Submission
No 48

THE TRANSPORT NEEDS OF SYDNEY'S NORTH-WEST SECTOR

Name: Mr Peter Egan

Date received: 4/10/2008

SUBMISSION COVERSHEET

Legislative Council General Purpose Standing Committee No. 4

Transport needs of Sydney's North-West Sector (Inquiry)

Submission by:
Peter Egan,
8E/1 Francis Rd Artarmon NSW 2064
PeterEgan2001@gmail.com
04 1450 9700

4 October 2008

Timeline: Call for submissions: 29 Aug 2008 Submissions close: 17 Oct 2008

Written submissions may also be lodged by sending to:
The Director
General Purpose Standing Committee No. 4
Parliament House Macquarie St Sydney NSW 2000
Fax: (02) 9230 3416

Contact Us
Primary contact: Beverly Duffy, phone (02) 9230 3544, gpscno4@parliament.nsw.gov.au
Assistant Committee Officer: Samuel Griffith, phone (02) 9230 3311, gpscno4@parliament.nsw.gov.au

Address for written correspondence:
The Director, General Purpose Standing Committee No. 4
Parliament House Macquarie St Sydney NSW 2000 Fax: (02) 9230 3416

Inquiry Terms of Reference
This inquiry was self-referred. These terms of reference were self-referred by the Committee on 29 August 2008.

TERMS OF REFERENCE
Transport needs of Sydney's North-West Sector
That GPSC4 inquire into and report on the integrated transport needs of Sydney's North-West Sector and, in particular:
1. The **requirements and plans for an integrated transport system** in the North-West Sector, including **road, rail and bus links,**
2. The proposed **funding of an integrated transport system for the North-West Sector,** including the **distribution of developer and State infrastructure levies,**
3. The **plans and funding for the North-West Metro** and the NSW Government's decision not to proceed with the North-West Rail Link, and
4. **Any other related matters.**

These terms of reference were self-referred by the Committee on 29 August 2008.

Committee membership
Hon Jenny Gardiner MLC (Chair) *The Nationals*
Hon Lynda Voltz MLC (Deputy Chair) *Australian Labor Party*
Hon David Clarke MLC *Liberal Party*
Hon Kayee Griffin MLC *Australian Labor Party*
Ms Sylvia Hale MLC *The Greens*
Hon Roy Smith MLC *Shooters Party*
Hon Henry Tsang MLC *Australian Labor Party*

TRANSPORT NEEDS OF SYDNEY'S NORTH WEST AND RELATED MATTERS

SUMMARY

The North West as a part of Greater Sydney

The transport needs of Sydney's North West need to be seen in the context of the transport needs of Greater Sydney. A key criticism of Sydney's public transport is that virtually all Sydney's railways radiate out from the centre, while the Orbital Motorway is driving Sydney's development in a manner that downplays the role of a Central CBD. Until the great post WW2 expansion Sydney's CBD was reasonably central in the metro area and a radial transport structure was appropriate. Sydney and thus North West Sydney needs a public transport system that can get people equally well to the many CBDs in the Greater Sydney area.

This paper thus discusses the Transport needs of Central NSW (Hunter Valley to the ACT) and its planning and funding. It has an emphasis on rail transport.

Economic and population growth, social disadvantage and fairness

This paper discusses the deficiencies in the State Government's rail strategy in addressing economic and population growth, social disadvantage and fairness. In the context of an integrated public transport system, additions to the rail network including a Sydney Orbital RAILWAY and restructuring of the existing infrastructure and operators are needed to better serve the community.

The Metropolitan area has expanded west to the Blue Mountains, yet all rail lines still radiate from the City centre. Development is following the Sydney Orbital Motorway and M4. Travel by public transport to many of the better paying jobs along the Global Arc of economic opportunity is difficult from many parts of Sydney. Robert Fagen, professor of human geography at Macquarie University, advises the South West of Sydney is particularly disadvantaged.

The State Government's fairness measure – *"Increase the percentage of the population living within thirty minutes by public transport of a city or major centre"* – needs to be revised to include efficient transport in the metropolitan area to the suburbs with the better paying jobs.

Integrated Transport Authority

After the fiasco of the integrated ticketing contract an Integrated Transport Authority is needed. To avoid replacing monolithic agencies with culturally similar agencies, an Integrated Transport Agency needs to be supported by specialised agencies for timetables, ticketing and marketing; infrastructure; public transport operations; property; road, rail and port operations; and a Transport Safety Authority. The Transport Safety authority will co-ordinate specialist safety agencies for transport regulation, vehicle licensing, vehicle operator licensing and transport safety investigation.

Sydney Orbital Railway and other additions to the network

A Sydney Orbital Railway is needed to directly link Parramatta, Liverpool, Bankstown, Hurstville, Sydney Airport, Sydney CBD, North Sydney, Chatswood, Epping and back to Parramatta with 22 in-between stops to cater for population growth, provide greater economic opportunity for the West and South West of Sydney and allow for increased passenger traffic through Sydney Airport. Its cost will be similar to the North-West Metro.

Other required additions to the rail network are extensions to the Cumberland Line, Eastern Suburbs Line and a tunnel on a Western Express Line between Strathfield, Olympic Park and Auburn.

Further clearways projects are needed to improve the robustness of the network. These projects should result in: 1. Sydney Orbital Railway with a NW branch if the Metro is not proceeded with; 2. Western Express/Blue Mountains Line; 3. Western All Stops Line (City to Penrith); 4. Northern/North Shore/Central Coast/Newcastle Line; 5. Eastern Suburbs/Illawarra/South Coast Line; 6. South-Western Circle Line (Bankstown and East Hills); 7. Cumberland Line. The South Line route is a combination of other routes and will be phased out. The Carlingford Line is too short and should be replaced by a busway to improve service. Dedicated freight routes should be established in the County of Cumberland.

The cost of the additional works and clearways, excluding the SOR, for passenger rail is $3B to $4B. The total cost with the SOR (2006 costs) is about $11 Billion.

In time a Western Orbital Railway incorporating the Cumberland Line will be required and should be planned for now.

Metros

The North-West Metro is supported along with North-East, South-East and West Metros due to population density along the routes. The cost means these projects will need to be staged over many years.

International visitors and linking five cities and four airports with a fast train

The Events NSW proposal for a Williamstown Airport to Sydney by fast train should be supported as many international and Australian visitors are prepared to add a few hours to their journeys to save relatively small sums. However, it should be modified to link five cities (Newcastle, Central Coast, Sydney, Wollongong and Canberra) and four airports (Williamstown, Mascot, Albion Park and Canberra) with a 500 km high-speed line which could also be used for a 60 km long Canberra Metro. Such a train service could be commenced reasonably quickly utilizing less crowded sections of existing track. The approximate $25 billion total cost for an all-new line would only be spent if justified by the success of the various stages.

Funding

The State Government's transport infrastructure budget for the next decade is just $20 Billion of its $110 Billion infrastructure budget. Transport infrastructure gets an average of $2 Billion per year and public transport $1 Billion of that. Transport infrastructure represents only 0.5% of a State economy of $350 Billion GSP (Gross State Product) – paltry sums for key economic enablers. The NSW Government should at least double or triple its transport capital expenditure in real terms.

Income Tax and the GST are, in part, a return on the great economic enabler of transport. Land has value due the public and private services (shops, schools, roads, hospitals, police, jobs, etc) available to land occupiers and government should broadly tax the value government helps generate. A Land Tax break for owner occupiers is cost shifting to less well off renters living in other peoples investment properties.

Taking into account indirect tax effects, the NSW Government has made big profits from tollways and done well from other motorways and railways.

As the Australian and NSW Governments will receive a significant return on investment from the rail network in the form of indirect revenue (GST, Land and Mortgage Taxes, Income Tax) both should be investing heavily in rail infrastructure that serves the Sydney Metropolitan Strategy.

PPP model of Project delivery

PPPs have been used where the environmental cost of competing infrastructure is too high. They are wrong in principle because much of the costs and revenues of the projects are not covered by the PPPs, yet the pricing/revenue relationship with the customer/voter is transferred from Government to private companies.

Government needs to maintain the pricing relationship to factor in environmental, social, safety and economic issues.

Rail fleet

Current orders will only marginally expand the rail fleet. The NSW Government wants to increase population density but has no significant plans to add to the train fleet on existing lines. Nothing is being planned to assist Sydney Airport meet future demand.

Planning round existing rail lines

The State Government requires 70% of Sydney's future growth to be in existing urban areas. As a greenhouse reduction measure, the Government should consider lifting the target of 85%. The Metropolitan strategy calls for significant growth of regional centres. The Planning Minister's concept of high-density hubs should be applied to all existing and proposed Railway/Metro stations in the metropolitan area to limit continuous high-density strips developing along major roads and prevent broad high-density areas developing away from railway stations.

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The transport needs of Sydney's North West need to be seen in the context of the transport needs of Greater Sydney. A key criticism of Sydney's public transport is that virtually all Sydney's railways radiate out from the centre, while the Orbital Motorway is driving Sydney's development in a manner that downplays the role of a Central CBD. Until the great post WW2 expansion Sydney's CBD was reasonably central in the metro area and a radial transport structure was appropriate. Sydney and thus North West Sydney needs a public transport system that can get people equally well to the many CBDs in the Greater Sydney area.

This paper thus discusses the Transport needs of Central NSW (Hunter Valley to the ACT) and its planning and funding. It has an emphasis on rail transport.

2. NEED FOR ADDITIONAL RAIL CAPACITY TO THAT PROPOSED BY THE NSW GOVERNMENT

Providing for economic and population growth

Sydney has grown rapidly since WW2. According to the State Government's Metropolitan Strategy of 2006, Sydney's CBD has 300,000 jobs. However, the CBD is no longer central as metropolitan Sydney expanded west and grew to 2,000,000 jobs. The rail network has not adequately responded to the westward expansion. The network is still totally radial – all rail lines lead to Rome (sorry, the CBD).

The North-West Metro is another radial line designed to serve people already working along the arc of global economic opportunity from Macquarie Park to Sydney Airport (the Global Arc). The Global Arc has 700,000 (35%) of Sydney's 2,000,000 jobs and they are better paid on average. Most of these jobs are not easily accessible by public transport from many parts of Sydney.

The State Government's plan to make Macquarie Park the fourth-largest CBD in Australia, behind Sydney, Melbourne and Brisbane, has been undermined by its decision to dump the North West Rail Link. Billions of dollars are being spent in turning the growing area into Australia's answer to Silicon Valley, with technology businesses setting up next door to an expanding Macquarie University.

Now, only four trains an hour will service the $2.3 billion train line in the foreseeable future. A masterplan for the area released by Ryde City Council shows it had expected to shift 40% of local journeys on to public transport. The Epping to Chatswood Rail Line, which will have two stations within Macquarie Park, has the capacity to carry some 23,400 commuters in the one hour peak, but now there will only be enough trains to transport a combined 8000 commuters in both directions in the one-hour peak.

While it remains to be seen if the recent large upward shift in hydrocarbon prices is permanent, the price rise has caught the public transport system short of capacity. The price rise risk is compounded by CO2 emission risks. The prudent course of action is to invest heavily in new capacity across the metropolitan area and not just a single Metro in the north of Sydney.

Addressing social and economic disadvantage

The Sydney Metro Strategy does little to address the relative social and economic disadvantage in South Western Sydney. Robert Fagen, professor of human geography at Macquarie University, as quoted by SMH journalist John Garnaut in an article published 20 Jan 2006, advises – *"jobs have been growing quite merrily in Western Sydney but are not accessible to groups of people who are in the most vulnerable localities. It's not only the location of the jobs but the kind of personal and social resources that workers have access to, including ... safe public transport."*

The article also quotes the ABS jobless rate for Liverpool/Fairfield LGAs at 9.9% compared to a Sydney average of 4.7%. Lack of personal and social resources were also quoted as issues in Macquarie Fields and Auburn. Fairfield and Auburn are also areas with high numbers of immigrants.

Frank Sartor writing in the SMH 29 Sept 2008 says *"access to many parts of Western Sydney is inferior to many other parts of the city"*, and *"parts of the Sydney Basin are languishing with depressed land values and house prices"*. While there is need for transport to the new development areas in the NW and SW, there is a pressing need to improve public transport in the many of the established areas of Western Sydney.

Transport performance measure 'Fairness'

The Government's Urban Transport Statement of November 2006 lists as its fairness measure *"Increase the percentage of the population living within thirty minutes by public transport of a city or major centre"*. A Labor Government, any government, should be ashamed of such a narrow measure of fairness. Government should also be aiming to significantly increase the percentage of the population with both good public and private transport access to the better paying jobs in NSW. It is no surprise land values in Western and South Western Sydney have gone backwards relative to Central, Northern and Eastern Sydney in recent years. Buses cannot adequately perform the large-scale medium and long distance transport tasks that rail is capable of doing.

The Sydney Orbital Motorway and M4 have done much to improve road access to the better paying jobs from all over Sydney. Very little has been done to improve rail access to those jobs.

Motorway led development in Sydney

The 1948 County of Cumberland Plan recognised the need for an orbital motorway to better serve Sydney's west. 60 years later the orbital motorway is complete and successful even though it's financing has been poorly done in recent years [The last four State Government tunnel projects are a financial mess – CCT and LCT motorways and Airport–City and Chatswood–Epping rail lines].

The Sydney Orbital Motorway and M4 are proving very effective in moving industries (e.g. distribution and manufacturing) involved in global commerce to Sydney's west. The State Government has recently sought initial funding from the Federal Government for a Western Orbital Motorway linking Rouse Hill to Penrith and the M5.

The Metropolitan Planning Strategy should be to expand the Global Arc into a 'global disc' of opportunity covering all Sydney. The Strategy is underdone in rail as it does not support the freedom of movement (by public transport) about the metropolitan area encouraged by motorways. Significant additions to the Sydney passenger rail network, including a Sydney Orbital RAILWAY (SOR), are required.

3. INTERGRATED TRANSPORT

The failure of the public transport integrated ticketing project highlights the need for an Integrated Transport Authority for NSW. To avoid replacing one large transport authority with another, the lead Authority needs the assistance of specialised agencies and operating companies. The Integrated Transport Authority should be the Government's vehicle for all its transport funding.

An Integrated Transport Authority should be supported by specialised authorities with responsibility for:

1. Ticketing, timetable and marketing – to manage ticketing, timetabling and marketing for all NSW passenger transport services. Service providers to supplement information provided by the Authority and act as its agent.
2. Transport planning and infrastructure – to contract for road, rail, port and airport (non Federal Govt controlled) infrastructure and infrastructure maintenance, and assist and advise the Department of Planning on planning matters and be a secondary source of planning advice to Government.
3. Public transport operations – to contract for all rail, bus, ferry, metro, port and airport operations services with government and privately owned operators who will be responsible for the safe and reliable operation of their service. The major rail service provider would control the rail signalling and communications network for NSW on behalf of all rail operators. As rail lines are separated from the main network, the operator would control its own signalling and communications. The operating authority would be required to assist tourism operators (like the operators of The Southern Spirit) enhance their product offerings.
4. Transport property – to administer land used for transport and lease/operate/maintain all retail/commercial outlets integrated with government owned transport infrastructure.
5. Road operations – to manage road use, the traffic-light network, temporary closures, punts and tolling.
6. Rail operations – to co-ordinate use and maintenance of the rail network in NSW.
7. Port operations – to manage all State Government owned sea and air ports and non Federal controlled navigation systems.
8. Transport safety – with the following four subsidiaries:
   – Transport safety regulator – to set safety standards for all modes of transport and its transport infrastructure;
   – Vehicle safety authority – to control testing/inspections and licensing of all road, rail and water vehicles;
   – Vehicle operator safety authority – to control testing and licensing of all vehicle operators;
   – Transport safety investigation authority – to investigate accidents and independently initiate investigations and audits.
9. State Owned Transport Corporations Holding Company – Ferries, Busses, Trains, etc.
10. Transport regulator (excluding transport safety).
11. Transport auditor in Auditor-General's office.

4. SYDNEY ORBITAL RAILWAY

Motorways take people to the edge of a suburb. Railways can take people directly to the centre of a suburb. They thus complement each other. Railways should follow where motorways go.

Our motorways form a circle crossed by a line – the Sydney Orbital Motorway and M4. This can be replicated in rail with an orbital railway in combination with the Western Line. These two lines alone would link almost all Sydney's regional centres and complement motorway driven development. While there is a need for Metro lines, an orbital railway will provide a greater benefit to NSW. In time a Western Orbital Railway, from Rouse Hill to Penrith and Leppington, will be required and should be planned for now.

A Sydney Orbital Railway (SOR) should directly link Parramatta, Liverpool, Bankstown, Hurstville, Sydney Airport, Sydney CBD, North Sydney, Chatswood, Epping, and back to Parramatta with 22 in-between stops. It would cost $6.5B (using 2006 Chatswood-Epping Line project estimates) with another $1.6B for trains – comparable to the North-West Metro. A worst-case trip, Parramatta to the Airport, would take one hour in either direction. See attached map for the proposed route.

The Orbital Railway would use the currently under-utilized Airport–City tunnel and the further delayed and future under-utilized Chatswood–Epping tunnel.

An Orbital Railway of 88 km, 31 stations and 2 hour circumnavigation will need double deck carriages, but there is no reason it could not be built and operated like a Metro and reap the cost benefits of a Metro. Its maximum capacity is about 80,000 passengers (80 trains – 20 per hour in each direction) simultaneously.

The service on the Airport Rail Line, according to the Sydney Airport Masterplan, is a major constraint on capacity of Sydney Airport. The present route of the Airport Line is not convenient for most air travellers and it is too expensive for groups heading to the Airport. The high arrival and departure charges for the airport rail stations need to be reduced to those for other rail stations. The Airport is relying on current Clearways programs to permit 20 trains per hour on the Airport Line leaving no City Circle capacity for other rail lines.

5. OTHER ADDITIONS TO THE SYDNEY RAIL NETWORK

Other needed additions to the rail network are:

1. The Cumberland Line service extended to Moss Vale, Campbelltown, Richmond, Rouse Hill and incorporating the State Government's South West Line to Leppington;
2. The Eastern Suburbs Line extended to UNSW and then link with the Illawarra Line at Sydenham;
3. Two tracks of the Western Line made a Limited Stops Line with a new underground section Strathfield–Olympic Park–Auburn.

6. FURTHER CLEARWAY PROJECTS FOR THE SYDNEY RAIL NETWORK

The Sydney network, not including Metros, should be further separated and simplified with the aim of improved reliability, i.e., interconnections need to be reduced and maximum return journey time for a metropolitan rail line should be no more than 2 hours. Frequency of service should be relied upon to keep down point-to-point journey times rather than timetabling.

With the additions identified at **4.** above, the rail network it should be separated into the following (see Figure 2):

1. Sydney Orbital Railway (SOR) with NW branch if NW Metro not proceeded with
2. Western Express and Blue Mountains Line (Limited stops with a new tunnel Strathfield–Olympic Park–Auburn)
3. Western All Stops Line (City to Penrith and sharing clockwise City Circle track with Western & Blue Mtns Line)
4. Northern Line (Combined North Shore, Northern and Central Coast–Newcastle Lines)
5. Southern Line (South Coast/Illawarra/Eastern Suburbs Line extended to UNSW and Sydenham)
6. South-Western Circle Line (Bankstown and East Hills Lines with the anti-clockwise City Circle track and the East Hills Line looping round to meet the Bankstown Line at Liverpool). Lidcombe to Sefton and Birrong replaced by busses.
7. Cumberland Line (Quakers Hill to Glenfield with northern branches to Richmond and Rouse Hill and southern branches to Campbelltown/MossVale and Leppington).
8. Dedicated freight route in the County of Cumberland. Port Kembla freight should enter Sydney via the Southern Highlands.

The Intercity services should be merged with the Suburban services and follow the Suburban routes in Sydney and not terminate at Central (thus improving service).

At Central, Platforms 14 & 15 would be modified to serve the Northern/North Shore Lines. The Western Lines would use Platforms 16, 17, 22 & 23. The Bankstown/East Hills Lines would use Platforms 18, 19, 20 & 21.

The cost of the additional works and clearways, excluding the SOR and dedicated freight line, is $3B to $4B. The cost the SOR (2006 costs) is about $8 Billion including trains.

The network will link 31 of the 34 metropolitan Sydney's 'global', 'regional', 'major', 'planned major', 'potential major' and 'specialised' centres (see Table 2 and proposed network map). The Sydney Orbital Railway (SOR) will directly link 15 of the 34 centres, 8 more centres than the Government's now abandoned NW/CBD/SW Line for similar cost (see Table 6). The centres, shown on the attached map from the Metropolitan Strategy, are well served by the Sydney Orbital Motorway (SOM) and M4. They should be equally accessible by rail.

The rail network will serve the 31 metro centres with 40 of the 160 metropolitan railway stations.

Of the three centres not linked by the above lines, Prairiewood will be serviced by the T-Way; Port Botany has too few public transport commuters; and Brookvale needs to be on a Metro line.

7. NSW RAIL OPERATIONS

The State Government intends Metro Lines not be operated by RailCorp.

In the environment of an integrated public transport system and the further separation of the rail lines to improve the robustness of rail operations, RailCorp can be broken up into a number of separate operators who have both fleet and track maintenance responsibilities. The intent is to improve the response to community needs while still maintaining overall direction by the State Government.

The present operating divisions of Suburban Sydney, Intercity, Country is a very Sydney centric view of the network. The NSW rail network is radial. City, regional and country journeys use common infrastructure on the radial arms.

As dedicated freight track is expanded its operation and maintenance should be separated from passenger rail tracks. Passenger rail operations companies can be established for each of the radial arms in NSW - North (Northern/North Shore lines to the QLD border), West (Western Lines to SA border), South (Illawarra/ES to Nowra), South West (Bankstown and South West Lines) and Cumberland (Richmond, Campbelltown to VIC border). The Metros will have separate operators. If a Sydney Orbital Railway is built it should have a separate operator. If a Newcastle, Sydney, Wollongong, Canberra fast train is built it should also have a separate operator. A robust protocol will need to be established for trains to pass from one network operator to another.

Initially, these operating companies would do little more than work on timetables, community consultation and marketing. As enhanced clearways programs permit, they gradually become owners, operators and maintainers of the suburban, interurban and country trains serving their Lines. These companies could remain controlled by the State Government but also have private equity.

8. METRO LINES

If the North-West Metro is justifiable than so is a South-East Metro connecting to the North-West Metro.

If a West Metro is justifiable than so is a North-East Metro connected to it. A North-East Metro route should run from Wynyard to the Harbour Bridge Cahill Expressway lanes, Neutral Bay, Manly, Brookvale and Mona Vale, largely following the route of the old tramlines to Manly. A North-East Metro Line could extend to Haymarket, Ultimo and become the Western Metro canvassed by the State Government.

A South-East Metro should link with and follow-on from the North-West Metro.

9. SYDNEY HARBOUR BRIDGE AND METROS

A North-East Metro using the two easternmost lanes on the Harbour Bridge is feasible if the City Council proposed demolition of the Cahill Expressway and undergrounding the Western Distributor goes ahead. Presently, both the CCT and Cahill Expressway are running at well less than half capacity. Demolishing the Cahill Expressway still leaves adequate cross-city capacity once appropriate links to the CCT from an underground Western Distributor are built.

The underground Western Distributor could commence on the Warringah Freeway in North Sydney like the Sydney Harbour Tunnel. The Sydney Harbour Bridge would effectively revert to its original configuration – four rail tracks and six traffic lanes (two bus lanes and four general traffic lanes). A second harbour tunnel to an underground Western Distributor ensures motorway traffic is underground (and under the Harbour) – where it should have been all along – and the City is a much more liveable place.

10. SEPARATION OF RAIL FREIGHT NETWORK

For robustness of passenger services the freight rail network should be fully separated from the passenger rail network in the County of Cumberland. This would also permit the passenger network to be split between 3 or 4 operators (with infrastructure maintenance responsibilities like the Metro operator) contracted to, and supervised by an Integrated Transport Authority. Benchmarking the operators against each other should lead to big cost savings.

11. INTERNATIONAL VISITORS AND LINKING CENTRAL NSW CITIES AND AIRPORTS LINKED BY A FAST TRAIN

Events NSW proposed Williamstown air base/airport be made a 24 hour international airport for civilian aircraft. Many international and Australian visitors to Central NSW are prepared to add a few hours to their journeys to save relatively small sums. As long as the fare is kept relatively low, a fast train will dramatically change the perceived boundaries of Sydney.

The Sydney Airport Masterplan is relying on current Clearways projects on the metropolitan train network to enable the maximum 20 trains per hour - a service every 3 minutes - in each direction, up from the present maximum of 12 services an hour. 20 trains each way on the Airport/East Hills Line requires clockwork timetabling the present RailCorp could never manage especially since the trains have to reverse direction at a turnback – the driver can't

lock up, walk to the other end of the train, unlock, check the controls and start again in under 5 minutes (15 minutes is presently allowed to add a margin for late arrivals). While a number of turnbacks are appropriate by the time you get out to East Hills and Campbelltown there would be a lot of wasted capacity on the line out past the Airport stations. The only way the Airport will ever get 20 trains an hour in each direction is if we build an Orbital Railway so that the trains never have to reverse direction. Plus the government will have to take back control of the airport stations so that the ticket prices can be reduced to the standard prices – at present it is cheaper for two people to drive a friend to the airport than to catch a train. Airport Rail will never reach capacity while it is cheaper and more convenient for most people to drive.

With the growth of the Lower Hunter and increased demand for civilian air services, Williamstown becomes less suitable for a military jet training and operations base. The nearest to Newcastle suitable location for an international airport is west/north of Cessnock. There is no location closer to Sydney than Williamstown with similar intrinsic safety. Relocating the fighter base is the most practical option. There are suitable locations west of Cessnock, near Singleton (Scotts Flat) and Taree (Wallis Island) with good support services and communities who would welcome the base and its people.

Linking only Williamstown to Sydney by fast train is ad hoc planning. Thinking more broadly about Central NSW transport needs, it is possible to link five cities (Newcastle, Central Coast, Sydney, Wollongong and Canberra) and four airports [Williamstown, Mascot, Illawarra Regional (Albion Park) and Canberra] with a 500 km high speed line which could also do double service in the ACT as a 60 km long Canberra Metro. Such a train service could be commenced in a few years utilizing existing track and some necessary new track. If a Sydney Orbital Railway is built the fast train could use the Epping to Hurstville section. The approximate $25 billion total cost for an all new line would only be spent if justified by the success of the various stages.

The proposed route is Williamstown Airport, Newcastle CBD, Gosford, Hornsby, Macquarie Park, Chatswood, North Sydney, Sydney CBD, Sydney Airport, Hurstville, Heathcote, Wollongong, Albion Park Aerodrome, Robertson, Moss Vale, Marulan, Goulburn, Breadalbane, Collector, Gundaroo, Amaroo ACT, Gungahlin Town Centre, Mitchell, Kaleen, Belconnen Town Centre, Dickson, City, Campbell, Canberra Airport, Fyshwick, Kingston, Woden Town Centre, Mawson, Wanniassa, Tuggeranong Town Centre, Gordon, Calwell, Gilmore ACT, Hume ACT (use existing rail corridor in NSW), Queanbeyan (using existing rail corridor in NSW).

The Illawarra Regional Aerodrome at Albion Park has flown under the radar. It has a North-South runway of 1800 metres and an East-West runway of 1300 metres and can serve as a regional airport. A road tunnel or road diversion would permit runways to be lengthened if necessary. By comparison – Bankstown's runway is 1100 metres, Richmond 2200 metres, Mascot East-West and Third runways 2500 metres.

The State Government's project delivery approach to the North-West Metro seems appropriate for a fast train. The experience gained on the Metro will shave years off a fast train project.

12. NSW TRANSPORT UNDER-FUNDED

According to the NSW Urban Transport Statement, the Government's transport infrastructure budget for the next decade is $20 Billion of its $110 Billion infrastructure budget. Transport will thus get an average of $2 Billion per year and public transport $1 Billion of that. Thus transport infrastructure represents only 0.5% of a State economy of $350 Billion GSP (Gross State Product) – paltry sums for key economic enablers.

The NSW Government should at least double or triple its transport capital expenditure in real terms.

13. SOURCES OF FUNDING

Transport, whether air, road, rail, pipelines, cable (power, communications) and radio (communications), is the great economic enabler because without it, other services are extremely difficult to deliver. Without transport we have a subsistence economy. Thus Income Tax and the GST are, in part, a return on transport investment.

Land has value due the public and private services (shops, schools, roads, hospitals, police, etc) available to land occupiers and government should tax the value it helps generate. Land Tax needs to be seen as a return to government for provision of services. Council Rates are similar to Land Tax and should be seen in the same light.

Taxing land value to recover part of the capital cost of provision of government services is economically efficient. Giving owner-occupiers a Land Tax break is cost shifting to less well off renters living in other peoples investment properties. All commercial, industrial and residential land should be taxed at the same land value rate. Rural and mining land has value in the main due to mineral composition and climate and should be taxed on a different basis.

Taking into account indirect tax effects, the NSW Government has made big profits from tollways and done well from other motorways and railways.

As the Australian and NSW Governments will receive a significant return on investment from the rail network in the form of indirect revenue (GST, Land and Mortgage Taxes, Income Tax) both should be investing heavily in rail infrastructure that serves the Sydney Metropolitan Strategy.

14. PPP MODEL OF PROJECT DELIVERY

PPPs have been used where the environmental cost of competing infrastructure is too high. They are wrong in principle because much of the costs and revenues of the projects are not covered by the PPPs, yet the pricing/revenue relationship with the customer/voter is fully transferred from Government to private companies.

Government needs to maintain the pricing relationship to factor in environmental, social, safety and economic issues. Pricing flexibility is particularly needed to provide incentives to reduce greenhouse emissions. Government also needs to factor in its indirect project revenue from additional GST and Land Taxes.

PPPs were designed to shift risk and provision of finance to private enterprise. Risk should be born by the organisation best able to manage it. This is often government. Our motorways and railways only make sense as part of a network. The network owner should wear the risk of its use. Its not economic to ask a company to wear the risk associated with one small part of it for 30 years (e.g., CCT, LCT). The market has said the CCT and LCT are over-priced for the service they provide, yet they have benefits to society that make them worthwhile.

Without PPPs, risk can still be managed by seeking competitive bids for Design, Construction, Maintenance and Operation of monopoly infrastructure. With a capacity to raise taxes, our governments are a sure thing for banks and thus our Government's cost of borrowing is lower than for any private company.

15. RAIL FLEET

The NSW government is replacing the 498 pre 1981 R & S non-air con suburban fleet of carriages with 78 trains (626 carriages) at a cost of about $3 Billion over the 30 year life of the trains (each pair of new suburban cars costs about $6M per pair to purchase outright). The outer suburban fleet of 212 is being updated with 122 carriages on order (to replace V set's 135 cars??). The current fleet of 40 intercity and regional single deck cars is being updated with 14 carriages on order to replace 620/720 12 Hunter service carriages from mid 2007.

Current orders will only marginally expand fleet. The NSW Government wants to increase population density but has no plans to add to the train fleet on existing lines. Sydney Airport is constrained by rail fleet availability.

16. PLANNING AROUND EXISTING TRANSPORT

The State Government requires 70% of Sydney's future growth to be in existing urban areas. As a greenhouse reduction measure, the Government should consider lifting the target of 85%. The release of blocks on Sydney's urban edge is far to low for new areas to absorb the population expected on them. The Commonwealth Government's migration program is placing extreme pressure on the Sydney Metropolitan strategy.

The Metropolitan strategy calls for significant growth of regional centres. The former Planning Minister's concept of high-density hubs should be applied to most existing and proposed Railway/Metro stations in the metropolitan area to limit continuous high-density strips developing along major roads and prevent broad high-density areas developing away from railway stations.

High-rise around stations provides an easy walk to train stations for many people and the surrounding low-rise housing is preserved. This strategy would have served municipalities like Ku-ring-gai much better than the wide area medium density being foisted on them at present.

[250 metres is an easy walking distance to a station for most people. A circle radius 250 metres encloses 20 Hectares. One 50 unit residential building houses about 100 people. Two of these buildings per hectare (about 1.5 football fields) will see each railway/metro station with 4,000 people in easy walking distance. A high-rise hub at most metropolitan rail and metro stations would house the majority of the expected 1.1 million population increase expected by 2031. The policy could be implemented with two intermediate stages at 150 M radius (7 Hectares) and 200 M radius (13 Hectares).]

Figure 1 – Metropolitan Strategy Map

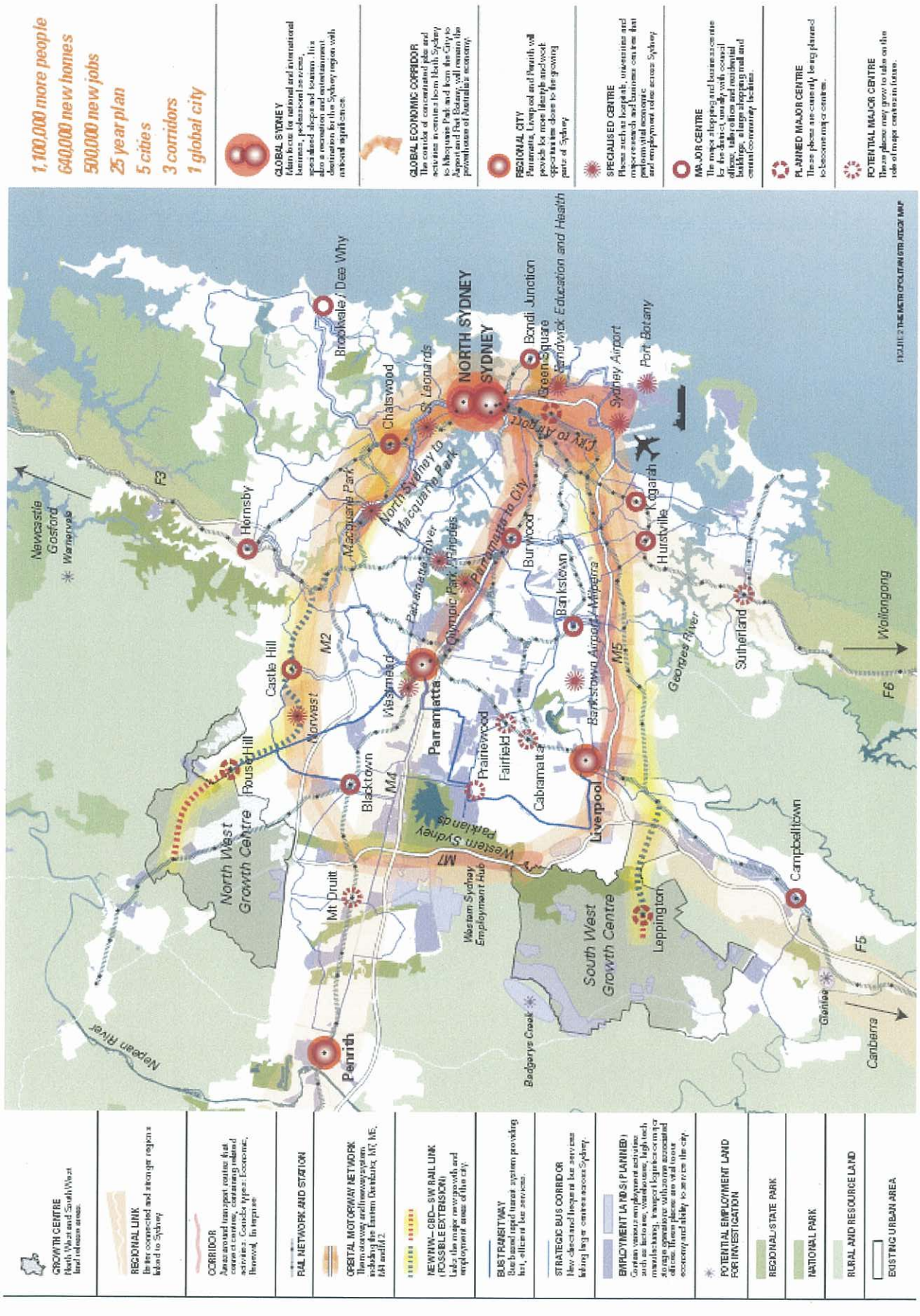

Figure 2 – Proposed Sydney metropolitan rail network map

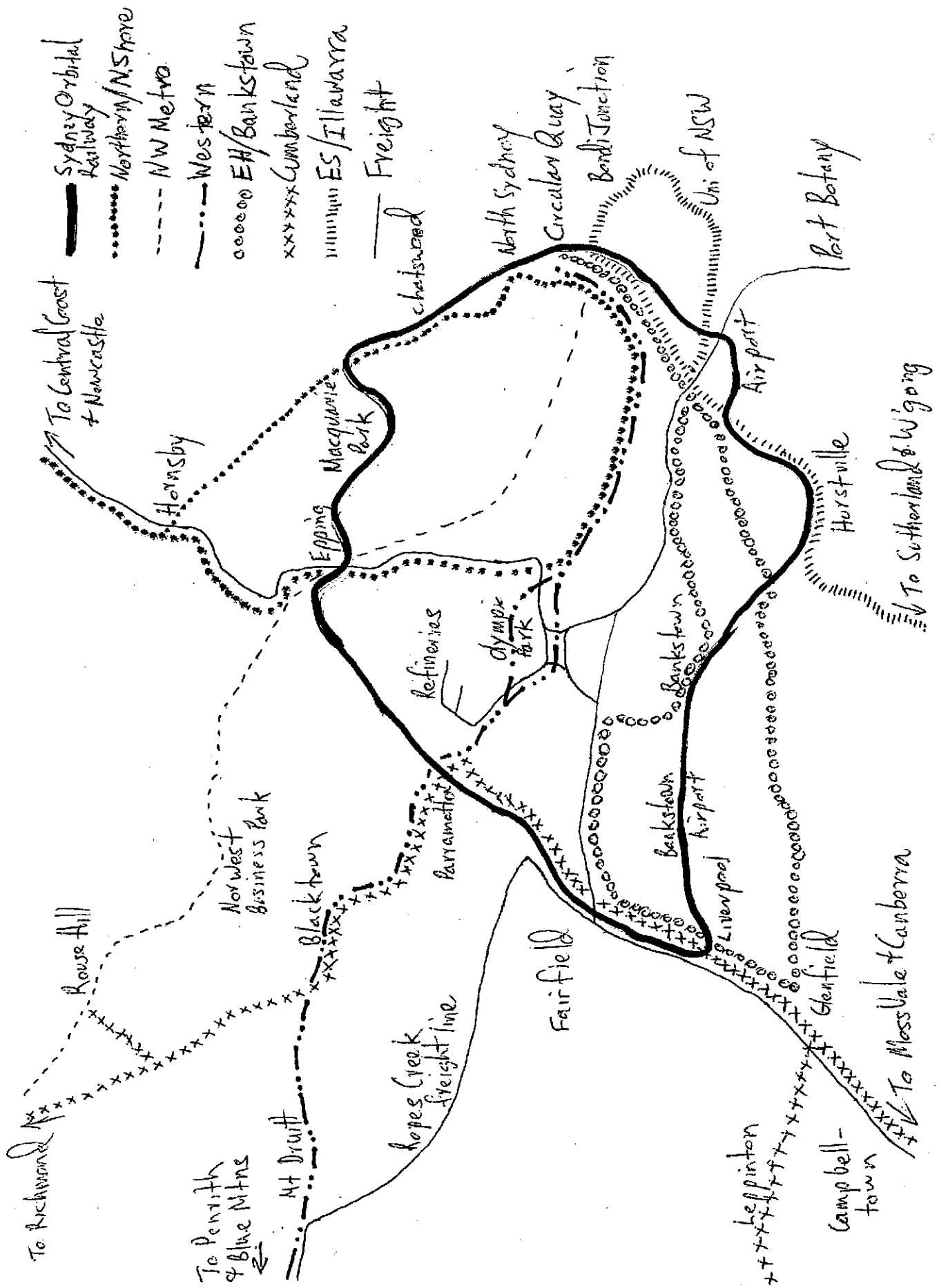

Figure 3 – Proposed rail lines and stations in the CBD

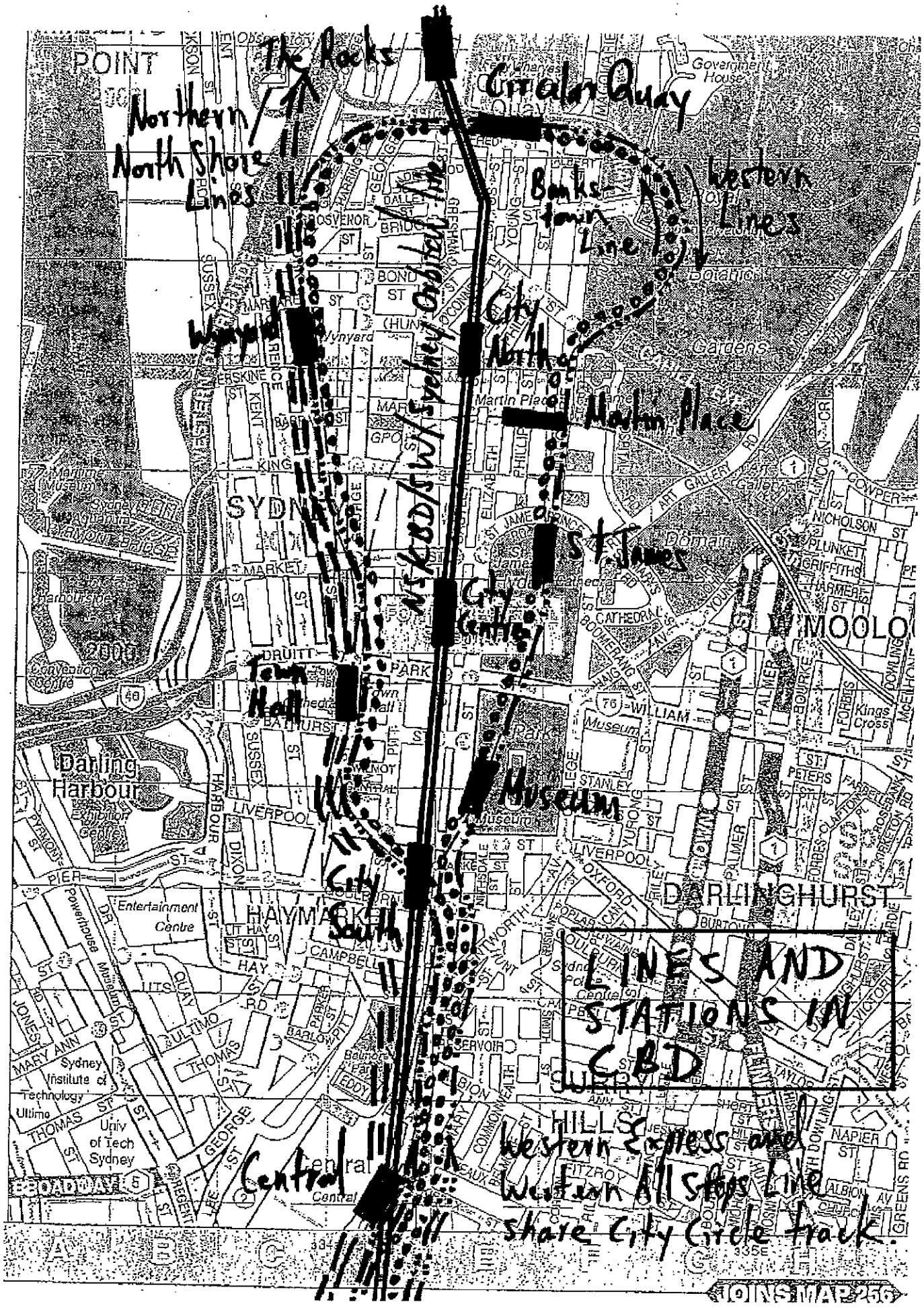

Table 1 – Metropolitan Strategy growth centres linked by existing and proposed rail lines

Metropolitan Strategy growth centres								
Type	**Totals**	**~~NW/CBD/ SW Line~~ Cancelled 2008**	**Western Lines (Express and All Stops)**	**Proposed Sydney Orbital Railway (SOR)**	**Cumberland Line**	**Northern /North Shore Line**	**Banks-town/East Hills Line**	**Illawarra/ Eastern Suburbs Line**
Global Sydney	**2/2**	~~Sydney, North Sydney~~	Sydney	Sydney, North Sydney	–	Sydney, North Sydney	Sydney	Sydney
Regional cities	**3/3**	–	Penrith, Parramatta	Liverpool Parramatta	Parramatta, Liverpool	–	Liverpool	–
Major centres	**10/11**	~~Castle Hill, Chatswood~~	Blacktown Burwood	Chatswood, Kogarah Hurstville, Banks-town	Campbell-town, Blacktown	Hornsby, Chatswood, Burwood	Banks-town	Kogarah, Hurstville Bondi Junction
Planned major centres	**3/3**	~~Rouse Hill, Green Square, Leppinton~~	–	Green Square	Rouse Hill, Leppington	–	–	–
Potential major centres	**4/5**	–	Mt Druitt	Cabramatta, Fairfield	Fairfield, Cabramatta	–	Cabramatta	Sutherland
Specialised centres	**9/10**	~~Norwest, Macquarie Park, St Leonards Sydney Airport~~	Westmead Olympic Park (on Express Line)	Macquarie Park, St Leonards Sydney Airport, Banks-town Airport	Westmead	Rhodes, St Leonards	–	Randwick
Totals	**31/34**	~~11~~	8	15	9	7	4	6

Table 2 – Costs of works for proposed rail lines

Line	Construct-ion type	Length km	Stat-ions	Additional train carriages	2006 Cost rail line $Billions	Additional carriages $Billions	Total cost $Billions
Sydney Orbital Railway costs to complete							
Epping – Chatswood	Tunnel	14	4		Existing	Completed 2008 $2.1* under-utilized	
Chatsw – St Leon	Surface	3	2		0.08		
CBD (St L – Redf)	Tunnel	8	6		2.0**		
Airport (Redfern – Wolli Ck)	Tunnel	9	4		Existing	Completed 2000 $0.8 under-utilized	
Wolli Creek	Connection	1	1		0.08		
Illawarra (Wolli Ck – Hurstville)	Surface	7	2		Existing		
Hurstville – Bankstown	Tunnel - with turnback at Hurstville Stn	9	3		1.35		
Bankstown – Liverpool	Tunnel & surface	11	2		0.8		
Liverpool – Merrylands	Surface - with Stabling yard at Yennora	13	3		0.3		
Merrylands – Epping	Tunnel - with Turnback at Parramatta	13	4		1.9		
SOR track	Tunnel & surface	88			6.5		
SOR trains – max capacity required for Airport to Macq. Park	See Sydney Airport Master Plan		31	520*** 16x2x2=64 trains in peak hrs		1.56****	
SOR and trains	Tunnel & surface	88	31	520ξ			8.1
ESR loop B J to Sdhm via UNSW	Tunnel	8	7	32ξξ	1.2 + 0.255 Clear1 proj	0.096ξξ	1.55
Cumberland line	Surface	50	30	120ξξξ	Existing	0.36ξξξ	
Cumberland SW (Glenfield – Leppington)	Surface	10	4	– ξξξ	0.3 (planned)		
Cumberland total							0.66
~~NW/CBD/SW~~							
~~North West~~	~~Tunnel/surface~~	~~19~~	~~7~~		~~1.8*~~	Scrubbed	
~~North West (Sur)~~	~~Surface~~	~~8.4~~	~~3~~		~~0.2~~	March	
~~North West (Tun)~~	~~Tunnel~~	~~10.6~~	~~4~~		~~1.6~~	2008	
East Hills (Wolli Ck – Glenfield)	Surface	25	13		0.523ψ		
South West Circle (Bankstown/East Hills line)	Surface with City circle anticlockwise				Existing 0.29 Clear2 project ψ		
Western all stops line	Surface with City circle clockwise				Existing		
Western express line via Olympic Park	Surface with City circle clockwise				Existing + 0.5 tunnel		0.5
Northern (Northern and North Shore Line)	Surface with short tunnels	2			Existing + 0.166 Clear5 proj		0.166

Table 2 – Costs of works for proposed rail lines (continued)

Line	Construct-ion type	Length km	Stat-ions	Train carriages	2006 Cost rail line $Billions	Additional carriages $Billions	Total cost $Billions
Clearways ext to separate West/ North/NS Lines	Sydney rail yard cross-overs, etc	??			**0.3**		**0.3**
New trains West and North Lines						**0.864ξξξξ**	
Total proposed new projects					**8.3**	**2.9**	**11.2**

* Published figures. Epping-Chatswood 14km & $2.1B=$150M/km
* Published figures NW Line $1.4B in 2001 (allow cost rise of 5% per annum for 5 years = $1.8 Billion)
* Published figures – Surface line in existing corridor – $10M to $15M. Stations $50M to $200M
** CBD $180M/km & $110M per station – extra costs due to depth and difficulty
*** $0.8 B in 2000 (allow cost rise of 5% per annum for 6 years = $1.1 Billion
ψ Existing East Hills Line+ $340M Clearway 3 project for express line + $183M Clear4 project for express line
ξ SOR – see Table 6 – 520 Cars @ $3M each = $1560M
ξξ ESR ext. via UNSW – see Table 6 – 32 cars @ $3M each = $96M
ξξξ Cumberland Line – see Table 6 – 120 Cars @ $3M each = $360M
ξξξξ Northern and Western Lines – see Table 6 – 288 Cars @ $3M each = $864M

Summary - Cost of Rail network track additions and additional carriages

1. A Sydney Orbital Railway utilizing the Epping–Chatswood and Redfern–Wolli Creek underutilized tunnels at a cost of $6.5 Billion for track and $1.6 Billion for trains.
2. Cumberland Line services extended in length and number to the North West and South West Growth Centres using existing track, planned SW track and a link to Rouse Hill track at a cost of $400 Million for track and $360 Million for trains.
3. The Illawarra/Eastern Suburbs Line extended to the specialised health and education centre of Randwick from both Bondi Junction and Sydenham at a cost of $1.2 Billion for track and $96 Million for trains in addition to current clearway works.
4. Two Western Line tracks diverted by tunnel Strathfield–Olympic Park–Auburn at a cost of approx $500 M.
5. Further clearways projects to separate the Western and Northern/North Shore lines of about $300 M.
6. An additional $864 Million of trains for the Northern and Western lines.

Total cost of infrastructure (based on published Epping–Chatswood Line 2006 cost estimates) for the above projects is approx $11.2 Billion – $8.3 Billion for track and $2.9 Billion for trains (960 carriages).

Note: Current orders of suburban carriages replace non-airconditioned carriages and fleet number will remain largely unchanged at around 1225 suburban carriages. There are 357 interurban and other carriages for a total fleet of 1577 carriages.

Rail network restructure – further details

1. **Sydney Orbital Railway (SOR)** – Epping, Carlingford, North Parramatta, Parramatta, Merrylands, Fairfield, Cabramatta, Liverpool, Bankstown Airport, Bankstown, Beverly Hills, Hurstville, Kogarah, Wolli Creek, Airport, CBD, North Sydney, Chatswood, Epping.
2. **Northern Line** – North Shore, Northern and Central Coast–Newcastle Lines. Convert two Country Trains platforms at Central for use by Northern Line.
3. **Southern Line** – Illawarra/Eastern Suburbs Lines extended to Uni of NSW/POW Hospital, Mascot and loop back the Illawarra Line at Sydenham.
4. **South West Circle Line** – Bankstown and East Hills Lines with City Circle anti-clockwise track and East Hills Line extended to circle round to connect with the Bankstown Line at Liverpool.
5. **Western Express and Blue Mountains Line** – City Circle clockwise line to Central, Burwood, new Strathfield-Olympic Park-Auburn tunnel, Lidcombe, Parramatta, Westmead, Blacktown, Mt Druitt and Penrith. One-third of trains continue to Blue Mountains.
6. **Western All Stops Line** – City Circle clockwise line to Penrith (sharing City Circle track with Western Express Line).
7. **Cumberland Line** – Quakers Hill to Glenfield with northern branches to Richmond and Rouse Hill and southern branches to Campbelltown and Leppington and services extended across the day.

Country and Interstate passenger trains to be accommodated on the lines relevant to their approach to Sydney. Country and Interstate train engines to be modified for running through underground railway stations. The intention being to give them a wider choice of metropolitan destinations.

Notes:

1. Current Southern Line service replaced by Western Line, SOR and Cumberland Line services.
2. Central Station will have 10 above-ground and 4 underground tracks serving the metropolitan network.

Table 3 – Sydney Orbital Railway route and construction requirements

Stn No.	Dist bet stns (Km)	Cum dist (Km)	Cum dist (rev) (Km)	Time bet stns* (Min)	Cum time (Min)	Cum. time (rev.) (Min)	Station name	Station location
1	0.0	0.0	87.5	0.0	0.0	119.5	Central**	Central Underground new platforms (SOR excl.)
2	0.7	0.7	86.8	1.7	1.7	117.8	City South**	Castlereagh St (Goulburn–Liverpool) (SOR excl.)
3	0.6	1.3	86.2	1.6	3.3	116.2	City Centre**	Castlereagh St (Park St–Market St) (SOR excl.)
4	0.7	2.0	85.5	1.7	5.0	114.5	City North**	Castlereagh St/Bligh St (Hunter St) (SOR excl.)
5	0.8	2.8	84.7	1.8	6.8	112.7	The Rocks**	MCA forecourt (SOR excl.)
6	2.4	5.2	82.3	3.4	10.2	109.3	North Sydney**	Pacific Hwy (Walker St–Miller St) (SOR excl.)
								(cross harbour tunnel ends 7.0 km)
7	2.3	7.5	80.0	3.3	13.5	106.0	St Leonards**	existing station (SOR excl.)
8	1.9	9.4	78.1	2.9	16.4	103.1	Artarmon***	Extra platforms req'd (SOR excl.)
9	1.3	10.7	76.8	2.3	18.7	100.8	Chatswood**	existing station (under construction) (SOR excl.)
								(Epping/Chats tunnel start 11.5 km)
10	6.7	17.4	70.1	7.7	26.4	93.1	Delhi Rd***	existing station (under construction) shared with NW line
11	1.5	18.9	68.6	2.5	28.9	90.6	Macquarie Park**	existing station (under construction) shared with NW line
12	1.2	20.1	67.4	2.2	31.1	88.4	Macquarie University**	existing station (under construction) shared with NW line
13	4.1	24.2	63.3	5.1	36.2	83.3	Epping***	existing station (under construction) shared with NW line
								(cont. tunnel to Merrylands 24.2 km)
14	3.8	28.0	59.5	4.8	41.0	78.5	Carlingford***	cnr Pennant Hills Rd/Carlingford Rd (SOR excl.)
15	5.9	33.9	53.6	6.9	47.9	71.6	Parramatta North**	cnr Church St/Victoria Rd (SOR excl.)
16	1.7	35.6	51.9	2.7	50.6	68.9	Parramatta**	below existing station via Smith St (SOR excl.)
17	2.7	38.3	49.2	3.7	54.3	65.2	Merrylands***	Extra platforms – via Wentworth/ High/Crescent Sts (tunnel end 37.4 km)
18	2.3	40.6	46.9	2.3	56.6	62.9	Guildford****	existing station South line shared
19	1.7	42.3	45.2	1.7	58.3	61.2	Yennora****	existing station South line shared
20	1.6	43.9	43.6	2.6	60.9	58.6	Fairfield**	existing station South line shared
21	1.8	45.7	41.8	1.8	62.7	56.8	Canley Vale****	existing station South line shared
22	1.0	46.7	40.8	2.0	64.7	54.8	Cabramatta**	existing station South line shared
23	2.2	48.9	38.6	2.2	66.9	52.6	Warwick Farm****	existing station South line shared
24	1.5	50.4	37.1	2.5	69.4	50.1	Liverpool**	existing station South line shared
								(new Liverpool–Hurstville link)
25	2.5	52.9	34.6	2.5	71.9	47.6	Moorebank****	shopping centre (SOR excl.)
26	4.6	57.5	30.0	5.6	77.5	42.0	Bankstown Airport**	Marion St (SOR excl.)
27	4.0	61.5	26.0	5.0	82.5	37.0	Bankstown**	Addit. platforms req'd (SOR excl.)
28	2.3	63.8	23.7	2.3	84.8	34.7	Punchbowl****	under existing station
29	1.6	65.4	22.1	2.6	87.4	32.1	Roselands***	Shopping centre
30	2.0	67.4	20.1	3.0	90.4	29.1	Beverly Hills***	Under existing station East Hills line and close to M3/M5 junction
31	3.0	70.4	17.1	4.0	94.4	25.1	Hurstville**	existing stn Illawarra line shared

(Continued)

Table 3 – Sydney Orbital Railway route and construction requirements (Continued)

Stn No.	Dist bet stns (Km)	Cum dist (Km)	Cum dist (rev) (Km)	Time bet stns* (Min)	Cum time (Min)	Cum. time (rev.) (Min)	Station name	Station location
31	3.0	70.4	17.1	4.0	94.4	25.1	Hurstville**	existing stn Illawarra line shared
32	1.1	71.5	16.0	1.1	95.5	24.0	Allawah****	existing stn Illawarra line shared
33	0.9	72.4	15.1	0.9	96.4	23.1	Carlton****	existing stn Illawarra line shared
34	1.1	73.5	14.0	2.1	98.5	21.0	Kogarah**	existing stn Illawarra line shared
35	1.3	74.8	12.7	2.3	100.8	18.7	Rockdale***	existing stn Illawarra line shared
36	0.8	75.6	11.9	0.8	101.6	17.9	Banksia****	existing stn Illawarra line shared
37	1.3	76.9	10.6	1.3	102.9	16.6	Arncliffe****	existing stn Illawarra line shared
38	1.0	77.9	9.6	2.0	104.9	14.6	Wolli Creek***	existing underground platforms East Hills →SOR excl.
39	1.4	79.3	8.2	2.4	107.3	12.2	International Airport**	existing stn East Hills →SOR excl.
40	1.5	80.8	6.7	2.5	109.8	9.7	Domestic Airport**	existing stn East Hills →SOR excl.
41	1.6	82.4	5.1	2.6	112.4	7.1	Mascot***	existing stn East Hills →SOR excl.
42	2.4	84.8	2.7	3.4	115.8	3.7	Green Square**	existing stn East Hills →SOR excl.
								(cross harbour tunnel start Cleveland St 86.8 km)
1	2.7	87.5	0.0	3.7	119.5	0.0	Central**	Central Underground new platforms

* Time between stations – 1 minute per km plus 1 minute per stations where trains stop – which approximates current network.
** 21 stations serving 15 of the 34 centres identified in the Metropolitan Strategy for growth.
*** 10 significant centres or rail interchange stations on the route.
**** 11 centres on the orbital route, served by other lines and not intended for service by SOR.
– SOR exclusively Hurstville to Liverpool via Bankstown (20.0 km) and Merrylands to Epping (13 km). (Total 53 km).
– SOR requires 2 extra lines beside the South/Cumberland Line (Liverpool to Merrylands – 13 km).
– SOR use 2 of 4 tracks on Illawarra Line between Wolli Creek and Hurstville. Illawarra line uses the other two and freight trains from Wollongong sent via Moss Vale to the Sydney freight centres.

Sydney Orbital Railway route and construction summary

The proposed SOR would be 88 km long [compared to the 112 km Sydney Orbital Motorway (SOM)]. It would have 31 stations and a circumnavigation time of about 120 minutes (compared to 70 to 80 minutes for the SOM). A suggested SOR route with distance and time information is attached as Table 3.

The **Orbital Railway** would comprise the following:
1. Existing track and track currently under construction – Wolli Creek to Cleveland St (9.0 km tunnel), Chatswood to Epping (14 km tunnel) and Hurstville to Wolli Creek (7.0 km above ground);
total exist track 30 km (34%)
2. Previous NSW Gov't tunnel proposals – Cleveland St to Chatswood **(11 km – 13%)** (part of NW/CBD/SW Line) and Epping–Parramatta Line but on new route through North Parramatta to Merrylands **(22.5 km – 26%)**
3. New above-ground track in existing rail corridor – Merrylands to Liverpool **(13 km – 15%)**
4. Other New track – Parramatta to Merrylands (1.5 km tunnel); Liverpool to Hurstville via Bankstown (20 km-route subject to study); Airport Line connection to Illawarra Line at Wolli Ck (0.5 km) **(22 km – 25%)**

Table 4 City Rail fleet data from City Rail website

Seats	Air Cond	Builder	Into service	Cars	Weight tonnes	Length mm	Width mm	Height mm	Carriages in set
M set (a) (Millennium) control trailer carriage (suburban lines) - M set (a) double									
104	yes	EDI Rail	2002-2005	**71**	45.5	20532	3030	4381	
M set (Millennium) non-control motor (suburban lines - M set (b) double									M sub dou
122	yes	EDI Rail	2002-2005	**70**	50	20243	3030	4381	**141**
T set (a)– tangara control trailer carriage - surburban double									
98	yes	Goninan	1988-1994	**186**	42	20320	3000	4413	
T set (b)– tangara motor carriage - surburban double									T sub dou
112	yes	Goninan	1988-1994	**184**	50	20220	3000	4413	**370**
C set (a)– control motor - surburban									
104	yes	Goninan	1986	**28**	52	20385	3036	4368	
C set (b)– trailer carriage - surburban									C sub dou
115	yes	Goninan	1986	**28**	43	20385	3036	4368	**56**
K set (a)– control motor carriage - surburban									
106	yes	Goninan	1981-1985	**80**	47	20385	3036	4368	
K set (b)– trailer carriage - surburban									K sub dou
118	yes	Goninan	1981-1985	**80**	47	20385	3036	4368	**160**
R and S set (a) (Goninan type) control motor – surburban – withdrawal from 2010									
113	no	Goninan	1978-1980	**79**	45	20216	3036	4368	
R and S set (b) (Goninan type) trailer carriage – surburban – withdrawal from 2010									R & S sub dou
130	no	Goninan	1978-1980	**70**	34	20217	3036	4368	**149**
L, R and S set (b) (Comeng type) controlmotor – surburban – withdrawal from 2010									
112	no	Goninan	1972-1980	**192**	47	20219	3077	4382	
L, R and S set (b) (Comeng type) trailer carriage – surburban – withdrawal from 2010									L,R & S sub dou
130	no	Comeng	1974-1980	**157**	34	20219	3077	4381	**349**
Current suburban fleet 1225 carriages. 498 new carriages to be purchased by 2010 to replace the 498 pre 1981 R & S non-air con fleet with possibly a min 208 single deck cars in order – order by mid 2006 as PPP									
G set (a)– tangara control trailer carriage (intercity and surburban) double									
98	yes	Goninan	1994-1995	**39**	45	20320	3000	4413	
G set (b) – tangara motor carriage (intercity and surburban) double									
112	yes	Goninan	1994-1995	**19**	53	20220	3000	4413	
G set (c)– tangara motor trailer with toilet (intercity and surburban) double									G int cit & sub dou
98	yes	Goninan	1994-1995	**19**	45	20220	3000	4413	**77**
V set (a)– control motor trailer - intercity									
88-96	yes	Comeng	1970-1989	**120**app	59-61	23968	2928	4382	
V set (b)– trailer carriage – intercity									V int city dou
92-112	yes	Comeng	1970-1989	**105**app	40	23965	2928	4382	**235**
								Total	**312**
Outer suburban (a) carriages control trailer carriage – to be introduced from mid 2006									
102	yes	Utd Goninan	2006-2007	**62**	47app	20340	3034	4403	
Outer suburban (b) carriages motor carriage – with toilet – to be introduced from mid 2006									
110	yes	Utd Goninan	2006-2007	**30**	52app	20435	3034	4403	
Outer suburban (c) carriages motor carriage – to be introduced from mid 2006									
New Out sub dou									
118	yes	Utd Goninan	2006-2007	**30**	51app	20435	3034	4403	**122**
Current fleet 312 with 122 outer suburban cars on order (to replace V set's 135 cars??)									
TE (Endeavour Railcars) control motor carriage (with toilet) intercity and regional services									
95	yes	Adtranz	1994-1996	**14**	57	25250	2921	4110	
LE (Endeavour Railcars) control motor carriage (with luggage area) intercity and regional services									TE,LE sing Int cit & Reg
95	yes	Adtranz	1994-1996	**14**	57	25250	2921	4110	**28**
620 Class control motor carriage (with luggage area) Hunter line services withdrawal from 2006									
48	no	NSWGR	1961-1968	**6**	38	19202	2972	3920	

720 Class control motor carriage (with toilet) Hunter line services - withdrawal from 2006
620/720 Hunt sing

54	no	NSWGR	1961-1968	6	29	19202	2972	3920	12

Hunter railcars (a) Diesel railcars control motor carriage - to be introduced from mid 2006

77	yes	Utd Goninan	2005-2006	7	57app	25250	2930	4240	

Hunter railcars (b) Diesel railcars control motor carriage with toilet- to be introduced mid 2006
New Hunt sing

69	yes	Utd Goninan	2005-2006	7	57app	25250	2930	4240	14

Current fleet 40 with 14 on order to replace 620/720 12 from mid 2006

Current total 1577

Current orders will not expand fleet. Replacement cost of fleet 1577 x $3M = $4731M
With 30 year life for 1600 cars = 53 cars to be replaced each year at cost of $160M (in 2006 dollars).

Table 5 Approximate division of trains between current services

Total suburban cars = 1225
Cumberland 3 afternoon/2 morning peak services – 24 cars
Olympic park all services 1 eight car train – 8 cars
Carlingford line all services 1 eight car train – 8 cars
Total suburban cars for other services = 1225 – 40 = 1185 cars equals 148.1 8 car trains

LINE	Services Per day Approx*	Ave service time (1-way) minutes	Ave trip hours	Service hrs per day	Service Hrs % of tot	Number of cars per Line	Number of trains per Line	Ave train interval** minutes	Trains per hr** each way
Northern Line	67	65	1.08	72	0.075	89	11	13.2	4.5
Western/NS line	105	145	2.42	254	0.265	314	39	7.8	7.7
ESR/Illawarra	146	63	1.05	153	0.160	190	24	5.9	10.2
Airport East hills	137	65	1.08	148	0.155	184	23	6.3	9.5
Inner west /South	165	75	1.25	206	0.215	255	32	5.2	11.5
Bankstown	93	80	1.33	124	0.129	153	19	9.2	6.5
	Total service hours per day 957				**total**	**1185 cars**	**148 trains**		

Notes:
Analysis assumes trains required for peak services are proportional to trains required per day as per timetable
* Approximate number of weekday services
** Average train interval taken as [(twice one–way journey time) + (15 minutes)]/[number of trains per line]
Number of cars is assumed proportional to service hrs
Number of trains available per line (for 2–way trip) = number of cars per line divided by 8
Trains per hour each way = sixty minutes divided by average train interval
Average service time each way taken from timetable.

Table 6 Calculation of additional carriage numbers for new lines

Additional carriages for 16 trains per hour SOR
Assume 16 trains per hour in both directions to service Sydney Airport and metro CBDs = 16 by 2 directions by 2 hour journey = 64 trains = 512 + 8 spare carriages = 520 carriages.
Additional carriages for 8 trains per hour Illawarra Line /ESR extension
ESR ext. via UNSW 0.25hr x 2 directions x 8tr/hr x 8car/tr = 32 carriages
Additional carriages for 6 trains per hour Cumberland line
Cumberland Line 1.5hr x 2 dir x 6 tr/hr x 8car/tr = 144 carriages less existing 24 carriages (3 trains) = 120 carriages
Additional carriages for Western and Northern lines
Western all stops = 9 trains per hr for 3.25 hr by 2 directions = 30 trains = 240 carriages
Western express/Blue Mtns = 9 trains per hr for 2.25 hrs by 2 directions = 40 trains = 320 carriages
North Shore/Nth Line 110 min = 2hr return at 4 trains/hr by 2 dir. = 16 trains = 128 carriages
Total 688 carriages less 400 servicing current Western/North Shore/Northern Line = 288 carriages

Additional carriages for all lines =960