION

No matter what format is chosen, each contract brings its own difficulties. With a design, build, operate, and maintain contract format that has so many new elements, the diffi-

culties are more numerous and complex. Difficulties can also result from the organizational arrangements of the parties to the contract. PTE, for instance, has mechanisms that must be followed in addition to consultation and approval procedures and also has to take account of both local and central government policies and procedures. Likewise, the contractor, as a newly formed company with major shareholders that are also the principal subcontractors, had its own difficulties.

The implementation of a contract of the scale and complexity of Metrolink highlights many areas of weakness that, with the benefit of hindsight, could have been reduced or avoided. Many paths were followed, which if starting again certainly would not be trodden.

At present, it is not possible to examine all the elements of difficulty and, in particular, discuss issues of financial delicacy. Nevertheless it is possible to review some salient issues.

Design/Build Contract Format

Even excluding the elements of operate and maintain, the undertaking of a contract of the scale and complexity of Metrolink using a design/build approach has many difficulties. Although a design/build format enables a fast track approach to be taken and, in some cases, to achieve benefits, it does lend itself more to a "green field" site, rather than work in a busy city center and conversion of an existing rail system. With the complex liaison and approvals procedure required on Metrolink and the controlling interests of third parties, delays to the fast track process are inevitable with all the contract financial implications.

Although at the bidding stage considerable attention was given to the development of a reference specification, which proved valuable, experience has shown that the detail and extent of the reference specification should have been greater. Establishing priority and understanding on details with a contractor at the bidding stage is much cheaper than negotiating during the contract period.

The client-body and third-party approvals involved in a design/build contract present potential difficulties created that cannot be overstressed. Within a design/build program sufficient time never is allowed for the approvals procedure, possibly because at the time of bidding the contractor does not know what to allow. In addition to the formal approval procedure, a great deal of liaison is also required with specialist groups, all of which are time consuming and, in many instances, part of the approval process.

Organization

In simple terms, the contract exists between PTE and the contractor, GMML. A supply subcontract exists between GMML and GMA Group (i.e., GEC/Mowlem/AMEC). In strict contractual terms PTE has no part to play with the subcontractors but in fact in this case it is the subcontractors who are undertaking the design/build element of the project.

Throughout the contract it is therefore essential that all instructions and acceptances pass only between the PTE and GMML. Although this is simply said, with the almost daily task of exchanging detail and approvals between all the parties, it is not so readily maintained. With the added difficulties of ancillary contracts and the requirements of third parties, the difficulties multiply rapidly.

Service Diversions

The service diversion contracts were deliberately kept separate from the main contract, the main service diversion contracts being let some 12 months prior to the commencement of the Metrolink contract.

Prior to the letting of the service diversion contracts, considerable liaison took place with the city engineer, police,

motoring organizations, and many other interested parties. As a result it was decided to separate the service diversion contracts from the main contract and undertake most of the service work in advance of the main contract. This decision has been criticized because it resulted in specific areas of highway being worked on on numerous and separate occasions by the service contractors only to be repossessed again by the main contractor for track laying.

Taking account of the different and, in some cases, extended lead times required by different statutory undertakers and the almost impossible task of coordinating two service contractors to work in the same trench, PTE continues to believe that the separate letting of the service contracts was correct. The disruption and delay to the main contract, if all service diversion works had been included in the main contract, would have been considerable—no doubt with a financial penalty to pay.

The success of the operation has been very much because of the efforts of the city engineer and police authority together with the support of motoring organizations and, last but not least, the traveling public of Manchester.

Unforeseen Work

Unforeseen work covers specific physical work not known before awarding the contract and also the unknown requirements or detailed understanding of third parties as existing at the time of contract signing.

All the bidders were given volumes of data bank information so that they would have as much information as possible about the current state of the physical work. It was up to each bidder to use the information or further investigate before determining a contract price.

The difficulty for PTE was to ensure or know that all elements of existing conditions had been covered. Of greater difficulty was to determine the degree of change likely in the conditions of work before the hand-over—particularly if some elements of the contract had delayed hand-over dates within the contract period. To agree on both a conditional state and, in some cases, responsibility for correction over and beyond the bid price puts considerable strain on the parties.

Public Relations

Both before and after the contract was awarded, PTE and GMML gave considerable attention to public relations. In particular PTE has endeavored through media coverage to inform the public of greater Manchester precisely what was going to happen and to respond as appropriate to questions raised by the media and the public about specific difficulties.

PTE set up a dedicated team to liaise directly with all who had premises fronting the alignment in the city center. In addition to many specific difficulties dealt with as a result of work in the city center, the team also held liaison group meetings with residents and interested parties on the Bury and Altrincham sections.

During the contract period a joint working party was established between the PTE and GMML to establish a mutual public relations strategy to avoid duplication of effort and ensure a common basis was developed for all press releases.

This was particularly important during the difficult days when the temporary closures of the Bury and Altrincham lines had to be extended and of even greater significance when Metrolink's operation was delayed.

LESSONS LEARNED

With the somewhat unique nature of the design, build, operate, and maintain form of contract, it may be of value to state a few areas that would be reconsidered or improved if PTE were at the fortunate position of being at the commencement rather than at the concluding stages of the contract.

Form of Contract

Although suitable for some types of major contracts the use of a design/build format for a complex LRT project would need careful evaluation before being repeated. Particularly as the benefits, if any, of bringing in the operational elements within the building element have yet to be realized.

Reference Specifications/Data Bank

With a traditional redesigned format, the detail of specification would be reflected within the prebidding design. With design/build the necessary detail of reference specifications and data bank information should not be underestimated. The more that is included in specifications, the less that is open for debate, and this also removes any ambiguity as to what is and is not in the contract.

Third-Party Agreements

Irrespective of contract format (but even more so with design/build) the level of detail required in advance agreements and understanding with third parties should not be underestimated. Third parties in this instance include British Rail, the Highway and Planning Authority, building owners, and utilities. To itemize all the elements for consideration with third parties would be difficult except to say whenever it is considered that all the elements have been covered, the plain fact is, they have not.

Advance Work

Certainly experience has shown that the more advance work that can be isolated from the project, the less opportunity there is for disruption. The target should always be to present to the contractor as an ideal a "green field" site. Whatever sets out as good intent in combining work elements with different contracting groups always seems to conclude with a price to pay.

Contingencies

The level of financial contingency and "float" in respect to time never, in hindsight, appears sufficient. An appropriate

formula does not exist to determine such allowances except that whatever is first considered—double it.

Time Scales

In general terms the time taken to develop the design, build, operate, and maintain form of contract (including the reference specifications and data bank information and the bidding and evaluation period) was just under 2 years. With a traditional predesign fully detailed specification and measured or approximate quantities (including the bidding period and evaluation), it may have taken 3 years. The approach therefore has possibly brought forward by a year the operation of Metrolink in Manchester. As yet the full cost has not been evaluated.

FUTURE METROLINK EXTENSIONS

As the Phase 1 Metrolink plan moves toward completion, the planning of new phases has continued. The routes identified in the earlier rail strategy study included conversion of BR lines to Oldham and Rochdale, Glossop and Hadfield, Marple and Rose Hill, and the former BR route to Chorlton and Didsbury. Two new routes have subsequently been added to serve Salford Quays and Trafford Park, and a possible diversion to serve Ashton town center has also been examined. The most recent proposal is a new line to Hulme as part of the Manchester City Council's "City Challenge" project.

Salford Quays is in essence Manchester's former docklands, which are now being developed for a variety of exciting new uses. An alignment has been established to provide a branch from the Phase 1 system at Cornbrook Junction, crossing the Manchester Ship Canal and serving a number of major developments in the Salford Quays area. A Parliamentary bill was deposited in November 1987 and enacted in 1990. The line to Trafford Park has been developed in close consultation with the Trafford Park Urban Development Corporation and Trafford Council, and is intended to encourage new development in this important area.

A fourth Parliamentary bill was deposited in November 1988 seeking powers to construct and operate the proposed line to Trafford Park, works on the Rochdale via Oldham line (excluding the extension to Rochdale town center), part of the Chorlton and Didsbury line, and an amendment to the Salford Quays alignment. The Trafford Park alignment leaves the Salford Quays line shortly after the Cornbrook Junction and follows a route to the south of the Ship Canal that links a number of major development sites. It terminates at Dimplington, the possible location for a major shopping complex adjacent to the M63 Manchester Outer Ring Road. This could also form a useful park-and-ride location for journeys to the regional center.

The Trafford Park route was withdrawn to meet some objections and resubmitted in November 1989 in a further Parliamentary bill, which also included powers to operate over existing BR tracks to Oldham and Rochdale. Royal assent was expected shortly.

In April 1988 PTE commissioned a major study to examine possible light rail extensions, to review their feasibility and costs, and to evaluate each extension in terms of operating

costs, estimated passenger traffic and revenues, and the impact of each extension on local economic evaluation against a base situation without the extension. The study also assisted in prioritizing subsequent phases of Metrolink. The initial findings were reported to the PTA in July 1991.

A number of more detailed studies have also been undertaken of, for example, an extension of the Oldham-Rochdale line to serve Rochdale town center, a deviation to serve Oldham town center, and more detailed engineering studies on parts of the Salford Quays and Trafford Park alignments. More detailed studies to assess future options for the eastside lines serving Tameside and the eastern part of Stockport have also been undertaken.

The Rochdale town center extension and the remaining part of the Chorlton to Didsbury route were included in a second bill deposited in November 1989 which has recently obtained royal assent. The most recent bill, deposited in November 1990 (the seventh LRT bill promoted by the PTE), seeks powers for the diversion to serve Oldham town center. It has almost completed its passage through the House of Lords and will then pass to the House of Commons.

Despite this considerable progress in obtaining Parliamentary powers, a number of issues remain to be resolved before a firm program of extensions can be developed. These include, in particular, the method of funding—as it is unlikely that the government will authorize further grants unless private-sector developers make a substantial contribution. This may well be feasible in the Trafford Park and Salford Quays areas where major new developments are in progress that would benefit significantly from light rail access. However, the difficulties in obtaining funding make it unlikely that any of these extensions will be built in the near future, despite strong

support from many bodies, including the district councils and development corporations.

CONCLUDING REMARKS

Since the Metrolink concept was developed, many difficulties have been encountered and some have been overcome. The early days of operation will no doubt bring more unforeseen problems both to the contractor and PTE.

At least to date the common aim has been to provide an LRT system for Manchester that both enhances and complements public transport within the conurbation for the benefit of the traveling public.

With the central core of a light rail system now established in Manchester, the possibility of extending the system to Salford Quays, Trafford Park, Dimplington, Oldham, Rochdale, Chorlton, Didsbury, and Hulme may not always be a dream.

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