"A world class transport system, fit for the 21st century, is essential for all Scotland."

Transport Minister
Tavish Scott

Evening Times
12/01/07
Foreword

This paper has been prepared by thgRAIL as a discussion document designed to draw attention to the presently under utilised asset of the Glasgow Subway, focus on its contribution to the urban transport network and plan for new investment and expansion of the system for the next ten to fifteen years.

The impetus for such a report has been triggered by the December 2006 publication, Regional Transport Strategy (RTS) for the West of Scotland 2007 – 2021, presented by the Strathclyde Partnership for Transport (SPT) as part of their role assumed as the recognised regional transport authority for the West of Scotland. That document, entitled “A Catalyst for Change”, does feature the revitalisation of the Subway as one of the ten SPT priority projects however that priority does not appear to be high with the expected (and unspecified) system improvements not apparent until the latter third of the RTS programme in 2017. This lack of ambition for the Glasgow Subway is underlined by the promotion of possible competing transport modes such as Fastlink (2010); Bus Rapid Transit (2017) and Glasgow City Centre Bus Priority (2018) before the existing subway infrastructure.

thgRAIL sees the Subway literally and figuratively at the core of any regional transport strategy and as such it should be a key component, examined, utilised and exhausted before alternatives are considered. There can be no greater measure of sustainability than working with our existing tools to maximum efficiency prior to any attempt to introduce new or replacement systems. As a core element of the regional transport strategy, the Subway should be central to the stated transport objectives of national and local government, supporting and promoting economic development, social inclusion, sustainability, integration and safety. Our vision allows these objectives to be expressed and sets the standard for other transport initiatives to follow.

As such our strategy is not a Catalyst for Change; it is a 2020 Vision – a clear view of how we can work with those facilities we possess over the next fifteen or so years before we embrace change, or worse still, change for the sake of change.

WILLIAM FORBES MRICS
thgRAIL
22nd January 2007
Executive Summary

Background
The Glasgow Subway 2020 Vision is a consultative report prepared by thgRAIL to encourage responses and formulate a comprehensive plan for the future of the system within a modern integrated transport infrastructure at the heart of the West of Scotland. The report is presented as part of thgRAIL’s response to the Regional Transport Strategy (RTS) prepared by Strathclyde Partnership for Transport (SPT). It is intended to refine the 2020 Vision taking account of relevant responses before submitting the final document to the SPT before closure of their consultation process on Monday 12th February 2007. Time is tight and therefore those parties wishing to respond to the RTS are at liberty to refer to the 2020 Vision for the Subway as a cross reference to their own responses.

The 2020 Vision brings together previous work which thgRAIL has carried out on aspects of the Glasgow Subway and also provides responses to topical issues which have recently been raised in respect of Glasgow’s oldest working transport system. Together these plans are reported through this document to identified stakeholders and other interested parties in the hope that through such collaboration, a clear view can be formed to bring about real investment in the existing infrastructure and planned expansion to respond to Glasgow’s importance as Scotland’s commercial capital.

All responses, critical and supportive, will be incorporated into the 2020 Vision before formally submitting the report to the SPT as a stand alone response to the RTS which concentrates on the importance of the Glasgow Subway. Those responses which cannot be directly incorporated into the plan or which offer a counter/alternative view will be appended to the report. To comply with the SPT’s deadline responses are therefore invited to be received by Friday 9th February 2007.

Context
The report has been written mindful of the socio-economic and planning context which governs transport and related activities in Scotland. The transport objectives of the Scottish Executive are well known and repeated in the RTS; the policies of Glasgow Council, the incumbent local authority, are similarly well stated and the over riding principles of natural justice and equality
laid down by the Scottish Parliament have also been observed. These factors interact and, where appropriate, over ride the economic or business case presented in this plan. The Glasgow Subway and indeed the regional transport strategy is not all about money.

The Existing System
The Glasgow Subway is well catalogued as being one of the oldest underground train systems in the world and for over 100 years locals and visitors have enjoyed or endured the bone rattling idiosyncrasy of a ride around the circular route. In that period the initial traction has changed from a pulley system to an electric motorised train and there was also a major upgrade of the station buildings and support infrastructure in the 1980s. Apart from the cosmetic appearance however little has changed since its inception; the circular route has stayed constant whilst Glasgow’s demographics have changed considerably and the introduction of modern technology is only now beginning to be considered. Passenger patronage appears to have peaked and the RTS has surrendered to this by setting un-ambitious growth targets. This is set against a recurring criticism of the system from users and politicians seeking a greater return from this part of the transport network.

The 2020 Vision attempts to address this lack of ambition and includes a plan for the reinvestment and upgrade of the Subway to increase patronage and offer greater revenue potential. Each station is considered and the plan set to maximise the property and people assets of the Subway. This plan concludes with a programme of undertakings and works designed to give a new impetus to the Subway and its contribution to the local transport network. By looking towards greater use of technology, service improvements and passenger safety can be maximised. The ultimate test will be the creation of a stand alone business with minimum operating subsidy; responsive to the needs of its customers; offering job security to its workforce and profitability to its investors.

Extension of the Subway
One of the conclusions from an examination of the existing system is that the change in the demographics of Glasgow has been detrimental to the fixed route of the Subway. One hundred years ago the system served the densely populated areas of the Gorbals; the docks and shipyards of Govan and the commerce and teaching areas of the West End. Since then, even Ibrox Stadium has reduced its capacity by half; other major traffic generators have relocated off the route and there is increased competition from alternative forms of transport. The opportunity to extend the Subway is limited and the narrow gauge and tunnel bore make the expansion of the existing
system questionable. Even the most logical expansion of introducing new stations on the existing route, for example at Glasgow Harbour, is difficult. This is the point of the Subway where the track is at the greatest incline and the tunnel is at its deepest.

The 2020 Vision plans to expand the system by the introduction of new complementary routes which interface with the existing line and offers interchanges which truly join up journeys. The proposal for a new Clyde Line with new modern trains and infrastructure following the River Clyde between Braehead and Parkhead is such an example. This line will complement the city council’s river regeneration initiative; dovetailing with proposals for flood prevention, connecting riverside communities and river wall reinforcement. At the same time, congestion relief is offered to the M8 corridor, which travels in the same direction, and support for Glasgow’s 2014 Commonwealth Games bid is underlined. By introducing new stations at the recognised Subway stops of Govan and St. Enoch the modal integration possibilities are enhanced with existing bus routes, park and ride, and cycle paths being given access to the new line. The consideration of Govan as an interchange station was made after considering alternative stations such as the new Transport Museum on the north bank of the river almost opposite Govan. Although the provision of a new direct city centre service may impact on the existing Subway business through Govan Station; the boost a new interchange would give to the regeneration hopes for Govan was considered a deciding factor. The Transport Museum link is therefore shown as a possible future expansion of the service as part of the southern T Line extension.

Similarly, economies of scale are presented by retaining and improving the Subway depot at Govan and making this the maintenance centre for the new service. The 12.6 km light rail system will support the new national indoor arena at Parkhead and offer communities which would benefit most from public transport improvements the opportunity of greater accessibility and the benefit of economic spin off such investments bring.

**Embracing New Technology**

Since the inception of the original Subway new technologies have always been considered and introduced to the system when appropriate. However, the pace of technological change has never been faster and there are now many tried and tested improvements which could be introduced to enhance the operation of the Glasgow Subway. The easiest to understand would be the move towards a driverless train system. The Subway is already partly automated and the step to a fully remote controlled system would be a comparatively easy undertaking.
The most dramatic improvement however would be from improved passenger access through advanced ticketing technology. The SPT’s efforts to examine this are recognised and they did recently host a seminar on “Smartcard” technology which featured the successful Oyster and Octopus travel cards. The RTS takes this further and suggests that some £100,000 has already been spent on a completed study yet this important strategy document is silent on the recommendations of that report or indeed any suggestion of an implementation on its Indicative Programme (Table 7.1). The 2020 Vision places great importance on this innovation being introduced as soon as possible but the emphasis placed may be at variance with the SPT’s thoughts. The authority appears to be attempting to reach agreement with all transport providers participating in any new scheme before it is endorsed. The thgRAIL approach is to use the Subway as the vanguard of a retail led scheme where the transport providers will miss out if they do not join. The SPT made a major announcement of “progress” on integrated ticketing technology some two and a half years ago. Such timescales are incompatible with the need for progress on this important issue.

**Funding and Finance**

The 2020 Vision may be seen as ambitious by some and an unnecessary draw on public resources by others. The response is simple – offer the challenge to those with ambition and finance to test whether there is an opportunity for the private sector to become involved. There is no doubt that it is a specialist market and it is littered with many failures which tend to mask the successes. The government will have to be open minded in its approach and there may be the need for initial support but there is little to lose in searching for an operator willing to take the risk and work at expanding the urban transport system. Unfortunately, the RTS does not convey this message. It appears to still promote a closed shop mentality where the private sector is not considered as a priority contributor (page 3 of Executive Summary – Funding). This does not necessarily mean that the Subway must be privatised. The SPT must be invited to bid for the franchise but that means clearly identifying the business within its operations; operating the service subject to strict franchise conditions; facing penalties for non performance and making the Subway an independently funded entity. In Canada, the Greater Vancouver Transportation Authority (TransLink) plans and develops the transportation strategy as an elected regional transport entity but operate SkyTrain (the Vancouver Metro), West Coast Express (a commuter train service) and Albion Ferry (a bay ferry service) all as independent, financially autonomous subsidiary companies. As an aside, TransLink operates with a board half the size of the SPT.
Programme
There are key external elements which are complimentary to the success of the 2020 Vision. Most notably, the integration with other committed capital projects such as the East End Regeneration Route and a successful Glasgow bid for the 2014 Commonwealth Games. To maximise this potential, the franchise for the new Subway operation would have to be awarded by the beginning of 2009. This is feasible if the 2020 Vision begins by being incorporated into the RTS as a priority project.

Conclusion
The report to follow will show that there is enough reason to promote the upgrade of the existing Subway system as a priority project in the Regional Transport Strategy (RTS) rather than something that may happen in ten years time. The desk top study indicates that there is a reasonable case for the costs associated with an improvements plan to be largely derived from a better use of the existing estate, business cost savings and improved revenue flows from non-subway activities.

Consultants should be engaged to examine the creation of an independent Subway operating company with a proper valuation of the estate and an agreed, costed and programmed plan of improvements.

An extension to the system is also considered feasible. Current congestion problems can be experienced on the roads (M8 & M77) and railways (Paisley – Glasgow corridor overcrowding; Ayrshire – Glasgow freight bottlenecks) indicating that the movement of goods and people in an east – west route is a particular problem. In addition the three major traffic generators within the region (City Centre, Braehead and Airport) all lie on the same axis, whilst major regeneration initiatives such as the Clyde Waterfront, Southern General Hospital and the 2014 Commonwealth Games, etc., are similarly aligned. This suggests that a Subway extension catering for such traffic movements would be successful in not only reducing traffic congestion but contributing to economic growth and social inclusion whilst offering a proven environmentally friendly mass transit system which integrates with other established transport modes.

The Clyde Line Subway extension should be properly assessed to allow comparison with other schemes (Fastlink, etc) and assist in a reasoned judgement on future transport investment.
Introduction

thgRAIL is a trading name used by Forbes Developments Limited a commercial property development organisation based in Glasgow and under the direction of William Forbes MRICS. thgRAIL consider the development possibilities associated with railway infrastructure, land and buildings and has contributed to the planning and design of transport infrastructure and projects in the West of Scotland. During the last major transport consultation exercise, “Travelling In Strathclyde” (Strathclyde Regional Council 1993), we were one of the few respondents who highlighted the need for a direct heavy rail link between Glasgow and the Airport. The initial response was worked up to a detailed scheme and the current proposal approved by the Scottish Parliament in November 2006 is based on that scheme. Our work has been highlighted by the SPT in this respect when they refer to the efforts of consultants to design and promote a rail link serving Glasgow Airport.

The approach of thgRAIL is to research the project and then deliver a design solution rather than a report highlighting the options. That work can form the basis of a more detailed design or be used to stimulate competing designs/bids.

That approach is demonstrated in the 2020 Vision. Recent press reports show a public demand for improvements to Glasgow’s Subway rail system. This follows on from publicised discontent from recognised users groups such as football fans, shoppers and leisure users visiting the Kelvin Hall. Stagnation in user numbers coupled to unambitious targets set by the RTS has added to the case for a comprehensive review of the system. It has therefore been examined with a view to looking at expansion and improvements. Each station has been visited and a business case formulated. The individual station plans allow for a phased programme to be implemented – allowing patrons to appreciate the efforts being made to improve the service whilst minimising the disruption to their daily travel plans.
From the base of improving the existing system and increasing the passenger throughput the estate of the Subway would be better managed to maximise the potential from associated undertakings. Opportunities to expand the system have been considered and a first phase of a new Clyde Line included in the initial business plan to 2014. Expansion of that first phase would be considered in direct response to the growth in the business subsequent to the initial investment. Any additional expansion would be scheduled for the period 2014 – 2020. This would take the system to a total of 44km of new track plus the existing 10km circle.

The resultant plan is therefore presented as a template to be adopted into the RTS and used to attract new investment into the Subway system. The success of Glasgow’s bid to host the 2014 Commonwealth Games would be a suitable timetable to allow completion of the first phase. Indeed the impact of a successful games bid should be emphasised. The competing bid cities of Halifax, Canada and Abuja, Nigeria make reference of the legacies which a successful bid would leave the local population. An improvement to public transport infrastructure is a prominent benefit in this respect whilst the Glasgow bid appears to be quiet on this point. Every other major sporting or cultural event on the world stage currently sees the host city committed to new public transport infrastructure as part of the overall investment. London 2012 Olympics and the Vancouver 2010 Winter Olympics both have strong transport investment as part of their bid package; but the bid to host the World Trade Expo 2012 by Korean city, Yeosu, goes as far as seeking to create a total transformation of the city by massive transport infrastructure investment. Glasgow’s bid has failed to emphasise this.

It is hoped that this plan, or any suitable alternative it may inspire is incorporated into the RTS as a priority project, underpinning the importance the Subway system has to the regeneration of Glasgow and giving stronger backing to important projects such as the 2014 Commonwealth Games bid.
History

The history of the Glasgow Underground and/or Subway is well recounted elsewhere. The SPT web site and the Glasgow Transport Museum offer superb insight into the story of the Underground and how it has developed over the years. These sources of information are suitably enhanced by the many individual contributions from authors and enthusiasts who have taken time and effort to record their own experiences throughout the years. In compiling this plan we have been fortunate to gain valuable insight to the history of one of the world’s oldest underground rail systems. These contributions are gratefully acknowledged below.

Following the influence of the London Metropolitan Railway and other similar congestion relief projects, the Glasgow Underground system began life in 1896 as the Glasgow District Subway, built by a private company and opening only months after the Budapest Földalatti to become the world’s third dedicated underground train system. Originally a steam powered, fixed cable drive system it was converted to an electrically driven train engine in 1935 -1936. Other small but significant changes were made to the trains and system over the years and the service was at its peak just after the Second World War when over 37 million passenger journeys were made despite the vagaries of rationing. Distinct travel patterns were also established with cross river traffic challenging movements to and from the City Centre as the busiest part of the service. Perhaps unsurprisingly the system ran at a profit for significant periods during this era.

However, in line with greater personal mobility and the planned (and unplanned) decline in the population of Glasgow over the next two decades the “UNDERGROUND”, as it was then known, failed to maintain such fantastic levels of patronage but nevertheless was still accommodating some 20 million journeys until the end of the 1960’s. In the following decade there was a dramatic fall in user numbers and it is perhaps no coincidence that this period was heralded with the opening of the Kingston Bridge (1969), now recognised as one of Europe’s busiest road bridges and certainly the principal conduit of cross river traffic in Glasgow.

“...growth was reaching crisis point and the symptoms were patently visible every day. Traffic was so bad that it was threatening the lifeblood of business.

Something had to be done.

The plan was simple: a railway beneath the streets that would relieve congestion at a stroke.”

This extract from History of London Underground web site has a particular resonance today.
With a dramatic decimation of the patronage in the early 1970’s, the next major review was conducted with the question of the future need of the Subway very much as part of the agenda. Reporters of the day suggest that the correct decision was taken to conduct a major overhaul of the Subway and a two year investment plan was instigated in 1977. The bright new “Clockwork Orange” opened again for business on 16th April 1980 following a comprehensive upgrade of stations, railway operating infrastructure, the locomotives and even the livery. This substantial reinvention then cost some £30 million and helped the Subway, as it was then renamed, to double its passenger base from the levels before modernisation.

The present era once again sees calls for a new look at the Subway. Passenger numbers and revenues have again slipped back and there are calls for improvements to the service and system. Ominously, the SPT’s own web site which chronicles the history of the system stops at 1996; perhaps signifying the uneventfulness of the past decade or, more seriously, the uneventfulness of the Subway which saw a decade peppered with tales of complaints and industrial action but did end 2006 with the optimistic announcement that mobile phones are now to be accommodated – free of cost!

A look at the history of the Subway cannot really be done in isolation. The rise and fall of the system is inextricably linked to the rise and fall (and hopefully re-rise) of Glasgow. Similarly, as one of the first dedicated underground rail systems in the world it is also useful to look at what other metropolitan districts have done and where we may have once taught so might we now learn.

Glasgow’s need for a subway system was very much a product of its own success. As second city of the empire and an industrial powerhouse on the world stage the associated population growth and need to commute and transfer goods across the city led to traffic and congestion problems not far removed from present day experiences. Similarly, the end of the 19th Century was also experiencing a veritable communications boom where newspapers, telephones and wireless telegraphy (radio) were the internet of their day. It is no surprise that London and Glasgow were in the vanguard of developing alternative transport systems as the solution to their burgeoning traffic and congestion problems. The post war optimism of the 1920’s quickly fell to the harsh
realities of the advances which wars sometimes bring to technology. Certainly the progress in 
avtomotive transport after WWI played a part in the (re-named) Glasgow Subway Railway 
Company facing closure and only a rescue bid from the then local authority, Glasgow 
Corporation, prevented the railway closing. The 1930’s Depression affected Glasgow as 
elsewhere and although the government of the time maintained their orthodox economic and 
social policies the move by the Corporation to introduce electric traction was perhaps as 
significant a social project as any of Roosevelt’s New Deal Programme.

The advent of WWII saw the Underground affected just as other parts of the city with a short 
term closure caused by bomb damage. The post war period was again upbeat with unprecedented 
patronage and profitability for the Underground mirroring the optimism and futuristic outlook of 
the city. Enshrined in the Bruce Report, the 1950’s planners’ enthusiasm for their modernist 
views meant that, like other relics of the Victorian age, the Underground was left behind whilst 
the Glasgow population was decanted to the housing schemes of Easterhouse, Drumchapel and 
Castlemilk; and the new towns of East Kilbidge, Irvine and Cumbernauld. The job of relegating 
the Underground to an almost tourist attraction was completed in the 1960’s when the city 
fathers’ vision for the motor car saw the cross river traffic being catered for by the new Clyde 
Tunnel (1963), Kingston Bridge (1969) and M8 urban motorway (1972).

The almost halving of the City population came at a 
time when Glasgow’s established industrial base was 
also changing. Easy access to the raw materials of 
heavy industry was no longer a mainstay of 
production and world wide, mostly state subsidised, 
competition removed the City’s domination in these 
fields. Nowhere was this more apparent than in the 
shipbuilding and shipping industries in Glasgow 
where the Underground stations of the south side were 
particularly linked. Indeed it is no accident that the 
engineering and maintenance depot for the Subway system is located here.

So, Glasgow is again in the throes of re-inventing itself. A City which now undergoes the 
transformation to a centre for commerce and tourism still faces the problems of 100 years ago 
when cross city movement of goods and people was hindered by traffic and congestion. It is 
perhaps unfortunately that such a forward looking City still cannot find an important place for an 
established transit system.
Meanwhile other cities, some working on similar regeneration plans to Glasgow, have a clear vision of the importance of urban transportation to the aspirations of growth and change. Two particular examples are fitting to be considered along with Glasgow.

In 1896, Budapest beat Glasgow to the position of the first dedicated underground railway outside London by only a few months when it started a straight line only half the length of the Glasgow system. The Hungarian capital now boats a three line system integrated with both local and national rail networks of over 33 kms. It is presently coming to the end of a refurbishment programme which brings all existing stations up to date. There is also a planning programme which could effectively double the system within 10 years.

However perhaps Budapest with a population of over 2 million people; a capital city and a country where central government intervention placed greater emphasis on mass transit systems does not offer a direct comparison with Glasgow. Stuttgart, in southern Germany, is a town of similar population size supporting a similar regional population. Again, historically an industrial city, Stuttgart is looking towards a greater cultural base and it is also regarded as one of the greenest cities in Germany due to its many parks. The similarity with Glasgow ends with the approach to urban transport. Since 1985, Stuttgart has embarked upon a plan to adopt the Stadtbahn as the preferred form of urban transportation. Building on old tunnels, railway systems and tram lines this form of metro presently extends to some 113 km serving the city and its immediate hinterland. The system is fully integrated with the state railway and is regarded as amongst the best in Germany. All of this has been largely completed within a comparable lifetime of the proposed RTS.
Today’s Subway

The Subway is once again at an important crossroads and the RTS has set no great challenges for this part of the urban transit system. The proposal to maintain passenger levels at just over 13 million trips per annum suggests that any planned (but as yet, unspecified) improvements will not do much to elevate the system to anything other than a secondary contributor to the metropolitan area’s transport infrastructure. Indeed, the fact that any improvements are not planned to be implemented until the latter part of the RTS programme in 2017, underlines that assessment of the Subway as not being a priority.

Elsewhere in our response to the RTS, thgRAIL has asked for hard questions to be asked of every component of the region’s transport infrastructure and for the Glasgow Subway it is no different. The decision has to be taken whether the Subway is to be retained as a loss making quaint tourist attraction or as a real contributor to the metropolitan transport network, capable of responding to the needs of passengers and helping resolve many of the economic, social and environmental burdens facing modern communities in a global society.

Although information available from the SPT is difficult to interpret, it is clear that fewer passengers are making shorter journeys requiring a greater level of financial support. This may be due to the lingering debt of the 1970’s refurbishment scheme or accumulated operating losses. However what is clear is that a more transparent reporting base is required in order to make valued judgements on the current operation. A similar situation exists with staffing and the management structure where the SPT web site suggests that there are currently 370 staff but “support functions such as finance, personnel and procurement are provided corporately”. Again this lack of specification makes it difficult to assess the true costs being created by running the present service. Yet behind this opaque view of the SPT’s stewardship of the Subway business, significant financial commitments continue to be made. There is a reported investment on improved rolling stock for the Subway system and even though this appears to be part of the £19 million (over three years) capital spend in the SPT 2006/07 Business Plan, it is difficult to imagine that any part of that figure would survive the required Scottish Transport Appraisal Guidance (STAG) assessment which the government apparently insists on before approving any new transport related investment.
The current Subway management of staff and interaction with customers displays problems which would not be expected in any other multi-million pound business. In recent years an ongoing difficulty of staff unrest and militancy has been demonstrated with no surety that the management yet has control of the operation. From the (hopefully) apocryphal story of the service stopping for a staff member’s wedding; the desperate plea for volunteer Christmas service drivers; the closure of stations due to absenteeism, or to the sacking then re-instating of 35 drivers, there are plenty of examples to support the fear that the staff rather than the management are in control of the service.

Likewise, there appears to be an almost contempt for certain user groups such as football fans attending Ibrox, particularly at evening games or Sundays, when the service makes no attempt to accommodate known travellers. This was further demonstrated recently when the call for extended Christmas Sunday services was made. The Chair of the SPT, Cllr Alistair Watson, defended their position by stating that an extension of the service by some 5 hours every Sunday would cost the service £540,000 each year but that an alternative bus service is planned to operate the route outwith Subway hours. Despite some doubt over the arithmetic this would equate to only an extra four pence per average ticket – if not a penny of revenue was derived from the additional hours. The decision to use buses is a capitulation of the management team’s responsibilities and a damnation of the Subway as a useful transport function when/if it can be so easily replaced.

However, on a positive note, at the close of 2006 there are signs that the present day management is facing up to the reality of the challenges ahead and their contribution to the urban transport network. Cllr Watson has admitted that the Subway needs substantial investment and that the intervention of the private sector is a “realistic” consideration.
Towards 2020

The 2020 Vision of thgRAIL is very much based on placing the Subway at the centre of the region’s transport network. The belief that the current passenger base can be expanded underpins the financial case for improving the existing system and that even more passenger numbers can be generated through future extensions to the Subway.

This can really only be done with the participation of the private sector. To create the correct financial foundation for massive new investment, risks will have to be taken and reward allowed. Certainly the strictures of government finance, politics, and STAG assessments etc. would prevent any entrepreneurial flair being part of the public sector process but government at all levels could still contribute to the creation of the proper environment to encourage such investment. On a financial front, the waiver of historic debt; the transfer of the assets and the provision of an initial operating subsidy or revenue guarantee are tools to be used. Politically, the explicit support for any approved scheme and the appropriate involvement at local government officer level will also encourage the funders. In the established Local Plan, Glasgow Council is quite clear on the part they have to play to make this work.

This is the thgRAIL vision for the Glasgow Subway system. A new level of investment can be generated through government by effectively selling the railway; subject to an approved plan which meets all stated transport objectives. That plan can be generated by competition or negotiation following publication of a government specification or design brief which specifies what exactly is expected of the successful bidder. The templates for such documents already exist in the heavy rail franchise agreements for the regional Train Operating Companies (TOCs).

Such a form of privitisation need not exclude the SPT. Indeed, they have stated they are awaiting their own consultants’ reports; they know the current system; are now open to the possibility of attracting private finance in partnership; therefore they should be best placed to win any bid. They would present an attractive option to a collaborative bid, management buy-in or other financial mechanism. This applies equally so to the staff, who would have job security, the maintenance of pension and other rights whilst also the opportunity for career advancement brought about by the committed expansion of the service.

Cities such as Strasbourg and Manchester are adopting more radical approaches to the provision of quality public transport that Glasgow will have to match if it is to remain competitive. Source – Glasgow City Plan Part 1 – Transport Para 6.30
To begin with, a plan is necessary and the thgRAIL scheme is shown in the following pages. It possesses some key elements; improve the existing system; attract more passengers; empower staff; interact with other businesses and extend the system. It is also guided by the central government transport objectives of economic expansion; social inclusion; environmental sensitivity and connectivity. The three absolute fundamental issues however are to regain lost business and boost revenues by

Integration; Integration and Integration.

**Transport Integration**

Apart from the enthusiasts and tourists using the service, the Subway is not and never has been an end in itself. It has always been a conduit to get elsewhere and never more so than in the post WWII period when connections to four main line stations; extensive bus and tram networks; areas of dense residential population; a concentrated commercial city centre; the shipyards and associated works of the south river bank, all boosted patronage to levels never likely to be seen again.

This form of connectivity with other transit systems, car parking (Park and Ride) and pedestrian movement is key to the success of any re-vitalisation of the Subway network. Complaints about the entrance to Kelvinhall (where the official address is Dalcross Pass – Dalcross Pass???)\); the almost hidden entrance to Cowcaddens (in Dundasvale Court, of course) and the lack of any...
meaningful direction indicators to Kinning Park are all barriers to good pedestrian connectivity and must be addressed in a plan for a revitalised Subway.

Community Integration

Any review of the Subway should also look closely at greater access for the disadvantaged and the less mobile. The SPT appears to have thrown in the towel on the question of disability access where, even before the requirements of the Disability Discrimination Act (DDA), they had an unclear policy in this respect. The provision of disabled parking bays at Park and Ride stations for example appears to clash with a system that is not wholly accessible to all members of the public. Indeed, recently there has been a complaint about the difficulties which mothers with prams face when using the system.

On a related matter, whilst the SPT’s concessionary fare at 40p represents good value for money it cannot compete with the Executive’s scheme for free bus travel for the elderly. Similarly the, again Executive sponsored, Scotland-wide Concessionary Travel Scheme for young people also appears to miss the Subway as an eligible transport scheme. The SPT should have lobbied the Executive for parity in both respects. The thgRAIL “Go Card” proposal offers this form of subsidy and control.

How Subway stations affect the local community has never been considered. There are clear indications of casual or unauthorised park and ride schemes operating around every Subway station. There should be a policy of removing inconsiderate parking, reserving local parking and forming disabled or mother and toddler bays close to each station entrance. The simple provision of services when it may not be wholly economic to do so is another area where the SPT could provide a benefit to those less well off. The districts of Govan (24) and Ibrox (13) are among the top areas in the whole of Scotland recognised for social deprivation. Such locations need easy access to employment and services, whether it is a worker attempting to return home from working in the city centre or a student attending evening class outwith the districts. The SPT has failed in recent attempts to extend evening, late weekend and Sunday services and this point must be addressed.

On a community planning level, the aims and aspirations of Glasgow Council are well documented and are considered achievable yet the SPT appear to have distanced their organisation from any real contribution in this respect. Indeed, the refusal to incorporate the Council’s request of a new rail station serving Ibrox as part of the Glasgow Airport Rail Link may suggest that the two organisations are out of sync where transportation matters.
are concerned. Even outwith direct action and substantial capital commitment the Subway fails to embrace suitable marketing opportunities like the city’s bid for the 2014 Commonwealth Games. An initiative to adopt commemorative tickets, supporting poster campaigns or even a train in the livery of the bid committee would show Glaswegians that the organisation is very much in touch with the city’s aspirations. This does not require a great leap of intellectual faith – O2 are one of the major sponsors of the games bid; O2 previously wrapped a subway train in advertising. With the hard part of design and production already in place it surely would have been easy to combine both.

Whilst the existing Subway system may be limited in the extent to which it could contribute to the Local Plan, an aspirational SPT may choose to look at where an extended service could integrate with Council plans. The SPT has certainly shown initiative in promoting other competing transport modes such as the proposed £40 million* Fastlink (guided bus) to support the Clyde regeneration proposals, but is this the best form of sustainable development when a subway system passes directly beneath Glasgow Harbour? How much would a new Subway station cost there despite the obvious engineering difficulties?

Integration with the business community also appears to have been missed. Glasgow is a retail capital, second only to London in the U.K. and an ideal location to try new ideas with the corporate world. Recently the city’s Hogmanay Party was unfortunately cancelled but even if it went ahead the Subway would have failed to provide any service. Of course, finance would have been a factor but there really was no initiative to overcome that by the SPT. Sponsorship, perhaps through local companies such as Tennents’ Brewery (T in the Tube?), or bars and restaurants encouraged to refund the Subway fare as part of any cover charge, or even the Hogmanay event adding say, £1.50 to the ticket price for the provision of late night public transport services (refundable on buses, taxis and subway) are all initiatives which would by pass the SPT in their stewardship of the Subway as they appear to be out of touch with the business community.

Nowhere is this more apparent than with the two busiest stations on the system. Both Buchanan Street and St. Enoch are on the doorstep of two major city centre shopping centres, Buchanan Galleries and the St. Enoch Centre. Even the names are so close to the station names but there the similarity ends. At the very least, fares refund schemes should be in place with shoppers using the centres being rewarded for using public transport and giving the shops their custom. This would be a relatively simple exercise to administer but it is perhaps beyond the ability of the SPT.

*Note: Fastlink first introduced in 2003 estimated at £32m. In 2006 it was costed at £40m (25% increase). It was formally unveiled on 9/1/07 when the delivery programme was put back one year until 2011 and the initial cost estimate had escalated a further 15% to £46m.
to initiate such a scheme. On that basis, the fact that both shopping centres have recently announced expansion and there are no plans to incorporate direct connections to the Subway stations, it is understandable that the SPT has missed these more complex opportunities.

Technological Integration
The SPT’s Regional Transport Strategy (RTS) document is some 112 pages long. In this plan for the next 15 years there is not one reference to computers, video, microchips, 3G, Wifi, the internet, wireless, radio, text (messaging); there is one reference to CCTV and only three references each to both technology and innovation (two in a quotation from the Scottish Executive). There is no great hope that the SPT possesses the innovation and initiative to capture and use the newer technologies to the benefit of the Subway and the travelling public. The most recent technological advances include a rather robust looking Customer Information System (CIS), which seems to be under continual testing, and a move to bring mobile phone access beneath the streets. It may have been more suitable to introduce the latter innovation first then the CIS may have been able to communicate by radio and then be broadcast to a wider audience (by text?). Indeed the RTS appears to adopt a cautious approach when considering advances that can be made.

It is therefore very much part of the thgRAIL proposal to bring driverless trains, text information services, video advertising, web cameras and internet accessibility to the new rejuvenated Subway system. These innovations are already with us and can easily be adopted, improving the service and the profitability of the business. The future challenge will be maintaining the receptive approach to new ideas and being prepared to accept the next generation of interactive technologies such as RFID (Radio Frequency Identification) and personal direct payment technologies such as PayPass, UPass, etc.

Perhaps the biggest current hi-tech challenge lies in the latter technologies highlighted above and the need to have an integrated ticket system. This must be universally acceptable to all travel forms in the region and offer the travelling customer value, flexibility and ease of use. In this respect it is worrying that the SPT are still championing their ZoneCard almost 17 years after it was first introduced and spent £122,000 of executive grant on upgrading their software last year.
In an era soon approaching when it will be possible for mobile phones to make small personal payments for travel tickets, etc., the RTS still sees further development of this somewhat dated technology based on the magnetic strip retaining certain programmed information. Furthermore, ZoneCard appears to offer nothing for the dedicated Subway user as a one week ticket costs £9.00 compared to a weekly ZoneCard at £13.20. This disparity of value with ZoneCard is also displayed in the SPT Business Plan 2006/07 where sales are expected to reach £11.6 million on weeks sold of 670,000. The average of £17.31 is less than the cost of a 3 (out of 13) zone trip. Given that some of these will be Juvenile tickets and at least a few will inevitably be for greater multiple journeys then the clear majority of sales apply to travellers moving between only 2 (out of 13) zones. At the ZoneCard “12th Birthday” re-launch in 2002 sales were then reported to have reached £150m since 1990, i.e. an average of £12.5m per annum. With projected sales now down to £11.6m per annum and a trend of mostly catering for short journeys it would appear that ZoneCard has had its time and newer technologies should now be endorsed. It is encouraging to note the SPT recently hosted a seminar on Smart Card technology where representatives from Oyster (London) and Octopus (Hong Kong) were present. It is even included in the RTS as a short term project with introduction before 2010. Unfortunately the RTS also confirms that the study has been completed but the SPT appear reticent about including its findings in the plan for the next 15 years.

Whilst the figures for Oyster and Octopus are very impressive there is no reason why a bespoke system could not be designed to cater for the particular requirements of the West of Scotland travelling public. The Executive has a clear vision in respect of Smart Card technology; Glasgow City Council has an excellent and well advanced technology strategy and some of our local businesses, such as Advanced Smartcard Technologies (part of E.CEBS) in East Kilbride are at the leading edge of new adaptable software.

thgRAIL propose a new chipped card system which will have a retail base and offer consumers points rewards (like Nectar) which can then be used to pay for Subway tickets, car parking, etc. A separate paper on the thgRAIL “GO card” will be submitted in response to the RTS.
Existing System

The existing system is the obvious starting point for the thgRAIL plan which is looked at from both an operational and property viewpoint. The estimated starting time base would be August 2008 and the rolling programme of works would see a completion by the end of 2011 – some five years before any Subway improvements are planned in the RTS.

OPERATIONS

The main restriction in improving operations is the physical limits on the system. The platforms cannot realistically be extended, indeed modern day management requirements restrict further the numbers which can be allowed on a platform at busy times. The method of improving this is to automate the system. At busy stations such as Buchanan Street glass partitions in the form of platform edge doors will be erected to allow for synchronised door openings therefore making it safer to encroach closer to the platform edge. This will also provide a clear indication of where doors are to allow disembarking passengers some freedom of movement. Platform capacities for each station will be set and turnstiles automatically programmed to lock when these limits are reached. Upon departure of a train the turnstiles will presume new platform capacity and open to allow waiting passengers’ access for the next train.

The incorporation of automatic platform edge doors will also improve safety, security and the local environment by assisting climate control and the reduction of natural draughts. The inclusion of such automated train boarding systems, even with glass platform walls, will make an already claustrophobic station appear even more so. To combat this, natural light will be introduced into all stations where possible. It will be easier to accommodate this at stations such as Kelvinhall where the cupola is clearly visible. Where it is not possible to take direct light then light conduits, e.g. Velux Sun Tunnel™ will be used to counter the tight, enclosed feelings which some of the stations give.

A programme of ongoing fabric repairs will be compiled and where appropriate alternative designs will be employed to replace or at least mask the 1970’s brown brick frontages which exist at most of the stations. A change of livery is not envisaged, certainly not without good reason, although direction signs and other means of identifying the stations from a distance will be improved. Indeed there maybe opportunities for a suitable public awareness exercise by launching a competition for new signage. The London Underground and the Paris Metro are
instantly recognised for the unique design and style incorporated into their signs. The French designs are a particular influence and point the way perhaps to a Rennie Mackintosh influenced design becoming the “signature” of the Glasgow Subway.

**SYSTEMS**

In conjunction with automated boarding, the signalling systems will be improved. The Subway lends itself to an automated signalling system and operations system such as Seltrac used on the Docklands Light Railway. With fifteen stations and a current maximum of eight trains on any circle the Seltrac moving block automatic train control (ATC) system, combining both automatic train protection (ATP) and automatic train operation (ATO) may be easily incorporated into the Subway’s systems. This would build upon the existing ATO used for stopping and controlling speed and eventually lead to the “driverless” train.

**ROLLING STOCK**

A fully automated system would remove the need for the driver cockpit and offer an opportunity to extend the passenger capacity of each train. The simple recapture of the space would offer 8 seats per train but the design would be examined to establish if a projected extension could be mounted on the cockpit area to at least offer a further 16 seats on each train, effectively increasing train seating capacity by as much as 20%.

**STATIONS & REAL ESTATE**

The land and buildings of the Subway provide a physical representation of the service to the Subway customer. In as much as the 1970’s photograph of West Street above summed up the reasons for the major refurbishment that followed so do current day criticisms like the recent reaction against the entrance to Kelvinhall Station or the call for a new passenger interchange at Partick. There is a need to review the Subway’s real estate and that should begin at the top. It must be difficult for any business to work with the staff and operational functions based in one location and the head office and corporate functions based elsewhere. The Glasgow Subway would appear to be no different and, unless there were compelling reasons to do otherwise, the expense and additional burden of having a head office function in Glasgow city centre would be reduced by a move and relocation to Govan. The depot, staff quarters and operational function at
Govan would become the head office of the Subway with the resultant savings in cost, staff and operations combining with the boost to morale to contribute to the reduction in losses which the service currently carries. This would also trigger a detailed review of the Broomloan Depot which would need to be revitalised particularly if it is also to accommodate an expanded service.

The main property assets of the Subway however are the stations where more precise action is required and a detailed plan is needed on an individual station basis. From a base of providing the existing assets as clean and presentable simple improvements such as ensuring the proper function of all passenger aids (escalator at Hillhead, travelator at Buchanan Street, down escalator St. Enoch Inner Circle, gate at Kelvinbridge, lighting at Kelvinhall, car park ticket machines at Shields Road, etc) can be made. Then fundamental objectives such as compliance with the Disability Discrimination Act (DDA) will be incorporated into a refurbishment plan. Full disabled access will be difficult to introduce into a system which was designed over 100 years ago but this should not be an excuse for ignoring matters such as hearing loops at ticket counters and improved visibility at platforms, stairs and ticket barriers.

The cost of full DDA compliance should be identified and a special case made to the Executive for this extraordinary funding. From an aesthetic standpoint the thgRAIL plan seeks to incorporate more natural light where possible and individual stations should incorporate a design theme perhaps reflecting a local feature or visitor attraction. Passenger safety and security aids will be incorporated, particularly at the busier stations.

Outwith the stations, improved directional signage and access are a priority whilst opportunities to improve revenue through the introduction of supporting retail (including advertising) functions can be taken where appropriate. As part of the DDA compliance plan disabled parking spaces should be reserved close to every station, not just official Park and Ride facilities. This recognises the pattern of unofficial parking witnessed close to almost every station on the network.
Govan Station

*Passenger throughput (2005) – 990,000*

*5yr trend – Falling (92%)*

An opportunity exists to redevelop the station in conjunction with plans to extend the Subway system where Govan would be an interchange station with the new proposed Clyde Line.

Existing integration is good with a great deal of space given over to a bus station which was planned in the days before the science of bus operation saw operators avoid the terminus and maintain a presence on the road. The opportunity therefore exists to redevelop the site with a smaller bus stance and release a potential mixed use development opportunity to the northern edge of the site. A new station could be included in such a redevelopment scheme. There already exists an informal Park and Ride facility on the vacant site to the north of the Subway station and it is expected that this site will be developed as part of the Govan Town Centre Action Plan. It will therefore be removed and the main transport integration will revert to having good bus links calling at Govan Subway.

Any redevelopment of Govan Station as an interchange would follow the principles of more natural light, greater accessibility and improved communications as the base design parameters. The combination of the new Clyde Line station would also allow the opportunity for full DDA compliance and the creation of a focal point for the regeneration of Govan including public space and street art as a reminder of the past and a pointer to the future. Until that opportunity arrives a short term cleaning and refurbishment of Govan Subway will be included in the initial Subway upgrade.
Partick Interchange

*Passenger throughput (2005) – 1,010,000*

*5yr trend – Falling (92%)*

This station is currently being redeveloped by the SPT as a major interchange with the suburban rail station and the bus services calling at Merkland Street. The development is currently one year behind schedule and over budget. It would be expected that the investment however would be a suitable part of the overall refurbishment plan. Until further details are available there is no provision in the thgRAIL scheme for any new works at Partick.

The SPT has emphasised the parts of the Partick project designed to ease access for the less mobile and in particular comply with DDA. As such it should act as a template for all stations, indeed there is little sense in providing access for those with mobility problems if there is not corresponding egress improvements throughout the rest of the network.
Kelvinhall

Passenger throughput (2005) – 620,000
5yr trend – Falling (95%)

This station has been subject to some recent criticism due to its unwelcoming and difficult access. It is the main Subway station serving the newly refurbished Kelvingrove Museum and Art Gallery; the sports facilities at Kelvinhall; the Glasgow Transport Museum; three hospitals and the popular residential areas of Partick and Kelvingrove. As a result, minor improvements including a new street canopy have been added but much more could be done. Kelvingrove Park will host the bowling competitions should Glasgow be successful in the bid to host the 2014 Commonwealth Games. Clearly, there is a case for re-naming the station Kelvingrove, although there may be some who feel it should revert to its historical and geographical name of Partick Cross. There would even be support for a simple but defining name such as Museum.

An improved entrance taking in part of the retail frontage on Dumbarton Road would be combined with an upgrade of the rear lane and pedestrian access. The additional frontage space may present a coffee shop or kiosk opportunity. Realignment of the local bus stops outside or close to the Subway entrance would allow bus information systems to be incorporated into the station/coffee shop to provide local information on transport and visitor attractions.

Within the station, the association with the Museum would be emphasised with strong information systems (audio, video, poster, exhibits, etc) being used at platform and entrance levels. The re-introduction of natural light by replacing the metal cupola with glazed lights would also bring the station back to a Victorian theme in line with the Museum and Art Gallery.

The site to the rear will be examined as a residential development opportunity.
**Hillhead**

*Passenger throughput (2005) – 1,860,000*

5yr trend – Falling (92%)

Five years ago this station had 250,000 less passengers than St. Enoch; now it is only 50,000. Yet both stations are experiencing a decline in patronage. The trend however suggests that Hillhead is declining at a slower pace and will soon become the second busiest station on the network.

However that perhaps disguises a bigger problem in that the four West End stations of Partick, Kelvinhall, Hillhead and Kelvinbridge have lost almost 400,000 passengers within five years. Hillhead remains a popular station serving Byres Road, the University and the West End.

Unfortunately the station is lost within a busy retail and leisure frontage and whilst it does have a retail kiosk within the ground floor level this has been given over to the travel centre and does not take full advantage of such a popular location.

Integration with local bus routes is excellent and there is a short term car park to the rear offering Park and Ride facilities. The varied ownerships may make redevelopment opportunities difficult to assemble but the station even fails to make use of upper floors in an area where space is at a premium. Subject to a suitable access arrangement being in place the air space should be developed, perhaps in conjunction with a neighbouring proprietor.

The station layout offers an opportunity to enhance access and satisfy DDA compliance; this could be part of any improvement scheme. In the interim, the dowdy appearance could be combated with a stricter cleaning regime (windows to Byres Road should be washed on a regular basis, graffiti removal, concourse cleaning, etc) and the removal of a commercial “wheely” bin across the main entrance would appeal to the travelling public, if not the fire authority and the new SPT Head of Security.
**Kelvinbridge**

*Passenger throughput (2005) – 910,000*

5yr trend – Falling (89%)

Kelvinbridge Station presents an identity problem with Kelvinhall/Kelvingrove but not such that a name change may be necessary. The station offers Park and Ride facilities for 150 cars although the patronage fails to match levels achieved at other stations. This may be due to the availability of on street parking nearby or to the lack of information to drivers passing in the road above.

Connectivity with Great Western Road is very good with stairs and escalators leading to the river level where the main station entrance is located. That integration can be improved with a refurbishment of the escalator, better signage and links to bus stances in the main road. At the time of inspection the entrance to the park was locked and closed apparently defeating the purpose of the path system which leads through the park. A makeover including basic cleaning would dramatically increase the impact of this station which offers excellent scope for improved access and DDA compliance. The introduction of natural light (by cleaning the cupola windows and the escalator enclosure windows in the first instance) would help take advantage of the parkland setting. Consideration would be given to the replacement of the solid roof with a new glass cupola. Indeed a more extensive use of glass as a building component could make this station aesthetically more appealing.

There is an opportunity to plan a residential based redevelopment of the site. The economics would allow the station and Park and Ride facility to be redesigned with part of the car park placed on a lower deck with a lift and escalator encouraging greater ease of movement into the station.
**St. George’s Cross**

*Passenger throughput (2005) – 580,000*

*5yr trend – Falling (88%)*

The French called the period between 1950 – 1970 when the Paris Metro suffered lack of investment and neglect as the "automobile decades" (décennies voitures) and St. George’s Cross is one of the stations most affected by Glasgow’s own love affair with the car. The station which once served a busy neighbourhood is now stranded in a triangular sunken island between three roads with access by underpass or stairs leading up to the main roads.

The proximity of the roads does however enhance its connectivity with local bus stances and pedestrian routes although the directional signage is poor. Even the tower neglects to say that there is a station below and, from street level, looks more like an advertisement for the SPT (if the graffiti is ignored).

The space within the “island” does offer the opportunity for redevelopment to improve access and observance of the DDA requirements. The incorporation of the walkways, stairs and underpass into the station concourse by roofing over the open space and improving lighting may go some way to making this station more noticeable by the creation of a landmark structure.

Certainly, the object of any regeneration exercise should be to bring the station more to street level and create a more direct interface with pedestrians, local transport and Subway passengers. Like some other stations there is the suspicion that there is an unofficial Park and Ride provision with cars parking in nearby streets, particularly around Queens Crescent which links to the station by underpass. With the cooperation of the Council, this may be something which can be built upon in the future. Certainly, in the immediate term, there is a strong case for dedicated disabled parking spaces to be provided in the spur road from Great Western Road to the immediate north of the station.
**Cowcaddens**

*Passenger throughput (2005) – 500,000*

*5yr trend – Falling (93%)*

Cowcaddens was also cut off by the road system and left with subterranean walkways as the preferred means of access. Certainly, unlike St. George’s Cross, the station can be seen from the main roads – the problem remains however in getting from the road to the station. This is particularly true of the north bound bus stance on Garscube Road which is only 50m from the Subway entrance but involves a 160m walk away from the station to get to the entrance via an underpass. A variety of worn paths around the station show that the public have developed their own routes. This lesson should be considered when designing and refurbishing the station and a priority given to improving access in the most direct route to the City Centre, at the top of Cambridge Street. It should be noted that using this route, Cowcaddens Station is only 300m from the Marks and Spencer store in Sauchiehall Street; whilst Buchanan Street Station is some 620m.

Again there is the suggestion of an unofficial Park and Ride with medium to long term parking clearly apparent in Dundasvale Court.

A refurbishment scheme which includes improved access, DDA compliance and increased use of natural light is planned for this station. In this respect Glasgow Council’s assistance in providing improved pavements and a pedestrian phase in the Gartscube Road traffic lights will also be sought.
Buchanan Street

Passenger throughput (2005) ~2,540,000

5yr trend – Falling (96%)

This is the busiest station on the Subway network but despite being located on Glasgow’s premier shopping street and close to many retail, leisure and other travel facilities the passenger patronage again displays a downward trend. However in the short times of the thgRAIL surveys it was noticed that some passengers simply vaulted the ticket barriers to gain access to the trains at this station.

Other than the small newspaper kiosk, the link between Buchanan Street Station and the prime retail neighbourhood is not apparent. Both Buchanan Galleries and the Buchanan St/Bath St corner (Atlas Investments site) are due to be redeveloped or expanded within the short term. The station should be featured in these schemes whether physically or by association and this is an opportunity which should be examined now. In the interim, there is no reason why the rather drab walkway linking the station to Queen Street mainline railway station should not be used as a shopfront for Buchanan Galleries or other retail outlets in the street – even if the main footfall using this link is not shopper traffic. In fact there is a prime retail redevelopment opportunity along the walkway and the information centre above. This is the closest location to Buchanan Galleries and it is being used for non-retail purposes!

Recent improvements to the street level entrances are attractive and worth keeping (although the glass on the north stair could be washed). They also introduce a reasonable level of natural light to the concourse although this could perhaps be improved upon. In the absence of a more adventurous collaboration with the adjoining retail neighbours (to perhaps develop a platform on the western side of the Inner Circle) then platform edge doors may be a suitable improvement in the immediate term. However, clearly in the longer term the introduction of a new platform for the Inner Circle is a priority. This would allow the flank platforms to operate as boarding only whilst the central island platform could be exclusively reserved for disembarkation.
**St. Enoch**

*Passenger throughput (2005) – 1,910,000*

*5yr trend – Falling (85%)*

St. Enoch Station is a source of significant concern within the Subway system. Showing one of the largest reductions in patronage over the last five years, the station requires a radical rethink if this trend is to be halted if not reversed. Unfortunately, during this period of decline, there appears to be change all around the station and it may be too late to take advantage of the investments being made elsewhere. The most significant of these improvements is the decision to extend and improve the St. Enoch Shopping Centre. Plans include an upgrade to the square to include significant works to the public realm and the station entrances could be an important part of this. Indeed, the Buchanan Street Station entrances offer a perfect example of the possibilities and it would certainly be in context to consider the replacement of the squat pillbox like structures with the use of glass being very much part of the square. The opportunity to create a more definite link with Central Station will be examined further and a walkway below ground incorporating travelators would enhance the interchange which presently exists through some poor signage. Such a walkway could offer new retail frontages to the shops and restaurants (McDonalds, Pizza Hut) above but could also be continued through the station to link the St. Enoch Centre with Central Station. The model for this already exists – Bond Street Tube Station in London opens onto a retail concourse in a prime Oxford Street location.

The future extension of the Subway offers more support for St Enoch Station which will also be a stop on the proposed Clyde Line. The two railways would be linked with a mall below street level which would connect the existing station to the new line and station (still known as St. Enoch) within Custom House Quay. Again this mall, below Dixon Street, offers a retail opportunity and a further connection between St. Enoch Shopping Centre and a city wide transit system. It would be important to be part of the future plans for St. Enoch Square and its environs and an early dialogue with the owners of the shopping centre is certainly appropriate.
Bridge Street

Passenger throughput (2005) – 470,000

5yr trend – Falling (94%)

Bridge Street Station hosts a busy Park and Ride scheme and it also supports an extensive unofficial parking scheme in the nearby streets around South Portland Street and Bedford Street (as witnessed by the beaten paths heading from these locations to the Subway). It is well connected to local bus routes and is a relatively easy walk (600m) into the southern areas of the city centre.

Any refurbishment of the station would centre on the strengths of Park and Ride but also seek to release some of the redevelopment value which exists in the site. There may be an opportunity to move some of the car parking to the undercroft of the Glasgow Central Station approaches opposite the Subway, even connecting the two by pedestrian underpass below Bridge Street. This would release a substantial part of the site for a largely residential development which would incorporate a refurbished station. Indeed, in the vision to create a world class transport system the SPT would be expected to support a plan to relocate the entire station to the west side of Bridge Street, should an examination of the Central Station arches provide the opportunity to improve the station and parking facilities. Any new station would provide full DDA compliance and offer greater capacity by incorporating side platforms accessed by lifts and escalators.

A detailed survey of the Central Station arches will dictate which development opportunity can be considered as most appropriate for Bridge Street. Certainly with the focus on Tradeston as a priority regeneration project, a new or refurbished Subway connection would underpin the Council’s aspirations for the area.
West Street

Passenger throughput (2005) – 150,000

5yr trend – Falling (90%)

West Street station would appear to be the problem station on the Subway system. It is often threatened by early closure, particularly when staffing problems occur. There is almost no real hinterland offering any reason to travel there, although the situation may be improved by the completion of the M74 extension when a lot of doubt will be removed and a better environment for investment will exist. Indeed it is this hope which saves West Street Station from possible closure. It is expected that the M74 will see the Kingston area as one of the city’s main commercial sectors with easy access to the motorway systems bringing new activities to the area. thgRAIL has previously proposed the creation of an interchange station with the suburban rail line which runs above the Subway as part of their Glasgow Airport Rail Link proposal. The SPT also support an interchange but see this as an airport station only when CrossRail is completed.

Until these major decisions are taken then West Street must survive on the basis of the popular, but small, Park and Ride facility and the unofficial parking which doubles the number of spaces available. A refurbishment scheme which includes the opening of the station to more natural light will be put in place and a more extensive scheme including improved access will be planned when other major decisions are taken. In the interim a liaison with the M74 planning group should look ahead to the possibility of improving available parking below the new motorway when completed. Savings will be made if this can be incorporated into the plans at this stage.
Shields Road

*Passenger throughput (2005) – 460,000*

*5yr trend – Falling (90%)*

One of the conundrums of the Subway is why is Shields Road not called Scotland Street Station? Another is why did the SPT build an expensive over sized car park on some of the most valuable commercial real estate in Glasgow when there are suitable alternatives close by?

As with West Street, it is anticipated that the completion of the M74 extension will bring an enormous boost to this area of the city and the improved communications will lead to new developments and investment in an area which has been overshadowed by other initiatives. The thgRAIL plan is to work with the M74 planning team to accommodate their land requirements in the construction of the motorway and also plan the Subway requirements on completion. This would include the creation of a new Park and Ride car park below the elevated section of the M8 which was previously used as a shuttle car park for the Glasgow Garden Festival. In addition (and if necessary) it is expected that other overflow opportunities will exist in the areas around the new M74/M8 interchange. These otherwise difficult areas of land (e.g. below the motorway) would contribute to the new parking serving the station and allow the release of the Scotland Street site. The new car park would have a traffic light controlled junction at the entrance and offer direct motorway access via Stanley Street.

The whole question of car parking demand would also be addressed; for there is little doubt that the vast emptiness of the current surface car park suggests that the new multi storey building is an overprovision, or certainly a very bullish future proofing.

The station refurbishment would again concentrate on the introduction of more natural light and (subject to survey) the possibility of introducing flank platforms to create easier access and DDA compliance. The link between the new car park and station will be covered and include retail opportunities whilst the station would be re-branded as Scotland Street to build upon the attraction of the Scotland Street Museum opposite. In this particular instance, a Subway signage theme based on the Rennie Mackintosh designs would be more than appropriate.
**Kinning Park**

*Passenger throughput (2005) – 240,000*

*5yr trend – Falling (89%)*

The surprise of Kinning Park is that there are still a reasonably high number of passengers using this station despite the construction of the M8 motorway leaving the station and the surrounding area somewhat isolated. However it is clear that there is a busy unofficial Park and Ride system operating in Cornwall Street and Scotland Street West. Whilst that patronage is good for the Subway it may not be fully appreciated by the local community and there may need to be an initiative to introduce parking bays perpendicular to the pavement to ease any conflict. This initiative should be discussed with the Council.

The refurbishment of Kinning Park Station would be one of the easier projects in the Subway rejuvenation scheme. There is ample circulation space around the station building and the introduction of a side platform with full DDA access including a lift and escalator could be constructed alongside the tunnel wall before breaking through to extend the station at platform level. Unfortunately, the patronage figures for this station may not justify such expenditure at this time and a scheme of works to include the introduction of natural light, extension of the CCTV system and fabric repairs to the station building are planned in the immediate term.

Kinning Park is also one of the stations where a change of name may help improve the image and create higher patronage from people simply knowing where it is. Certainly there is no modern reference to Kinning Park in the immediate vicinity and technically although this was the original name it has always been located in the Plantation District – as witnessed by Plantation Park adjoining the station. The very proposal would be expected to promote public debate and perhaps could be used as part of an awareness campaign which involved the public.
**Cessnock**

*Passenger throughput (2005) – 520,000*

*5yr trend – Falling (90%)*

Cessnock Station already embodies the individuality of design and ease of access being promoted by thgRAIL for other stations on the system. Cessnock offers good communications with the bus routes in Paisley Road West, clear interface with the National Cycle Routes 7 & 75 and once again shows signs of (unofficial) Park and Ride in the neighbouring streets.

The station blends well with the location and the dominance of the Alexander Thomson terrace above. There has been some thought given to hard landscaping and how the station is represented with good directional signs on the main road indicating the presence of the Subway. The opportunity for improvement would concentrate on the re-introduction of a glass cupola to replace the metal covering clearly seen to the rear of the station at ground level and a general fabric upgrade. The modern additions of anti-climb measures and the imposition of a modern street lamp on the Cessnock Street entrance could be dealt with more sympathetically and the “rhubarb and custard” colour scheme may be reviewed although this reflection of the train livery does reinforce a strong corporate message.

Full DDA compliance would be difficult at Cessnock but all other things considered this would be a suitable station to feature as a guide for improvements/works elsewhere.
Ibrox

Passenger throughput (2005) – 540,000

5yr trend – Falling (86%)

In providing a service to visitors to Ibrox Stadium this station has perhaps the biggest captive market of any on the Subway system, yet it has still seen a loss of almost 100,000 passengers over the last five years. In the same period crowds at Rangers football matches have been static at or near capacity suggesting a clear decision not to use the Subway as a means of travel to Ibrox. With proposals to extend the Subway likely to lead to greater patronage by football fans routing through Govan Interchange, the service problems currently being experienced should be addressed now and a consultation set up with the club and the fan groups. Rangers Football Club has certainly demonstrated a responsible approach to traffic management with provision of coach parks for home and visiting fans and cooperation in the enforcement of match day parking restriction in the streets surrounding the stadium. Plans for a new hotel, casino and conference centre at the stadium have been approved and it is to be expected that the Ibrox Station would play a growing part in the travel choices available as the area regenerates. Football traffic has a fairly predictable use pattern and should be accommodated by additional trains and staffing. Indeed, the proximity of Ibrox to the Broomloan Depot makes the opportunity of introducing these additional match day staff and trains much easier with the possibility of a three minute service being introduced for the hour before and after each match. This could be further accommodated by the provision of a third line for trains waiting.

Whilst the football traffic is a large user group, the Ibrox community should also have a say in any new works to the station. As highlighted above Ibrox and Govan are areas recognised by the Executive as having special needs to combat known social deprivation in the area. The provision of a reliable and cost effective transport system would be an important tool in any regeneration programme and that tool will be more effective if Ibrox Station is upgraded to cater for the needs of both the local and transient communities.

The results of consultations with community and fan groups would be the basis of a refurbishment of Ibrox Station. Whilst this would be expected to follow the pattern of other station improvements it may be that at this station more than any other, improvements to the service may have greater effect than the cosmetic or physical improvements to the buildings.
COSTS & FUNDING

The costs of an upgrade to the existing Subway system would be accurately calculated following detailed survey work. At this stage indicative costs are given on the basis of this desk top study excluding DDA compliance which, although it would make sense for any such works to be programmed to take place as part of the upgrade scheme, a separate funding exercise and special grant application would be made to Transport Scotland for assistance with this part of the works.

Costs

An elemental approach has been adopted in respect of the station upgrade work with each station viewed as a separate project.

Head Office retraction (lease termination, dilapidations) – £ 100,000
Broomloan Depot upgrade (new offices, internal layout improved) – £ 1,800,000
Station Improvements –
  Govan (until Clyde Line) - £ 50,000
  Partick (no works, new signs) – £ 6,000
  Kelvinhall (new cupola, entrance & fabric) – £ 460,000
  Hillhead (to be redeveloped) - £ 50,000
  Kelvinbridge (new cupola, fabric repairs) – £ 230,000
  St. George’s Cross (raise to street level) – £ 520,000
  Cowcaddens (cupola, fabric repairs) – £ 430,000
  Buchanan Street (third platform, integration) – £ 3,250,000
  St. Enoch (new entrances, integration) – £ 2,500,000
  Bridge Street (to be redeveloped) – £ 50,000
  West Street (until CrossRail) – £ 50,000
  Shields Road (new Park and Ride) – £ 2,150,000
  Kinning Park (cupola, fabric repairs) – £ 230,000
  Cessnock (cupola, fabric repairs) – £ 230,000
  Ibrox (third track) – £ 4,250,000

Professional Fees – £ 850,000
Contingency – £ 3,750,000

TOTAL £20,956,000

The indicative costs of £21 million are based on 2nd quarter 2006 prices and will require adjustment for inflation to the start date. Similarly they have not been compiled with the benefit of a full survey. They do not reflect any grants or other cost mitigation which may come from collaboration schemes with partners or neighbours, e.g. at Buchanan Street and St. Enoch.
Similarly, it is not known if the current staff compliment has the resources to carry out some of the suggested works as part of a rolling plan of improvements. There may therefore be merit in incorporating some of the works into a plan of programmed maintenance and upgrade, even if this required a strengthening of the management team.

The extensive works at Ibrox would be subject to direct support from Transport Scotland due to the potential for congestion relief on the M8 and surrounding roads during match days at Ibrox Stadium (see suggestion for Congestion Relief Grant in the RAIL response to the RTS).

**Funding**

The costs do not take account of any development potential released from the SPT estate and this would provide the main source of funding for the improvement scheme. Other sources of funding include savings in operations costs, revenue enhancement and direct grant. The indicative source of funding is therefore:

<table>
<thead>
<tr>
<th>Source</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational savings (head office – 5 years) –</td>
<td>£ 250,000</td>
</tr>
<tr>
<td>Retail estate - TCN (revenue capitalised 5 years)</td>
<td>£ 100,000</td>
</tr>
<tr>
<td>Coffee (revenue capitalised 5 years)</td>
<td>£ 200,000</td>
</tr>
<tr>
<td>Advertising (revenue capitalised 5 years)</td>
<td>£ 50,000</td>
</tr>
<tr>
<td>Other retail (revenue capitalised 5 years)</td>
<td>£ 500,000</td>
</tr>
<tr>
<td>Capital release - Residential</td>
<td>£ 6,500,000</td>
</tr>
<tr>
<td>Retail (Buchanan Street – residual value)</td>
<td>£ 7,500,000</td>
</tr>
<tr>
<td>Commercial (Scotland Street)</td>
<td>£ 2,000,000</td>
</tr>
<tr>
<td>Direct grant - Ibrox (congestion relief)</td>
<td>£ 3,900,000</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>£21,000,000</strong></td>
</tr>
</tbody>
</table>

Improvements to revenue from enhanced Park and Ride opportunities are not accounted for in the capital programme. Any increased revenue from this source will attribute directly to the future operating account. As the improvements will create new opportunities for enhanced retail income from franchise and direct lettings, this new income is applied to the amortisation of an external loan for the first five years as a contribution to the capital expenditure. Thereafter the income would revert to the operating account.

As with the costs stated above, the revenues will also require further investigation and scrutiny. However the important issue at this point is that the margin between cost and revenue would appear to be such that the Subway improvements could be largely self financing.
Disability Discrimination Act (DDA) Compliance

As stated above the need to comply with the DDA requirements is recognised and although there would be a strong argument for a special case exemption this would not be compatible with the aims of creating a fully integrated transport system accessible to all sectors of the travelling public. Indeed, there would be little sense in designing an extension to the Subway to create a city wide metro system if passengers of all abilities could not interchange and have full access to the network. On a more relevant note this report calls for disabled parking spaces to be reserved at every station – which would clearly not be needed if passengers could not gain access to the stations concerned.

A clear decision has to be taken to provide access to all travellers of all abilities and in this respect the RTS is somewhat ambiguous. The “Equalities Charter” contained in section 6 clearly recognises the need for people with disabilities to be treated equally however that equal treatment does not appear to apply until 2017 for the Subway system. This is not acceptable and making the Subway fully accessible should be a priority project – not only would it be instrumental in attracting greater patronage but it would be a representative example that government at all levels treat the matter of disability discrimination seriously.

The task however is not easy and requires detailed consideration from government – the ultimate funders; the SPT – the implementation managers; and the relevant stakeholders – the user groups. The thgRAIL proposal is that

i) DDA compliance on the Subway is adopted as a priority project in the RTS,
ii) the acknowledgement and acceptance of the RTS is given by all political parties before the forthcoming elections,
iii) detailed survey work and initial recommendations are compiled and reported by the end of 2007,
iv) this report is circulated as a consultation document requiring feedback by April 2008,
v) the finalised report adopting feedback where appropriate leads to final designs, costing and application for Executive financial support by June 2008, and
vi) the final adopted design solution is incorporated into the brief or franchise agreement for the Subway privitisation proposal.

In the interim an access map or information sheet should be produced to inform those with disabilities exactly what access they may have to the system.
New Investment

From a base of a solid business operating a rejuvenated Subway system working on the original circular route, opportunities to expand the system can be examined. Whilst there are possibilities to extend the circular line in different directions most of the desirable routes would naturally emanate from the busier stations. Whilst these possibilities may deserve further detailed investigation this plan has avoided such opportunities for the following reasons:

*Engineering* – the existing system operates on a reduced gauge and consequently reduced tunnel bore, thereby limiting the opportunities to introduce modern trains designed to meet the requirements of modern travellers.

*Limited Capacity* – any direct interface between the old and new systems at existing stations would find the platform lengths consequently limiting to the lengths of trains which could be used, even if a greater gauge or tunnel bore on any extended part could accommodate more modern trains.

*High Property Costs* – being part of the fabric of the City Centre means that any attempt to extend the existing system will involve complex, time consuming and expensive property acquisitions. It should be noted that plans for similar systems in the U.S. have been shelved due to the expense of the real estate involved.

*Serving Traffic Generators* – as explained above, the problems of the existing system in falling passenger numbers is due, in part, to the demographics of Glasgow changing and the Subway being unable to serve the historic traffic generators in the City. Any new system should concentrate on identifying the movements towards the known traffic generators through Glasgow and attempt to accommodate these.

The thgRAIL proposal for expansion of the system therefore concentrates on the clearly identified movement of people to the centre of the city rather than around it. This is for a variety of purposes such as business, retail, leisure and even living in or around the centre. This migration to and from the centre is served by a number of traffic carriers using the radial roads, the local and national rail networks and, in part, the Subway itself through the extensive Park and Ride opportunities. However the main focus and almost constant source of congestion in Glasgow is the M8 Motorway as the conduit for traffic movement east and west of the City. This is the main influence for the initial proposal to extend the Subway in a linear form which travels
east – west through the City Centre, to be part of the system and known as the Clyde Line. Arguably, this is also the influence for the SPT’s Fastlink guided bus scheme which is also designed to accommodate traffic movement from the centre to the west. However, the thgRAIL scheme is purposely designed to also serve major traffic generators as well as cross reference many established Council policies and aims for river regeneration, flood control and congestion relief. Whereas the biggest traffic generator served by Fastlink is the SECC (3 million trips), the Clyde Line will offer a transit system to Braehead Shopping Centre (40 million trips); Xscape Leisure Centre (6 million trips) and eventually Glasgow Airport (over 20 million trips). The Clyde Line will also extend eastwards initially to Parkhead Forge Shopping Centre, including stops for Celtic Park and the National Arena. As such it will also support Glasgow’s bid to host the 2014 Commonwealth Games.

The new railway will be designed to European standard gauge and the initial phase will be entirely below ground or water. There is comparatively little land acquisition involved and the design will allow for the trains to go above ground, becoming a pre-metro system as it reaches the outer areas of the city.

The Clyde Line will also be centred on the Broomloan Depot at Govan where all maintenance and system controls will also be located. As such it will naturally interface with Govan Station on the Circle Line and also at St. Enoch.

**The Route – Clyde Line West**

From a new station located at Custom House Quay the new railway will head west along the river’s north bank in a twin tunnel formed from prefabricated tunnel sections and supported on the river bed and quay walls. The route passes above the existing Subway tunnel and below the Jamaica, Central Station and King George V Bridges to a new station serving the International Financial Services District (IFSD) at Broomielaw close to the proposed pedestrian bridge linking the area to Tradeston on the south bank. The twin tunnel structure continues along inside the river on the north bank until Anderston Quay where it crosses to the south bank under the Kingston Bridge to allow for a future station at Springfield Quay. The proposed pedestrian and cycle bridge will allow access to the station from Anderston on the north bank. The route continues in the river again crossing to the north bank below the Clyde Arc (the “Squinty Bridge”) to accommodate a new station close to the Crowne Plaza Hotel and serving the SECC, Glasgow Science Centre (via Bells Bridge), the Clyde Auditorium (the “Armadillo”) and the proposed new Clyde Arena. The tunnels proceed west almost in a straight line but due to a bend in the river this naturally brings the route into the south bank at the former Graving Docks at Govan where provision for a future station serving the Graving Docks development/Science
Centre is made. It enters the land and proceeds beneath Clydebrae Street and the north verge of Govan Road in a cut and cover form and then turns north beneath the existing Circle Line to create a new Govan Station which interfaces with the existing Subway Station. At this point a spur is taken to access the Broomloan Depot to the south of the station, the train entry point and the main servicing centre of the new railway. From Govan the route bends northwards back into the river to cross to Glasgow Harbour. This not only offers a station on the north bank serving the new river regeneration area but also keeps the tunnels clear of the slips and yards of the Govan Shipyard. The route again traverses the Clyde, within the river bed to maintain the channel serving the shipyards and enters the land on the south bank; still within a tunnel to cross above the Clyde Tunnel at Holmfauld Road; below Lighthouse Road and offers a new station serving the Southern General Hospital at the bus stance in Govan Road. The railway continues to travel below ground westward in a cut and cover tunnel formation in that area between the northern edge of the road and the water treatment plant on Renfrew Road before turning again north (partly in a former abandoned railway cutting) to enter the river on the southern bank and dip below the entrance to the King George V docks. The route proceeds along the south bank inside the river ensuring clearance for the slips and yards of the BAE Scotstoun (Yarrows) shipyards and terminates with a new station serving Braehead Regional Shopping Centre and Xscape Leisure Centre. The new station will be located within the boardwalk adjacent to the Scottish Maritime Museum and create an interchange with the Braehead Bus Station, Travel Centre and waterbus.
The Route – Clyde Line East

From St. Enoch Station the tunnels continue east along the north bank within the river and cross under the Gorbals Street Bridge and below the old St. Enoch Railway Bridge where the provision of a future station serving the Sheriff and High Courts is made. The route continues east below Crown Street Bridge then turns north out of the river before the weir and entering Glasgow Green on its western boundary close to the arch. The railway continues east through Glasgow Green in a cut and cover formation to a new Bridgeton Station at the corner of Kings Drive and Greenhead Street. (Note – by locating the station further west at Arcadia Street the station location would be almost 400 metres equidistant from Bridgeton Cross, the People’s Palace visitor attraction and Glasgow Green Football Centre (GGFC), but the suggested location offers better interchange opportunities with Bridgeton traffic.) Suffice to say, Glasgow Green offers tremendous flexibility to incorporate perhaps two stations – one serving the People’s Palace, The Barras, the University Boating Centre and east Gorbals (via the weir and the pedestrian suspension bridge at McNeill...
Street) and one further east serving Bridgeton, GGFC and the new Oatlands residential developments (via Shawfield Drive). From Bridgeton Station the new railway would seek to be incorporated into the East End Regeneration Route (EERR) either below the new road or running beside the road. This would create substantial economies of scale on cost and time. The Subway would offer interchange opportunities at Dalmarnock suburban railway station (refurbished for the 2014 Commonwealth Games) and continue within the EERR to a point close to London Road where it would turn east and enter the old disused tunnel and cutting to create a new station at Dalriada Street/London Road serving Celtic Park, SportScotland H.Q, the National Arena and Velodrome (subject to Commonwealth Games bid). From the National Arena Station the trains head north in a cut and cover construction in Springfield Road where it would terminate with a new station below ground at Parkhead Cross serving Parkhead Forge. An alternative route on this section still within the EERR and running to the west of Celtic Park was considered but as the station location at Parkhead Cross could not be accommodated, this was rejected.

The Stations

The initial phase of the new Clyde Line is designed to have ten new stations plus a new combined Govan Station with the Circle (existing Subway) Line. There is also the provision for future new stations at Springfield Quay, Govan Graving Docks and The Judiciary (serving the High Court and Sheriff Court). All stations will have a minimum 85m platform length serving the line with future extensions to 110m allowed in the design. Where possible the design will attempt to incorporate natural light even though they may be below ground (or water). Also where stations interface with the river bank opportunities will be taken to combine the construction works with any relevant scheme of river wall rebuilding.

Braehead Station

The new station at Braehead would be located within the boardwalk area of the regional shopping centre close to the Scottish Maritime Museum. The structure would partly enter the river to allow access over the railway lines to two flank platforms. The station would be designed to offer an entrance at either end of the platforms to cater for pedestrian traffic moving to Xscape,
Braehead Arena or the Shopping Centre and Retail Park. At its eastern end it would link with the travel centre, river bus and bus station to create a multi-modal interchange offering visitors to Braehead a number of travel options.

**Southern General Station**

A dedicated station specifically for travellers and staff attending the Southern General Hospital is planned to be located in Govan Road within the northern verge and close to the site of the bus stance. Plans for the new hospital may influence the relocation of this station to within the hospital grounds although this may have an effect on the route alignment as the new railway crosses the Clyde Tunnel.

The station would be based on a central island platform with a ticket office above and towards the eastern end. This would combine with the bus stance in Govan Road.

**Glasgow Harbour**

A station serving Glasgow Harbour on the northern bank of the Clyde would not only offer this somewhat isolated regeneration scheme quick links to the city centre but also go some way to renewing the historic cross river communications between the Partick and Govan communities. Indeed, it could be expected that residents of Glasgow Harbour would take advantage of the new Subway to use Govan as a shopping and service centre (banks, post office, etc), bearing in mind that the new residents will always have a short distance to travel for these functions. In this way the new station at Glasgow Harbour would also help the regeneration of Govan. The station would be based on a central island platform.

**Govan Cross**

A new interchange station linking the new Clyde Line with the existing Subway or Circle Line would also extend to a redeveloped bus station to ease modal transfer and encourage travellers to Govan. The station would not only be symbolic of the regeneration of Govan but would also make a tangible contribution by attracting further investment due to the improved communications the district would enjoy. In its simplest terms it could also be expected that real spending would be imported into the district as a result. This could be the simple act of buying a newspaper whilst waiting for a change of trains to go to Braehead, or residents of Glasgow Harbour recognising that Govan offered them their closest bank, post office, supermarket or pub. The station would operate with two flank platforms.

**Govan East**

The provision of a possible future station serving the eastern part of Govan, and the redevelopment of the Govan Graving Docks in particular is allowed in the plans for the new Clyde Line. If the redevelopment proposals for the docks include a suggested bridge to the
Glasgow Science Centre then the new station could also be a stop for this important tourist attraction.

**SECC**

On the north bank, a station would serve the SECC, Glasgow Auditorium, Crowne Plaza Hotel and the proposed new Glasgow Arena. The pedestrian bridge to the south bank will allow access to the Science Centre and Glasgow Tower and the new Media Village on the former Garden Festival site. The station would be constructed partly within the quayside at the side entrance to the Armadillo to the east of Bells Bridge. The construction would include two flank platforms beneath a central ticket office. An opportunity to link with the river pontoon would also be examined.

**Springfield Quay**

The new line crosses back to the south bank of the river and allows for the later construction of a new station for Springfield Quay to assist with the regeneration of the area and also give access to the established residential and leisure facilities nearby. Again, the link to the proposed new pedestrian bridge will allow the north side of the river easy access to the new railway.

**Broomielaw**

A new station will be created on the north bank of the river at Broomielaw close to the junction with James Watt Street. This station will give access to the International Financial Services District and to the regeneration proposals for Tradeston via the proposed new pedestrian bridge which connects to the south bank of the river.

**St. Enoch**

A new station will be located within Custom House Quay on the north river bank opposite the Clyde Street/Dixon Street junction. The station will link with the existing St. Enoch Station on the Circle Line via a new mall running below Dixon Street, under Howard Street and the south part of St. Enoch Square. It is hoped that the combined stations will have a direct link to Glasgow Central Station and the St. Enoch Shopping Centre.

**The Judiciary**

Provision will be made for a new station to be built in a future phase which serves the two main law courts, Glasgow Sheriff Court and the High Court of Glasgow. The new station will be located on the north bank of the river on Clyde Street below or close to the crossing point of the St. Enoch railway bridge. It is expected that the bridge will be brought back into service if the application for Glasgow CrossRail is successful and there may therefore be a further interchange opportunity with a main line station.
Bridgeton
A station serving the area around Glasgow Green will be located at the corner of The Green and King’s Drive. This will serve Bridgeton to the north and the visitor attractions of the People’s Palace, the University Boat House and Glasgow Green Football Centre. The station will also help alleviate congestion problems experienced when Glasgow Green is used for major events such as marathons, fireworks displays, concerts and carnivals, etc.

Dalmarnock
An interchange station will be created where the new railway crosses the Glasgow Suburban Argyle Line at Dalmarnock. There are important bus routes in this location and they will be moved to integrate with the railway services. Should Glasgow be successful in the bid to host the 2014 Commonwealth Games then this would be the station serving the athletes’ village.

National Arena
The railway will use part of an existing abandoned railway tunnel and cutting close to Celtic Park to create a station serving the football stadium, the National Arena and the new SportScotland H.Q. Again, subject to the Commonwealth Games bid, there will also be a new Velodrome. As this station is likely to be well used during major events a third track and platform will be built to accommodate special trains and to assist with crowd control.

Parkhead Cross
The final station on the first phase of the Clyde Line would be at Parkhead Cross. This would not only connect major parts of the city to the Forge Shopping Centre but also contribute to the regeneration of this part of the city. At Parkhead Cross many city wide bus routes converge and this would create an important location for modal change.

Integration
In addition to being a significant transport investment in its own right the new Clyde Line would also offer tremendous interchange possibilities with other modes of travel and each station will be designed to maximise that flexibility of choice for the travelling public.

On a wider scale however the new railway construction will also offer the opportunity to integrate with other city projects and goals. In doing so it could be expected that the effectiveness of the projects could be enhanced or costs reduced. City projects such as scour protection to Glasgow bridges; the Central Govan action plan; Springfield and Anderston pedestrian and cycle footbridge; the river pontoons; the new south Glasgow hospital (Southern General), the Ferry Village at Renfrew and the flood prevention schemes at Glasgow, Govan and North Renfrew could all stand to benefit. Similarly, with greater cooperation, the design of the railway as it
crosses the Clyde could be used to support Council initiatives on river walls, quayside improvements and flood abatement at the confluences of the Kelvin and Cart Rivers, whilst also reducing the need for regular dredging to maintain navigable channels to the remaining Glasgow shipyards.

Construction

The route adopted for the Clyde Line is designed first and foremost to serve known traffic generators. From that base it has also recognised areas where economic growth may result from a new railway such as Govan, the Clyde Corridor and the East End. Social inclusion has been recognised in the attempt to create a new transport connection to the Southern General Hospital and wherever possible the route has integrated with other transport modes. It is a happy coincidence that the route follows the line of least resistance in travelling within the River Clyde and also through areas such as Glasgow Green and within the EERR. That sustainable approach is taken further with construction materials, methodology and activity all being subjected to the sustainability test. With large sections of the route not subject to the acquisition of private interests (possibly through compulsory purchase) and with very little consequential disturbance to other owners a fairly simple construction method can be adopted. A large element of prefabrication can be employed and tunnel sections can be made off site then transported to the location – perhaps even by barge. The Clyde Estuary has a number of possible sites in which to locate (or regenerate) a fabrication yard. The thgRAIL preference is towards Hunterston as those construction elements which cannot be delivered to the fabrication yard by water can then be delivered by rail. The transport of prefabricated tunnel sections to site by water will allow larger sections to be built with a resultant reduction in cost and environmental impact. The design of the tunnel sections will also be guided by sustainability rules and where possible the tunnel will be constructed in an alternative material rather than concrete – perhaps even reconstituted rubber from old tyres moulded to shape and given structural strength from reinforcement. Certainly, in locations such as the river and Glasgow Green there would be less need for structural strength to support any above ground (or water) structures and lighter weight tunnel sections will therefore be preferable. In the river, for example, the upper part of the tunnel including the roof could be constructed of reconstituted rubber whilst in parkland the entire tunnel section could possibly be made of reconstituted material surrounded by a compacted grout. In each case any rubber material would be treated with a suitable intumescent fire retardant and all tunnels would have sprinkler systems and chamber protection. Whilst novel, this form of construction is by no means unique. The Sydney Harbour Tunnel is an immersed tube structure.
(IMT) with sections averaging some 120m long; indeed in Berlin they have gone further and completed the first cut and cover tunnel construction within the River Spree.

The typical tunnel section would be a little over 11.2m wide by 5.5m high incorporating separate twin tracks within a nominal 5m diameter tunnel bore. At stations with flank platforms the section would extend to some 20m wide whereas stations with island platforms would be accommodated within the existing tunnel profile of 11.2m as the space allowed for maintenance walkways would then be incorporated into the platform. The minimum tunnel section length would be 50m and it is hoped that much larger sections up to 100m long could be designed and transported to site.

Within the river, the tunnel sections would be supported on concrete piles on a notional 25m grid and tied to the river wall by piled connections. In areas such as Glasgow Green, and other locations where there is little or no overburden, the tunnels would be built in a cut and cover exercise with ground consolidation where necessary. The depth of the tunnels within the river would be set following agreement with Glasgow Council, Clydeport, the shipbuilding industry, and other known river users. On land it is expected that, subject to soil conditions, the tunnels will be set a maximum of 3m - 5m below the surface.

The tunnels would accommodate service ducts for the railway operation and also additional drainage to be used by the Council in their efforts to alleviate the danger of flooding where required along the route.

A typical tunnel section is shown in Appendix A.

Rolling Stock, Track & Infrastructure

The model for the new Clyde Line railway is taken from a number of working examples already proven in terms of quality of service, technology and reliability.

The experience of the Docklands Light Railway (DLR) has been used to determine the train specifications. The DLR has adopted a programme of continuous improvement to its rolling stock and over the last 20 years has used its experience to produce a train specification suitable for use on the busy London Tube network. Their typical trains are approximately 28m long, 2.65m wide and carry 284 passengers (70 seated). They travel at 80kph and can operate to a minimum track curve of 38m. From an initial fleet of 11 units the total now stands at 94 with the latest being supplied by Bombardier in Germany. This type of specification would be suitable for use on the proposed Clyde Line and there may be an opportunity to work with the DLR as they seek to upgrade their fleet. Similarly, the transport experts Siemens have a range of trains tested and improved to reach the particular operational specifications and performance required by...
different operators. The Avanto Light Rail Vehicle may be particularly suited to the proposed Glasgow Clyde Line. However, perhaps the decision on rolling stock may be influenced by a management strategy to simplify maintenance by using trains which are similar to the existing rolling stock; or follow a programmed design, maintenance and infrastructure plan such as the Siemens Turnkey System.

The track will be of standard 1435mm European gauge and an advantage of the prefabrication of the tunnel sections is that the track bed can be designed for sleepers or slab giving additional track support depending on the curvature of the particular part of the route. The use of lightweight continuous weld rail to BS80A standard is particularly suited to the preformed track bed and when rolled in quantity will produce significant cost savings. Crossovers between each tunnel will be planned for Braehead, Govan, St. Enoch and Parkhead Cross.

The supporting infrastructure of communications and signalling will be easily accommodated trackside. The power source will be relayed to the trains by means of a third rail rather than overhead catenary. When the metro travels above ground the third rail will become live only under the length of the train such as the system used in Bordeaux in France. Despite having early teething problems the ground-level power supply, (or Alimentation par Sol (APS)) system is now functioning as designed and offers greater aesthetic advantage than an overhead power system. A derivative of this system is planned to supply the proposed Edinburgh tramway which is shortly due to start construction. The plan, if possible, is to extend the existing 600V system as the main source of electrical power. This will be fed into the system from substations centred on

Metro Guangzhou, China
Siemens AG offered a complete turnkey package to create a modern metro system.
Source – Siemens AG

Bordeaux tram using APS power system with third track supplying current from the road
Source - Wikipedia
Govan but with access to grid power at each end of the railway at Dalmarnock and Renfrew (perhaps from the Yoker sidings across river but via the new pedestrian tunnel).

**Staff**

The new system is very much an extension of the existing Subway and as such will be staffed by the same people. With a doubling of the number of trains and stations, a trebling of the length track and infrastructure there will be a significant increase in new jobs created and career advancement opportunities for existing staff. Only the driver compliment will remain close to the present numbers. As the new Clyde Line comes into operation, existing drivers will be given the opportunity to retrain for the new locomotives whilst the existing Circle Line will switch to driverless operation.

The housing of corporate operations at Govan will remove the distance between management and staff. This will allow the management structure to be redefined and lead to better communication and understanding with a resultant positive effect on the current unsettled staff relations.

**Service**

The initial service is planned to operate on the basis of a 3 - 6 minute peak hour service falling back to an 8 – 12 minute off peak for 18 hours each weekday and 21 hours during the weekend. This is compatible with proposals for service improvements to the existing network. Eighteen trains will initially provide the service and all will be stabled in an expanded depot at Broomloan Road, Govan.

The journey from Braehead to Parkhead Cross will take approximately 22 minutes.

**Costs**

Costs for the new Clyde Line are based on the entire 12.6km being below the surface and the only sections possibly to be cut by tunnelling would be the last 500m in Springfield Road to the Parkhead Cross Station and the 300m access between the line and the depot in Govan. Additional costs have been allowed for this and similarly, at this stage no cost reduction has been estimated for any collaboration with the construction of the EERR. The lengths of the route within the Clyde will be constructed by submerging prefabricated tunnel sections into a

**Immersed Tube Tunnel technology**

*Source – Japan Dredging Assoc*
pre-dredged track in the riverbed (with piled supports, where necessary) whilst the remainder of the route will be formed by a cut and cover excavation method.

The anticipated costs using 2nd Quarter 2006 prices are:

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>New railway including signalling, track and infrastructure – bored tunnel</td>
<td>£ 18,000,000</td>
</tr>
<tr>
<td>IMT river</td>
<td>£ 58,000,000</td>
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<tr>
<td>Cut &amp; Cover</td>
<td>£ 51,500,000</td>
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<tr>
<td>Larger Station bore</td>
<td>£ 24,000,000</td>
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<tr>
<td>New Stations</td>
<td>£ 59,000,000</td>
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<tr>
<td>Broomloan Depot upgrade -</td>
<td>£ 10,000,000</td>
</tr>
<tr>
<td>Rolling stock (18 train units) -</td>
<td>£ 22,500,000</td>
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<tr>
<td>Professional fees -</td>
<td>£ 13,250,000</td>
</tr>
<tr>
<td>Land acquisition/disturbance -</td>
<td>£ 4,500,000</td>
</tr>
<tr>
<td>Contingency -</td>
<td>£ 52,000,000</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>£ 312,750,000</strong></td>
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The estimate of almost £313 million is based on comparables from other light rail schemes currently being developed around the world, taken back to a U.K. base. These estimates are generous, at almost £25m per kilometre this would compare to some of the most expensive schemes in the U.S.A. Indeed, it is even more expensive than the cost of the proposed Glasgow Airport heavy rail link. Coordination with the EERR design and construction; integration with the existing system; the ability to construct longer prefabricated tunnels and the simple act of accurate survey and measurement would all contribute to substantial cost savings.

**Revenue & Patronage**

The expected patronage will be derived primarily from modal shift from alternative transport modes although by serving the new National Arena, SportScotland H.Q, the Commonwealth Games Velodrome, the new Southern General Hospital and the Glasgow Arena (SECC) there will be significant levels of new patronage. Similarly, although serving existing venues such as Braehead, it is expected that connecting the regional shopping centre to a city wide metro system would bring a number of new visitors who would otherwise see some difficulty in accessing this part of the city.
However, the greatest number of passengers using the service will result from changes away from other forms of transport, especially the motor car and bus. Having Braehead with some 20,000,000 shoppers visiting annually (40,000,000 return trips on the M8 motorway) as a backbone to passenger projections, helps establish a firm base for expected passenger numbers. From Braehead other known traffic generators such as the other Glasgow shopping centres of Buchanan Galleries, St. Enoch Centre and Parkhead Forge would all benefit from the new service. Football fans travelling to Celtic Park and conference and concert goers to the SECC would also use the new Subway as an acceptable alternative to current means of accessing the many popular venues along the route of the first phase of the Clyde Line. A 5% shift from these known generators combined with a small share of daily commuter traffic (perhaps through Park and Ride, etc) would produce an annual patronage of at least 18,000,000 passengers or 47% of the system capacity. This compares favourably with the existing Subway patronage of 13m and the projected FastLink levels of 7m passengers.

In addition to the passengers using the Clyde Line there would be a consequential uplift in passengers using the existing Circle Line due to the excellent links between the two. The expansion of the system on such a basis would also lead to setting a different fare tariff other than the current fixed fare for the round trip. With new extended journeys possible a fare based on distance travelled would be acceptable. This would go some way to contributing to the overall profitability and with anticipated revenues in excess of £50m per annum a high farebox recovery ratio would reduce the need for government subsidy – certainly below current levels.
Future Growth

It may be presumptuous to highlight future growth of the Subway system and suggests that the upgrade of the Circle Line and development of the Clyde Line will be easy. That is far from the case. Scotland has a poor record of delivering major transport and infrastructure projects and the inertia of continuing to talk or commission endless reports (it took 5 years to get approval for Glasgow Airport Rail Link) rather than take action will be difficult to overcome.

If inspiration is needed then the achievements of the plan described above should go some way to demonstrating that, as it was 100 years ago, the solution to Glasgow’s congestion problem is underground (or perhaps underwater). If further encouragement is needed then we should look elsewhere:

**Vancouver Skytrain**

The **SkyTrain** in Greater Vancouver, British Columbia, Canada is an urban Advanced Rapid Transit system operating two lines, the Expo Line and the Millennium Line. The system runs principally on elevated tracks (hence its name), uses fully automated trains with no human drivers on board, and has had no derailments or collisions in its history. With 33 stations, it moves over 220,000 people a day along the 49.5 km of track. Built for the Expo 86 World's Fair, it is being extended again for the 2010 Winter Olympics. It is the world's longest automated light rapid transit system and it uses the world's longest transit-only bridge, the SkyBridge. –
Paris Metro

Although first established in 1900, the Paris Metro maintains a strong sense of the need to move with the times, and always with some flair. The system now extends to some 211kms of mostly underground track on 16 different lines and features almost a quarter of the stations interchanging with other lines. The trains transport over 4.5 million passengers each day (or 1.4 billion in 2005) and during special events such as New Years Eve the network is partially open throughout the night.

Docklands Light Railway (DLR)

Within the same timeframe proposed by the RTS, the DLR has established a 31 km, computer controlled driverless system serving 38 stations. Presently there are at least 11 plans for extending the network albeit most are associated with the success of London winning the bid for the 2012 Olympics. Transport was cited as an important function in the Olympic Committee’s assessment of the suitability of the 2012 venue. In this respect the DLR would have made a significant contribution.

Oresund Bridge

Although not strictly part of the Copenhagen Metro system the Oresund Bridge is included as a demonstration of the power of a “can do” attitude. Part bridge and part tunnel this transit connection crosses the Baltic Sea, joining two countries.
As for Glasgow Subway, there are further expansion options which have been considered and these are listed in order of priority.

**Extension 1 - Clyde Line West to Glasgow Airport (2014 – 2020)**

There was a temptation to include the 5.6km westward continuation of the Clyde Line beyond Braehead as an initial part of the pre 2014 Subway extension scheme. However with a commitment already given for a Glasgow Airport Rail Link which is planned to open in 2011, the new Subway could undermine that. Indeed, it is hoped that the heavy rail link is a major success and plans are quickly put in place to continue the line north through the airport and across the river, joining the northern electric suburban line at Yoker. If that were to happen then there would be great economies of scale in combining much of that work with the Subway extension.

No matter the success or otherwise of the heavy rail link, the extension of the Subway to the airport is a fairly simple construction exercise, environmentally appealing, socially inclusive and economically compelling.

The extension would give Renfrew, the largest town in Strathclyde without a rail link a connection to Glasgow and the main line stations.

**The Route**

The extended Subway would continue 1.5km in the river along the south bank from Braehead Station to Renfrew where a new station serving north Renfrew would replace the existing ferry service. The station would be located at Clyde Street/Ferry Road and would be linked to the north bank of the river at Yoker by a 200m pedestrian tunnel with escalators, lifts and travelators to join the two communities on each side of the river. At each side of the river, adjoining the station entrances, would be provision for Park and Ride and bus links. From North Renfrew Station the route would continue below ground (0.5km) southwest under Meadowside Street to rise and adopt the former railway column of the Arkleston Spur to Inchinnan Road and a Renfrew Central Station. Inchinnan Road would be widened to accommodate the metro and the traffic lights at the Inchinnan Swing Bridge phased to allow the trains priority in a single track over road traffic. Any proposed redevelopment of the bridge would include double tracks in a permanent way for the metro system. West of the bridge, the railway would continue on the surface alongside the eastern edge of Inchinnan Road before going below ground for 1.2km and turning into the airport under the road and St. Andrew’s Drive. It would then terminate at a new below ground station as part of the proposed public transport interchange contained in the Airport Master Plan to 2030.
Cost
At second quarter 2006 prices, the estimated cost of the extended line would be £95 million including two new trains, but contributions from BAA and the savings from the loss making Renfrew Ferry would greatly reduce that figure. Also there would be the opportunity to coordinate the scheme with other projects such as the Airport Master Plan; new Inchinnan Bridge and the north Renfrew redevelopment projects to generate further savings and/or set off.

Proposed Clyde Line extension to Glasgow Airport (2014 – 2020)
Source - Aerial photograph by Google Earth

Extension 2 - Clyde Line East to Easterhouse (2014 – 2020)
The creation of the East End Regeneration Route (EERR) is shown to be an important element in the development of the Clyde Line extension to the Subway system. Indeed cooperation on design and implementation would result in savings in time and money as the Subway is extended. If that thinking is taken further then the opportunity exists to continue the Subway alongside or
below the development of the road and open up the metro system to the disadvantaged areas of Glasgow’s East End.

The Route
From Parkhead Cross Station, the extended Subway continues north within a new tunnel in Duke Street, below Shettleston Road, the Glasgow/Airdrie railway line and Carnynty Road where it surfaces and creates a station serving South Carnynty close to the junction of Todd Street. It then travels north along the old railway solumn alongside the EERR until turning and rising into the central reservation at Edinburgh Road. The route continues eastward in the central reservation offering stations at Carnynty North (Hogarth Avenue); Carnynty Central (Gartcraig Road); and Cranhill (Stepps Road) before branching into a single track one way 6.5km loop northeast along Bartibeith Road with a station for Queenslie then over the M8 Motorway and entering Easterhouse with a new station at the Glasgow Fort Shopping Centre. The line then continues along Westerhouse Road with a station at Lochend (Cairnbrook Road), looping southwards on Easterhouse Road to create a Park and Ride interchange with Easterhouse heavy rail station before turning back westwards onto Edinburgh Road and creating stations at Garrowhill (Barrachnie Road) and Barlanark (Barlanark Road) before again joining the twin track and completing the loop at Bartibeith Road. A plan of the route is shown in Appendix B

Cost
The 10.6km route would benefit greatly from coordination with the EERR and substantial savings would result from the line being incorporated into the design and construction process of the new road. On reaching Edinburgh Road, the metro comes above ground and has an easy route along the central reservation (although if the decision is taken to narrow the road or dedicate the outside lanes to the metro then more costs can be saved). The railway then splits into a 6.26km single track loop around Easterhouse. The route has 11 stations all above ground within the roadway.

The estimated cost using 2nd Quarter 2006 prices is £96 million including four new trains.
Extension 3 – Southern T Line to the National Stadium (2014 - 2020)

To gain full advantage of the infrastructure in place, it is natural to put it to as much use as possible. Indeed, as stated above, it is perhaps the greatest example of sustainable development that an asset is used to its maximum capacity before any alternative is utilised and that same belief is applied to the extended Subway.

To serve the south side of the City, proposals to extend the system include the creation of a southern “T” Line which uses the Clyde Line between the Airport and City Centre and then comes through Govan to serve the southern part of the city and beyond. Line T1 follows a route south east to the Victoria Infirmary and the National Stadium at Hampden Park. Line T2 branches off at Mosspark and moves almost directly south-southwest to the new Silverburn Shopping Centre. Line T1 may eventually be further extended through Toryglen and Rutherglen to rejoin the Clyde Line at Dalmarnock, thus completing another circular route. Similarly, line T2 could be further extended south to Newton Mearns and northeast Ayrshire.

The Route

The T Line would use that part of the Clyde Line running between Braehead (and later the Airport) to St. Enoch Stations. Trains would travel between the relevant southern terminus and the two Clyde Line stations in a triangular pattern, e.g. Braehead – National Stadium – St. Enoch. At Govan the route would branch to the south and travel through the depot at Broomloan Road to use the former dockside branch line which is now used as a test track for the Subway. The railway comes to the surface at this point. As the railway crosses the Glasgow – Paisley heavy rail line there would be a new integrated heavy rail and subway station serving Ibrox Stadium.
From here the line continues south, using a new phasing of the traffic lights to allow a single track, two way railway line to cross the M8 at Dumbreck Road where upon crossing the line enters Bellahouston Park. The line runs within the park and branches to offer two alternative south bound routes (T1 & T2) at Mosspark Drive where a station before the branch will offer Park and Ride facilities. Line T1 again joins the road system at Dumbreck Road crossing the M77 motorway by way of the existing road overbridge carrying a single bi-directional track with a suitable priority given in the traffic light phasing. To the south of the motorway the metro again reverts to a twin track formation and enters Pollok Park at Cartha Park, running alongside the verge of Dumbreck Road until the junction with Haggs Road/St. Andrews Drive where a station serving Pollokshields/Pollokshaws is created before crossing the junction and continuing in the road along Titwood Road. At the junction with Minard Road a new bridge crossing the railway would be constructed to allow a continuation of the tracks in a straight line across to Titwood Road (east). At the new bridge an interchange with Crossmyloof train station would be formed. The route continues along Titwood Road and crosses Pollokshaws Road before entering Queens Park where a station interchanging with the bus routes on Pollokshaws Road is created. The railway crosses the park to create a station close to the Victoria Road entrance then follows the park perimeter southwards to Grange Road and further station serving Victoria Infirmary. The route then turns east and goes below ground to cross under Grange Road, the football pitches and Cathcart Road then resurfaces in the former Cathkin Park, turning up and under Prospecthill Road to terminate at a new station north east of the National Stadium at Hampden Park. From Hampden it would be possible to create a further extension through Toryglen and Rutherglen to join back up with the Clyde Line at Dalmarnock.

Line T2 leaves the branch at Bellahouston Park and travels westwards along the edge of the park at Mosspark Drive, and provides a new station at Bellahouston Drive to serve the sports centre. It then turns south onto a widened Corkerhill Road with a dedicated metro lane. At the junction with Mosspark Drive a priority phase in the traffic signals will allow the train to cross the junction and travel in a single bi-directional track to past the junction with Kinnell Ave to again join a dedicated twin track re-lined Corkerhill Road (using the chevron areas). After a new interchange station with Corkerhill Station on the Paisley Canal Suburban Line. The tracks then move to the central reservation within Corkerhill Road and continue south. At the roundabout with Braidcraft Road at new station will serve the local population and the route turns left to continue towards Barrhead Road junction. Before the junction the track turns south east along the route of the burn and joins Barrhead Road with a new station on the northern verge serving the new Silverburn Shopping Centre.
The possibility remains that Line T2 could be extended further south alongside the M77 verge to serve Newton Mearns and beyond or east within the verge or central reservation of Barrhead Road to Pollokshaws Road where it could interchange with Pollokshaws West Station and the bus routes in the main road. It would then follow the line of the railway north to Haggs Road where again within Pollok Park it could head north and join Line T1 at the Pollokshields Station thereby creating a loop.

An indication of the T Line is shown in the Route Map to 2020 in Appendix C.

Cost
Not yet assessed.
Summary

In attempting to summarise this paper there is little need to repeat what has been said elsewhere:

“A world class sustainable transport system that acts as a catalyst for an improved quality of life for all”
- Vision of SPT as stated in the Regional Transport Strategy December 2006

"The future is about a transport network that matches the needs of people, the needs of commerce and industry and the needs of the environment. When the final report is agreed by everyone who has an interest in it, the plan will be matched with money, resources and effort to make it happen."
- Chair of SPT, Councillor Alistair Watson
11th January 2007

In respect of the existing Subway, it is hoped that the SPT realise that they are actually sitting on the money and resources which could make a rejuvenation scheme happen now rather than 2017. They require the managerial ability and effort to ignite that possibility.

To extend the Subway, a little more innovation and inventiveness is required; combined with a realisation that Glasgow is bigger than the area between the IFSD and Glasgow Harbour. This plan is presented to look beyond the shiny parts of “new” Glasgow and seriously address the traffic needs and congestion problems of the major traffic generators across the whole city. The SPT is asked to match that plan with money, resources and effort to make it happen.
The Tunnel is made from a precast reinforced concrete base section with a lighter weight roof section. In line with a general desire to mitigate against the environmental impact of the construction process, it is hoped that the roof section could be constructed of a reconstituted material such as rubber (from car tyres) moulded and reinforced to give the necessary strength. This could be used in locations where there are reduced surface structural loads such as in the river and through Glasgow Green.

The Tunnel will also include storm water drains to assist with flood prevention measures where rising water levels could be channelled quickly downstream particularly to avoid the confluences with the Kelvin and Cart Rivers.

The internal Tunnel diameter is 5m and provision for a walkway either side of the track is allowed for maintenance and emergency purposes. Similarly, there will be intermittent passageways between the tunnels as well as combined cross ventilation chambers.
Appendix B

Route Plan of Clyde Line

East End Extension
Acknowledgements

Particular thanks to Robert Schwandl and Dewi Williams
All original material © thgRAIL and William Forbes

CIRCLES UNDER THE CLYDE, A History of the Glasgow Subway by John Wright, Ian Maclean

Glasgow Subway Album, by George Watson

U-Bahnen und Stadtbahnen in Großbritannien by Robert Schwandl www.urbanrail.net

Glasgow's Unique Subway Railways http://mikes.railhistory.railfan.net/r048.html

Photograph of Metro Guangzhou, China courtesy of Siemens AG

The Glasgow UndergrounD/Subway http://dewi.ca/trains/g_subway/index.html


Information on Kingston Bridge http://en.wikipedia.org/wiki/Kingston_Bridge,_Glasgow

Arial photographs by Google Earth © Google Earth; © 2007 NASA; © The GeoInformation Group

Glasgow Commonwealth Games photographs courtesy of Designhive/Glasgow 2014


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Smart Card graphic courtesy of Advanced Smartcard Technologies / E.CEBS
Glossary

Farebox Recovery Ratio

The farebox recovery ratio of a passenger transportation system is the proportion of the amount of revenue generated through fares by its paying customers as a fraction of the cost of its total operating expenses. Most systems are not self-supporting, so advertising revenue, real estate income and government subsidies are usually required to cover costs.

Immersed Tube Tunnel (IMT)

Immersed Tube construction method involves a number of tunnel elements essentially prefabricated in manageable lengths, each often 100 m long (Sydney Harbour Tunnel had eight 120m lengths). The sections are laid in the water and joined to form the final tunnel. They have temporary bulkheads across the ends of each section to allow them to float with the insides dry. Fabrication is either completed in a dry dock, or the elements are launched like a ship and then completed afloat close to their final location.

Intumescent

An intumescent is a substance which swells as a result of heat exposure, thus increasing in volume, and decreasing in density. Intumescents are typically used in passive fire protection and are used in fire stopping, fireproofing and gasket applications, in buildings, offshore construction, ships, and aircraft.

PayPass

PayPass by MaterCard is a new method of making small payments by means of a “contactless” technology which can be embedded in a card, mobile phone or key fob. The technology allows the holder to tap the embedded device on or close to a terminal reader rather than swiping or inserting a card. A test of the system was carried out in 2003 with some 16,000 card holders in Orlando, Florida and the technology is now beyond experimental.

Octopus Card

The Octopus card is a rechargeable contactless stored value smart card used to transfer electronic payments in online or offline systems in Hong Kong. Originally launched in September 1997 to collect fares for the city's mass transit system, the Octopus card system has grown into a widely-used payment system not only for virtually all public transport in Hong Kong, but also for making payment at convenience stores, supermarkets, fast-food restaurants, on-street parking meters, car parks and many other point-of-sale applications such as service stations and vending machines. Octopus has become one of the world's most successful electronic cash systems, with approximate 14 million Octopus cards in circulation (twice Hong Kong’s population), ten million transactions per day, 420 service vendors, and 50,000 processors.
Oyster Card

The Oyster card is a form of electronic ticketing used on Transport for London and National Rail services within the Greater London area of England. The card was first issued to the public in 2003 with a limited range of features and there continues to be a phased introduction of further functions. As of March 2006 over 5 million people used the cards.

STAG

Scottish Transport Appraisal Guidance - more commonly referred to as STAG - outlines a process that assists transport planners and decision-makers in the development of multi modal transport policies, plans, programmes and projects. It is an objective-led process that seeks to avoid the traditional solution-led approach and requires transport planners to identify what it is they are trying to achieve before identifying the means of achieving it.

Although the size of the document may appear daunting at first, the structure and philosophy behind the Guidance make it suitable for application across a wide spectrum of transport planning areas both in their size and form. The principles can equally be applied to the development of low cost solutions to traffic congestion at a roundabout as they can be applied to the development of transport access strategy to an airport. The scale of the analysis and appraisal simply needs to be proportional to the task in hand.

The document is commended to Local Authorities and Consultants for guidance on the appraisal of transport projects for which they have responsibility. However, it is a requirement of the Scottish Ministers that all transport projects for which Scottish Executive support or approval is required, shall be appraised in accordance with this guidance. The Guidance contains a number of forms and worksheets which may be completed as part of the appraisal process.

The document, including access to the various forms and worksheets, is available along with other important transport analysis documents at www.scot-tag.org.uk

Transport Scotland is responsible for STAG.

UPass

UPass is a pre-paid card for transportation system in Seoul and its suburbs. This card is issued by Seoul Metropolitan Bus Operator Association and eB Card. Its parent-generation card is Seoul Transportation Card, a world-first commercial-used pre-paid RF card for transportation, first used in June, 1996.
Distribution

This first draft has been submitted to the SPT as a proposal to be incorporated into the 2007 Regional Transport Strategy. To draw attention to the proposal and invite contributions from stakeholders and other affected parties, the plan has also been issued to:

**Government**
The First Minister
Minister for Transport
All elected local MSPs
All Glasgow Councillors
Director of Planning, Glasgow Council
Director of Planning, Renfrewshire Council

**Quasi-government**
Scottish Enterprise Glasgow
Scottish Enterprise Renfrew

**Other Parties**
Glasgow Chamber of Commerce
Renfrew Chamber of Commerce
Local Representative, TGWU
Glasgow 2014 Commonwealth Games Bid Committee

**Press**
Daily Record
Glasgow Herald
Evening Times

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