

**Submission  
No 4**

## **INQUIRY INTO RAIL INFRASTRUCTURE PROJECT COSTING IN NSW**

**Organisation:** EcoTransit Sydney

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A submission to the

**INQUIRY INTO RAIL INFRASTRUCTURE PROJECT COSTING IN NSW**

General Purpose Standing Committee No. 3  
Legislative Council  
Parliament of NSW

Prepared by EcoTransit Sydney  
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Authorised by the Executive Committee of EcoTransit Sydney

The submission consists of 16 pages.

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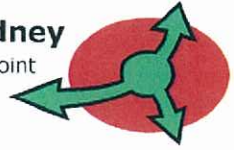
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Ms Beverly Duffy  
Director  
General Purpose Standing Committee No. 3  
Parliament House  
Macquarie St  
Sydney NSW 2000

Dear Ms Duffy,

Please find enclosed the submission from EcoTransit Sydney to the *Inquiry into rail infrastructure project costing in NSW*. EcoTransit Sydney<sup>1</sup> is a long standing, community-based, non-party political, public transport and active transport advocacy group.

We would be pleased to meet with the inquiry to discuss and elaborate on the matters raised in our submission.

Yours sincerely,

John Bignucolo  
Secretary  
EcoTransit Sydney

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<sup>1</sup> [www.ecotransit.org.au](http://www.ecotransit.org.au)

## Overview

EcoTransit Sydney has been concerned<sup>2</sup> for some time over the NSW government's rail planning and project cost estimation practices<sup>3</sup>. Project cost estimates have been consistently – and very substantially – higher than those of comparable international and Australian government transport agencies. The poor benefit-cost ratios associated with rail (whether heavy or light) has resulted in a substantial under-investment in heavy rail and light rail projects across NSW, particularly when compared with other states and comparable OECD economies. We therefore welcome the decision by the committee to undertake the inquiry and commend its well-chosen terms of reference.

Observing the manner in which critical NSW rail projects (both heavy rail and light rail) have either failed to be built, or have been built at an inexplicably high cost, or delayed by decades, has been a matter of serious concern for anyone who takes seriously the importance to a modern society of a functional, well maintained and comprehensive rail system. Such a system is vital to enhancing sustainability, improving land use planning outcomes, reducing fossil fuel dependence, reducing congestion costs, ameliorating social disadvantage and enhancing community amenity across Sydney and NSW.

The radical overhaul of rail project planning, funding and construction processes initiated under the Greiner Coalition government in 1988 and continued by its Labor successors has led to a loss of professional engineering, design and project planning capacity within the NSW government in relation to rail projects. While the Roads and Traffic Authority was able to retain its professional capacities, reflecting the transport preferences – or more accurately the ideological prejudices – of the political consensus that has governed NSW since the Greiner Government, the rail agencies have fared poorly.

The void has been lucratively filled by engineering consultancies and construction companies whose primary purpose is not to serve the public interest, nor to maximise the return on taxpayer funds, nor to develop a coherent, efficient rail transportation network serving Sydney and NSW, but solely to benefit a narrow private interest.

With (detailed) project design, estimation and management outsourced to engineering consultancies, and with insufficient independent, internal technical capacity to rigorously assess and challenge the resulting costings, we have seen an increasing degree of dysfunction, scarcely discernible from maladministration, amongst the NSW agencies tasked with planning, assessing, estimating and constructing rail infrastructure projects.

Such a characterisation may seem harsh, but how else would one describe a process under which cost estimates for the **same** rail project have doubled or quadrupled over a short period of time, particularly during a period of low inflation and gains in engineering efficiency?

There have been several significant signposts that highlight the extremely poor outcomes to the taxpayers of NSW from those agencies tasked with maintaining and improving rail infrastructure in NSW. They include:

- All the nominated road projects in the NSW government's ten-year *Action for Transport* policy, adopted in 1998 were completed. Indeed the RTA over-delivered, constructing additional large projects, such as the Cross City Tunnel and Lane Cove Tunnel, that were not even referenced in the policy. On the other hand, almost none of the rail projects nominated

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<sup>2</sup> Letter from EcoTransit Sydney to Infrastructure Australia, 3 February 2009

<sup>3</sup> <http://www.crikey.com.au/2009/03/26/why-rail-projects-in-nsw-cost-three-times-as-much-as-they-should/>

in *Action for Transport*<sup>4</sup> were completed.

- The decision to radically change the scope of the Parramatta-Chatswood rail project by tunnelling under the Lane Cove River. Effectively, this turned it into the more limited, more expensive, and less functional Epping-Chatswood rail project.
  - While arguably justifiable when considered in the narrowest of project terms, when viewed from the perspective of the overall rail passenger *network*, the outcome represented a poor return on investment for the taxpayer. And critically, the Sydney rail system **is a complex, unified network**, representing 150 years of social investment.
  - The cost, scope and intended purpose of the revised project diverged significantly from the original aims and intended outcomes of the Parramatta-Chatswood rail project.
  - It resulted in the removal of the planned stop at the UTS Ku-ring-gai campus and an increase in the length of the tunnel to achieve the grades required for train operation (even these grades were too steep for most of the existing CityRail carriages, introducing additional operational complexity which RailCorp was left to deal with).
  - It necessitated a dramatic escalation in the per kilometre price of the project, which was to the benefit of the consultancies and construction groups to whom TDIC contracted out design, engineering, project management and construction services.
  - The cost increase was used by rail opponents within government as justification for abandoning the Parramatta-Epping section of the project, severely diminishing the network benefits that would have otherwise flowed from completing the full link, and which underpinned the original rationale for the project.
- The appointment of the same coterie of senior managers responsible for the Epping-Chatswood and CBD Metro rail projects to the North West Rail Link project.
- The dramatic increase in project costs for each iteration of the previous Labor government's cycle of announcing, cancelling/delaying, and re-announcing rail projects. For example, the cost of the South West Rail Link escalated from \$440 million when first announced to \$2.2 billion before contracts were finally signed.

The processes by which NSW government agencies arrive at such estimates remain utterly opaque to the general public. Similarly opaque has been the role played by engineering consultancies in the planning, assessment, cost estimation, design and management of rail projects. These private entities, whose interests are not congruent with the public interest, have had outsourced to them tasks previously considered the core duties of government. Nor has the role of Treasury<sup>5</sup> in adjusting upwards rail project cost estimates been adequately investigated.

This inquiry is a vital first step in determining the factors that have led to this dysfunction becoming entrenched. However, we recognise the limitations under which the committee is undertaking the inquiry. The scope of the problem is very broad and the time available limited. It is already evident that the dysfunctional nature of rail planning, design, costing and tendering are costing the NSW taxpayer dearly, either through necessary infrastructure not being constructed or through gross over-costing of infrastructure when built.

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4 [http://en.wikipedia.org/wiki/Proposed\\_railways\\_in\\_Sydney#Action\\_for\\_Transport\\_2010.2C\\_1998](http://en.wikipedia.org/wiki/Proposed_railways_in_Sydney#Action_for_Transport_2010.2C_1998)

5 More than one transport practitioner has recounted how the Treasury officials tasked with assessing rail projects repeatedly “double the cost and halve the benefit” until satisfied the benefit-cost ratio is sufficiently poor to ensure the project has no hope of being approved.

**We would therefore urge that the committee recommend the establishment of a royal commission to continue its work.**

The systemic nature of the problem, the resulting incapacity of government agencies to provide sound assessments to the elected representatives of the people of NSW, and the far-reaching consequences flowing from bad advice strongly suggest that the forensic powers of a royal commission will be necessary to determine the causes and culpability of those interests responsible for the grossly inflated cost estimates being assessed against rail projects by NSW government agencies.

The expense of a royal commission is justified by:

- The magnitude of the taxpayer monies involved, in the order of billions of dollars, for these projects.
- The manner in which skewed benefit-cost ratios for rail projects compared to road projects (whose costs are estimated separately) has led to a preference for road projects over rail projects. This has affected and will continue to affect on the state's capacity to provide for the community's transport needs. A direct consequence — induced road congestion<sup>6</sup> — represents an escalating multi-billion dollar impost on the state's economy.
- The ongoing reduction in rail services in regional NSW and the refusal to reinstate services, let alone construct new rail lines, for the purposes of assisting in the development of regional centres and “future proofing” them from the effects of Peak Oil. This is particularly evident when compared with improvements to the regional rail network undertaken in Victoria by that state's previous Labor government.
- The decision of the NSW government through 2008-2009 to advance the CBD Metro project despite its extraordinarily poor benefit-cost ratio<sup>7</sup> and – apparently deliberate – objective of blocking future expansion of the CityRail network.
  - This proposal originated in a small clique of senior Department of Transport and Treasury officials<sup>8</sup> who succeeded in convincing an inexperienced Premier to adopt it despite non-existent feasibility studies and detailed planning.
  - The scope of the breakdown in governance and probity associated with the project was evidenced in December 2009, when a leading transport consultant, Mr Sandy Thomas, resigned in protest at a request to censor his work, because it would have been "materially misleading and deceptive."<sup>9</sup>
- The extent to which the areas of Sydney experiencing the fastest growth rates, such as the North West and South West sectors, were allowed to develop without timely provision being made for an alternative to road-based transport. The lack of investment in rail has resulted in escalating congestion costs and social disadvantage.
- The fact that communities without access to a viable rail service, whether in urban areas or regional NSW, are particularly vulnerable to increasing petrol prices and are disadvantaged in comparison with those areas that enjoy the benefits of a functional rail service.

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6 <http://www.bitre.gov.au/publications/49/Files/wp71.pdf>

7 [http://ecotransit.org.au/ets/files/ETN\\_0909\\_CBDMetro.pdf](http://ecotransit.org.au/ets/files/ETN_0909_CBDMetro.pdf)

8 “CityRail growth 'blocked' by metro”, Sydney Morning Herald, October 5, 2009.

<http://www.smh.com.au/national/cityrail-growth-blocked-by-metro-20091004-ghx8.html>

9 “Fixers twisted metro files.” Linton Besser and Andrew West. Sydney Morning Herald, 17 February 2010

Only a focussed judicial inquiry with the power to compel witnesses, subpoena documents, and the time and resources to follow the document trail, particularly internal Treasury, Department of Transport and RailCorp documents, including cabinet briefing material provided to the former Labor government, would have the powers to thoroughly address what has become a profoundly damaging state of affairs for the people of NSW.

## **The problem in microcosm – how much does it cost to duplicate 3 km of rail track?**

As a cheap and practical means of increasing the number of containers transported by rail from Port Botany, EcoTransit Sydney has proposed<sup>10</sup> duplicating three kilometres of constricting single track, within the existing freight rail corridor, between Port Botany and Sydenham.

As noted on 18 December 2010 in the Sydney Morning Herald<sup>11</sup>:

"For most of the decade, government policy has professed an aim to transport an increasing share of these goods by rail instead of road. Rail cuts noise and air pollution and, by taking trucks from the streets, makes them safer and less congested for regular drivers. The former transport minister, Craig Knowles, set a 40 per cent target for rail transport in 2004 that is still in place. When Knowles set the target, rail had a market share of 22 per cent. It has since slipped to 18 per cent."

Advice to EcoTransit indicated that this minor project would cost several million dollars and could be completed in months rather than years, allowing hundreds of container truck movements to be taken off the M5 and local roads. It would be a small step towards achieving the original policy target of transporting 40 per cent of containers out of Port Botany by rail.

Prudence dictates that the first step in assessing a project proposal is to undertake a feasibility study. It is difficult to fault this approach, as the NSW government discovered to its – and taxpayers' – cost with regard to the CBD Metro.

The question arises, however, as to who should undertake the study. Is it better to follow the model in which sufficient professional capacity is retained within government to undertake this work, or is it better to go down the path of retrenching that capacity and instead engaging private sector engineering consultants on an ad-hoc basis? Let us assume that a public service engineering professional is of equivalent ability to his or her private sector counterpart. Which approach is better for the taxpayer?

The response from the NSW government, as set out in this answer<sup>12</sup> from the Minister for Ports and Roads to a question on notice from the Hon. Cate Faehrmann, MLC was to follow the latter course and request \$30 million from the Commonwealth to undertake an outsourced feasibility study.

### **0488—PORT BOTANY FREIGHT LINE**

#### **Ms Faehrmann to the Minister for Roads and Ports representing the Minister for Transport—**

1. What cost estimation standard or policy was used to estimate the cost of the Duplication of the Port Botany Freight Line project, as specified in the Government's submission to Infrastructure Australia in the updated submission

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10 [http://www.ecotransit.org.au/ets/ets\\_acf\\_nine\\_point\\_plan](http://www.ecotransit.org.au/ets/ets_acf_nine_point_plan)

11 <http://smh.drive.com.au/roads-and-traffic/coming-to-a-traffic-jam-near-you-20101217-190s7.html>

12 <http://parliament.nsw.gov.au/prod/lc/qalc.nsf/c63f637ee30ce3beca2578c300122a54/70c07071dceb8ba5ca2578e900310714?OpenDocument>

- in 2010?
2. What are the components of the capital cost estimate and their estimated costs for the project?
  3. What are the risk components associated with the project?
  4. Are the estimated costs of those risk components included in the capital cost estimate of the project?
  5. What is the estimated capital cost of the project without accounting or providing for any allowance for the identified risks associated with the project?
  6. What is the confidence level of the estimated capital cost of the project?
  7.
    1. Is this cost estimate valid and appropriate?
    2. If not,
      1. Why not?
      2. What are the revised cost estimates?

**Answer—**

I am advised:

1. to (7) The project submission to Infrastructure Australia by the former Government includes a component of planning funding (\$30m) that would inform a detailed cost assessment.  
This planning funding, if provided, would cover detailed project cost estimates including engineering feasibility, confirmation of the appropriate alignment and securing the necessary planning approvals.

In short, the NSW government, via the Department of Transport, requested \$30 million to be distributed to consulting engineers for the purpose of undertaking a detailed feasibility study to duplicate three unchallenging kilometres of rail track and the elimination of a single level crossing on a minor road.

According to benchmark rates used by ARTC<sup>13</sup>, new track on flat terrain costs \$2 million per-single-kilometre. Consequently, by using the processes of the NSW government for assessing rail projects, the cost of a nominal \$10 million project leapt to \$30 million before a pen was put to paper, or a keystroke entered on a computer.

That \$30 million, which according to the metrics employed by the NSW government is only sufficient for the private sector to assess the feasibility of **one** very minor project, could instead be spent in the following manner: If one assumes a salary of \$120,000 for a senior engineer, and \$80,000 for standard engineer, and a team ratio of 1:3, then that \$30 million could pay the salary of 332 engineers for a year:

Senior Engineer	Standard Engineer	Total	Cost (Senior Engineer)	Cost (Standard Engineer)	Cost (Total) in 000's
83	249	332	\$9,960	\$19,920	\$29,880

<sup>13</sup> <http://www.artc.com.au/library/IRAS%20WP3%20Stage%201%20Capital%20Works%20Costings%20090505.pdf>, p. 8.



If one applies a 2.5 times multiplier for support staff and operating costs, a total of 132 engineers (32 senior and 99 standard) could be employed for a year.

Senior Engineer	Standard Engineer	Total	Cost (Senior Engineer)	Cost (Standard Engineer)	Cost (Total) in 000's
33	99	132	\$ 3	\$	\$29,880

One can reasonably conclude that either the department lacks the capacity to assess the duplication of three kilometres of track in an existing rail corridor, or as a matter of policy, the default option is to always pay for the services of engineering consultants at astronomical rates.

The latter approach yielded a five-fold increase in the cost of the project to the taxpayer, before even considering track laying and other engineering costs. It also implies that for \$30 million, the government could remedy the former and essentially have an entire rail/light rail planning and design section preparing detailed plans for many projects to put out to tender.

## **Tunnelling in Sydney sandstone costs \$400 million/km?**

In the 29 September 2009 edition of the Sydney Morning Herald, the NSW government placed an advertisement directed at the Commonwealth government. It consisted of a statement addressed to the Commonwealth Grants Commission and was signed by the Treasurer Mr Roozendaal, Unions New South Wales and a number of business chambers and others aimed at securing a larger share of Commonwealth taxation revenue. The following statement was made:

Due to the geographical and population spread of Sydney, tunnelling is one of the only options to improve transport and rail links — and the cost of tunnelling through Sydney sandstone is \$400 million a kilometre.

EcoTransit notes that when the former Minister for Transport, Mr Robertson, was asked about this figure during budget estimates<sup>14</sup> he was unable or unwilling to explain how the \$400 million figure had been derived. He suggested that the committee seek an explanation from the Treasurer, Mr Eric Roozendaal:

In regard to the advertisement and figure that is in the advertisement, I cannot answer for where that figure has come from. I was not party to the drafting of the advertisement. I suggest if the figure you are referring to in the advertisement is the question, you would need to ask the Treasurer, maybe the secretary of Unions NSW or the business chambers.

**Recommendation:** That the inquiry follow Mr Robertson's suggestion and question Mr Roozendaal under oath. Mr Roozendaal should be asked:

- Who (which Department(s), which individuals) provided \$400 million figure to him?
- On what basis was the \$400 million arrived at, and by whom?
- Were comparisons with tunnelling costs in other countries undertaken and the estimate tested against the experience in countries at a similar level of economic development to NSW and Australia?
- How is it that the per kilometre cost of the Cross City Tunnel, which was tunnelled through sandstone – and ideal tunnelling medium – using road headers cost \$160 million/km for a

<sup>14</sup> <http://parliament.nsw.gov.au/Prod/parlment/committee.nsf/0/F223F6956B558D0ECA2577A00020C34A>, p.9-10.

two lane tunnel?

- How is it that the per kilometre cost of the Airport Rail Line, which tunnelled through the difficult to manage medium of porous sand and sediment and required a specialist tunnel boring machine, was \$100 million/km, yet tunnelling through sandstone is claimed to cost \$400 million/km?

## The Role of the Transport Development Infrastructure Corporation

The role of the former Transport Infrastructure Development Corporation, later rebadged as the Transport Construction Authority<sup>15</sup> (TCA) before its staff were absorbed into Transport for NSW this year, should in particular be subject to detailed scrutiny, both as to the general concept of such an organisation separate from the publicly-owned rail organisations for which it held the exclusive right to control design and supervise construction, and in regard to the outcomes it delivered and the amount it ‘charged’ RailCorp for its work.

It appears to be the case that TIDC/TCA, a government-owned business based on a private-enterprise consultancy model, charged RailCorp a **flat** 12.5% of its estimate of the final cost of construction of the projects for which it was nominally responsible. That revenue was then returned to the NSW Treasury.

This is not to say that TIDC/TCA produced detailed designs which could then be put out to tender. These agencies produced only “concept” or “reference” plans from which private enterprise was contracted to complete work on a “design and construct” basis.

A single project is sufficient to make the case for forensic scrutiny of the projects for which TIDC/TCA were responsible.

TIDC’s 2009 Annual Report<sup>16</sup> (p. 73), shows that the organisation lists as “income” from “North Sydney Station Upgrade – concept design and planning approval”, \$20,814,000 for the year ended June 2009 and \$34,015,000 for the year ended June 2008 and listed as “expenses” \$20,560,000 and \$34,010,000 respectively.

In January 2009 CityRail stated that the upgrade of North Sydney Station had cost \$88 million<sup>17</sup>. If this figure is correct, and if it includes TIDC’s \$54 million “concept design and planning approval” work, detailed design and actual construction works cost around \$34 million.

It beggars belief that costs for concept design and planning approval could exceed those for detailed design and actual construction.

It should also be noted that the TCA’s 2010 annual report<sup>18</sup> lists no less than 19 senior executive officers paid between \$250,000 and \$458,640 annually, five of them above \$350,000 annually and the organisation had a total of 190 employees.

**Recommendation:** That an independent agency (for example a university department without any funding links to the road, bus and construction industries) be engaged to research the history of the construction of rail and light rail in Australia, with particular reference to the experience of NSW and Victoria. The aim of this history would be to produce an overview of the particular design, tendering and construction arrangements and their outcomes over time. Such an overview would inform parliamentary and public debate as to the best value-for-money in rail construction.

15 <http://www.tca.nsw.gov.au/About-us/Policies-and-publications/Annual-Reports/Annual-Reports/default.aspx>

16 <http://www.tca.nsw.gov.au/ArticleDocuments/45/TIDC%20Ann%20Report%202009%20web%20version.pdf.aspx>

17 [http://www.cityrail.info/news/2009/090120-north\\_sydney](http://www.cityrail.info/news/2009/090120-north_sydney)

18 <http://www.tca.nsw.gov.au/ArticleDocuments/45/TCA%20Annual%20Report%202010-2-LR.pdf.aspx>

**Recommendation:** That the committee should call as witnesses the recent heads of TIDC/TCA.

**Recommendation:** That the committee investigate how many of the staff employed by TIDC/TCA in contract positions to work on large projects such as the Epping Chatswood Rail Line and the CBD Metro were seconded from the same engineering consultancies and construction companies who bid for work, and to whom TIDC awarded contracts. Similar enquiries should be made of the North West Rail Link project.

## **Comparing rail project costs in NSW with other jurisdictions**

In this section we will compare cost estimates for rail projects in other jurisdictions with those in NSW. It is understood that variations related to the technical differences between, for example, WA's narrow-gauge heavy rail system and NSW's standard gauge system, or differences of geology, can be relevant to costs, but we contend that these differences could account for only a small proportion of the huge discrepancies that have been observed. Several recent and compelling examples follow.

### **South West Rail Link**

When complete, the South West Rail Link<sup>19</sup> will consist of a 11.4 km of double-track railway serving the developing suburbs of Leppington and Edmondson Park. The new line will connect with the existing CityRail network at Glenfield and will also include a train stabling facility to the west of Leppington station. The project was being managed by the Transport Construction Authority<sup>20</sup> (formerly the Transport Infrastructure Development Corporation and now subsumed into Transport for NSW).

This project was designed to connect Sydney's new South-West Growth Centre with the heavy rail network. Although touted as an example of the NSW Government finally "getting the message" that adequate public transport connections should be delivered at the same time as new housing developments, this project was repeatedly deferred and its cost escalated.

The South West Rail Link was originally part of the Metropolitan Rail Expansion Program (MREP) proposed by NSW Premier Bob Carr in 2005, along with the North West Rail Link and the CBD rail link. The three projects were to be integrated into a single operational sector, with trains from the south west running to the north west via the CBD Link. The other two components of the MREP were cancelled in 2008, but the South West Rail Link remained on the government's agenda. It was costed at \$600 million<sup>21</sup>.

In March 2008, the NSW Premier Morris Iemma indicated that construction would begin in 2009, with completion scheduled for 2012. By October of that year the government had decided that delivery of the project would be divided into two stages. Stage one would comprise preliminary work around Glenfield railway station, and stage two would comprise the actual extension of the rail network to Leppington; stage two was deferred due to budget cuts. On 14 November 2009, the New South Wales Premier Nathan Rees announced that construction of stage two of the South West Rail Link would begin in mid-2010, with completion scheduled for 2016.

When last announced by the NSW government the project cost was given as \$2.1 billion. The line was to have been just 13 km long, double-track, over unchallenging terrain with two new stations, a stabling yard, reconstruction of a third existing station (Glenfield) and connections to the existing

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19 [http://en.wikipedia.org/wiki/South\\_West\\_railway\\_line,\\_Sydney](http://en.wikipedia.org/wiki/South_West_railway_line,_Sydney)

20 <http://www.tca.nsw.gov.au>

21 <http://www.aquenta.com.au/project-profiles/transport-projects/south-west-rail-link>

network. There were no tunnels or major water-crossings.

The project is being built in two stages. As outlined in footnote 19, Stage 1 involves preliminary work to support the new line. It is centred around Glenfield station and includes:

- A ground-level car park at Seddon Park on the eastern side of the station.
- A multi-storey car park on the western side of the station.
- The northern rail flyover. This replaces the flat junction between the Main South line and the East Hills line with a grade-separated junction.
- An upgrade of Glenfield railway station including a new overhead concourse to replace the existing footbridge, and construction of a new platform.
- A bus interchange.

Stage 2 includes extending the railway line westward towards Leppington. This involves:

- A rail flyover on the south side of Glenfield railway station which will take the new line over the Main South line and the Southern Sydney Freight Line.
- 11.4 kilometres of new double track from Glenfield to Leppington.
- A new station and car park at Edmondson Park.
- A new station and car park at Leppington.
- A new train stabling facility to the west of Leppington with a capacity of 20 8-car trainsets.

The line's final estimated cost per kilometre was, therefore, nearly \$184 million.

It is instructive to compare this with the final cost for Perth's Mandurah line which is five and a half times as long.

The Mandurah line cost the WA taxpayer \$1.22 billion – almost half the cost of Sydney's South-West Rail Link estimate. The Mandurah Line<sup>22</sup> is 72 kilometres long and traverses similarly unchallenging terrain for much of its route. It has 11 stations. Two of these are underground, and the construction of the Perth station platforms was a major undertaking involving the excavation of most of a city block. The above-ground stations feature integrated bus interchanges and most have hundreds of park-and-ride spaces. There are two major water-crossings, over a kilometre of tunnel under the city, connections to the Northern Line and a stabling yard.

**The per-kilometre cost for the Mandurah Line was \$17 million per kilometre – almost one tenth of the final NSW estimate.**

While Perth's sand plain geology is different to Western Sydney's, earth-moving costs could only account for a small proportion of such an enormous per-kilometre cost difference. We are also aware that in Sydney the planned connections to the existing network were complex, but, bearing in mind the engineering challenges faced in Perth, sufficient allowance for technical difficulty and complexity has been factored into the estimated per kilometre cost.

We note that at the time of the Mandurah Line's opening some news reports gave the cost as \$1.63 billion. However, this figure included two minor extensions to other parts of the Perth system, a large rolling-stock acquisition and other minor improvements, leaving the final cost of the line at \$1.22 billion.

It should also be noted that during the 48 months of the project's construction, the cost of steel

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<sup>22</sup> [http://en.wikipedia.org/wiki/Mandurah\\_railway\\_line](http://en.wikipedia.org/wiki/Mandurah_railway_line)

nearly doubled, the mining boom drew technical skills out of Perth and a protracted industrial dispute delayed work. As a result of these difficulties the final cost of the line includes a \$250 million over-run. (A legal claim by Leighton Contractors, the builders of the Perth CBD section track, for \$60 million in compensation for unexpected difficulties in construction resulted in the Federal court awarding \$8 million. The current Liberal WA government subsequently agreed to pay Leighton an additional \$43.675 million.)

On the evidence of this comparison, if Sydney's proposed South-West Rail Link had been constructed for the WA Government, it would have cost under \$230m.

It is also instructive to note that the South-West Rail Link estimate is more than the \$1.8 billion paid for Sydney's M7<sup>23</sup> motorway which is over 40 km of continuously reinforced concrete (CRCP) and asphalt roads, with over 90 bridges (of four different types) and off-ramps, and the enormous Light Horse Interchange. This project traversed the same geological environment as the South-West Rail Link and involved more earth-moving per kilometre.

## **The Parramatta-Epping Link**

The Parramatta-Epping link (an integral section of the Parramatta-Chatswood Line indefinitely deferred by NSW Transport Minister Michael Costa in 2003) was to have been slightly over 11 kilometres long. Five kilometres were on the surface, along the route of the existing single-track Carlingford Line, and this section required some earth works to accommodate double track. The rest of the project consisted of a total of 6 km of tunnelling in two sections. It was last costed at \$2.2 billion.

What should it really have cost? It is possible to arrive at a rough (and generous) estimate. Assume that the existing surface track, with its wiring, signals and bridges was completely replaced with new double track and all necessary fittings. On the evidence of the Mandurah Line's \$17 million per km (which included significant engineering challenges and incurred a 25% cost over-run) this section should cost no more than \$100 million.

The cost of tunnelled sections can be reasonably estimated by looking at two comparable Sydney projects and by assuming that the costs for these were not excessive. The Airport Line (four years in construction) came in at around \$800 million 11 years ago. There are five stations on this line and construction involved state-of-the-art engineering through sand using a specially imported tunnel-boring machine for 6km. This project was 8 km long, so a cost of \$100 million per km would seem robust.

More recently, the North-West Rail Link, Stage 1, from Epping to Castle Hill, was costed at \$660 million in November 2006. This was to have been a conventional heavy rail link (not to be confused with the short-lived North-West Metro proposal). Curiously, the then Transport Infrastructure Development Corporation's estimate for that section of the North-West Link was in line with international norms. This section of the project was to have been 9 km long, all in tunnel, with three stations. At \$73 million per kilometre it would have been rather cheaper than the earlier (and more technically difficult) Airport Line, but to be conservative we shall use the Airport Line's \$100 million per km in calculating a reasonable cost for the tunnelled sections of the Parramatta-Epping connection.

We are aware that a two-level underground rail-bus interchange at Parramatta Station was a feature of the Parramatta-Epping link, however the Airport Line, which we have specifically used as a cost comparison, featured four major underground stations, including the Domestic Terminal station

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23 [http://en.wikipedia.org/wiki/Westlink\\_M7](http://en.wikipedia.org/wiki/Westlink_M7)

whose construction was especially challenging and involved a major cost over-run, so an allowance for this component and underground platforms at Epping is, in effect, built into the comparison.

On this basis, total cost for tunnelling for the Parramatta-Epping link would be \$600 million. Add the generous \$100 million for the surface section and one ends up with a total of \$700 million for the whole project. The TIDC estimate was over three times this figure.

## The Metro West Proposal

The Metro West proposal<sup>24</sup> (Parramatta to Central) was submitted to Infrastructure Australia for federal funding with an estimated total cost of \$8.1 billion.

In spite of having been submitted for Infrastructure Australia's consideration, this project was only in the very early stages of planning when the cost estimate was made, and it is unclear how such a precise estimate could have been arrived at. Nevertheless, sufficient of the project's details were already in the public domain for its basic outline to have been clear. All in tunnel, the Metro West would have been about 23 km long with 11 stations. **On the evidence of the Airport line this should cost a maximum of around \$2.3 billion (not including rolling stock), but the official estimate was three and a half times higher.** Even if rolling stock was included in the TIDC estimate, it should have totalled no more than \$3 billion.

The project<sup>25</sup> has now been withdrawn.

## The effect of cost overestimates on benefit-cost analyses

Had the estimates for these three projects (there are, of course, others we have not analysed) been merely 30% higher than for comparable projects – either actually built or properly estimated – the excess might be legitimately explainable by regional differences in materials, geology, labour costs, land acquisition (where applicable) and the like, but such a rationalisation evaporates at 100% higher, becomes absurd at 200% and beyond 300% is inexplicable and scandalous.

Absurdly high estimates such as those listed above skew the benefit-cost ratios for rail projects with the result that they are indefinitely deferred, typically in favour of motorway projects. This seriously corrupts the planning process and inhibits the introduction of necessary public transport infrastructure at a time when global oil production has gone into decline, per-capita car use is falling dramatically, there's enormous pressure on existing public transport, and vast areas of Sydney are effectively without any public transport at all.

In the alternative, if over-estimated projects are in fact funded, the Australian taxpayer and NSW residents will be paying at least three times as much as they should be for much-needed infrastructure.

## Tunnelling costs in Europe: the Gotthard Base Tunnel case

With tunnelling completed and fit-out for high-speed rail underway, the Gotthard Base Tunnel<sup>26</sup> is, at 57 km, the longest in the world. It runs under the Swiss Alps between Berne and Valais. It is actually twin 9.5m diameter tunnels, so the total length of rail tunnel is about 114 km, but there are also 38 km of access tunnels, plus crossover chambers and two large emergency evacuation stations.

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24 [http://majorprojects.planning.nsw.gov.au/index.pl?action=view\\_job&job\\_id=3437](http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=3437)

25 [http://en.wikipedia.org/wiki/West\\_Metro](http://en.wikipedia.org/wiki/West_Metro)

26 <http://www.alptransit.ch/en/>

Because the twin tunnels will be used by high-speed trains travelling at 250 km/h they can each carry only one track, but being around the same diameter as Sydney's Airport Line tunnel they could easily accommodate two conventional standard gauge suburban rail tracks.

The Gotthard Base Tunnel is a vastly more challenging undertaking than, for example, the North-West Rail Link. Final cost after complete fit-out is expected to be \$10.2 billion. This means a per-kilometre equivalent for a single 9.5m tunnel cost of \$90m per km. In other words, if the Swiss were building the tunnelled section of the North-West Rail Link, and if it featured a single bored tunnel carrying two tracks, the project would come in for much less than \$2 billion.

It is, of course, the case that twin bored tunnels, each of smaller diameter is the proposed construction method for the North West Rail Link, but this would not radically increase the per kilometre cost. Nor would it would not move the cost into the realm of the \$7 billion now being put forward as the estimated cost of the entire project.

The printed copy of our submission provided to the committee includes a DVD of the popular science series "Big, Bigger, Biggest." One of the episodes was based on the Gotthard Base Tunnel. While non-technical in nature, the episode provides a helpful overview of many of the difficulties the project had to deal with.

In particular it debunks the ill-informed suggestion that tunnelling presented little difficulty because the tunnelling medium was granite. In fact, the geology encountered by the project was quite varied, and in some sections, the material had similar properties to the sand and sediment the Airport Rail Line tunnellers had to deal with. This increased the complexity and the cost of tunnelling.

## **Expanding the Barcelona Metro**

Barcelona is presently expanding its (tunnelled) metro system<sup>27</sup>. In ten years time, Barcelona will have built 48km of new metro lines costing €6.5 billion (AU\$8.7 billion according to today's exchange rate), or \$181 million per kilometre. For AU\$8.7 billion, the city will be getting 52 stations, 20 of which will include transfers. The large number of stations accounts for the cost of AU\$181 million per kilometre.

As outlined in footnote 27, in June 2010, Barcelona opened the first shared segment of the L9 and L10 lines. Both are being constructed as part of a unified program that will increase the metro system's size by a third, providing a new north-south circumferential corridor west of the city centre, access to northern neighbourhoods, a connection to the new high-speed rail station at La Sagrera, and direct links to both the airport and the port to the south. The first segment of L9 opened in December 2009 and the first section of L10 in April 2010. The southern links will be completed in 2012, with the full program in service in 2014.

Because of Barcelona's already very dense metro network, the line has been built below existing lines. Tunnel boring machines, which Spain specialises in, were used for the entire underground path (the line includes a few miles above ground on viaducts).

## **Expanding rail services in the Paris region**

In 2011, French transport authorities and the Île-de-France region (which includes Paris) gained planning and financing approval to proceed with the Grand Paris Express<sup>28</sup>, the largest metro expansion in Europe and one of the largest presently under development. The project will

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27 <http://www.thetransportpolitic.com/2010/06/29/barcelonas-metro-continues-its-expansion-at-a-relatively-cheap-price/>

28 <http://www.thetransportpolitic.com/2011/05/27/paris-region-moves-ahead-with-125-miles-of-new-metro-lines/>

incorporate extensions to several different rail transport modes: metro, suburban rail, tramway and regional rail.

Altogether, officials plan to invest €20.5 billion (AU\$27.5 billion) on 200 kilometres of rapid transit lines, most of which will be completed by 2025. That represents a per kilometre cost of AU\$137 million.

In order to complete the project by 2025, up to eight tunnel boring machines are expected to be in use in parallel. In total, 57 stations are to be built, 44 of which will provide transfers to the existing system and seven of which will offer links to the high-speed TGV rail network.

## **Estimate for Melbourne-Brisbane Inland Rail Alignment tunnels**

A detailed 2008 cost-assessment for a proposed inland rail line<sup>29</sup> from Melbourne to Brisbane, developed by consultants Parsons Brinkerhoff, Connell Wagner and Halcroft for the Australian Rail Track Corporation settled on a standard estimate of \$55m per km for 9.3m diameter tunnel construction. The estimate was based on recent Australian experience. Conservatively, the consultants assumed that tunnels would have to be lined because of poor geological conditions.

The estimate did not include fit-out, track laying, signalling and power supply. It is clear that track-laying would add not more than \$5m (and more likely \$1-3m) per track kilometre to the basic tunnel price.

Of course this estimate does not include the construction of stations which would be a feature of an underground suburban railway but it makes clear that a robust rule-of-thumb for a fitted-out two-track rail tunnel is \$100m per kilometre or less.

## **Additional recommendations**

**Recommendation:** That Mr Peter Martinovic, Director of Infrastructure Planning and Land Services of Western Australia's Public Transport Authority is called to provide evidence and advice to the inquiry.

Mr Martinovic, as Principal Engineer Planning and Permanent Way, led the team that developed the route for the Perth-Mandurah Railway as gazetted in Perth's Metropolitan Region Scheme (MRS) in December 1994. During 1997 he led the team that developed the three Master Plans that secured funding and underpinned the construction of the Mandurah Line. As Deputy Project Director of MetroRail from 2001 to 2007 he saw through the successful completion of the project.

As someone deeply involved in the process, Mr Martinovic would be able to provide valuable insights into the factors that underpinned the WA government's success in designing, constructing and delivering a large, complex rail project at a cost substantially below that of comparable rail projects in NSW.

**Recommendation:** That the inquiry examines the basis on which the NSW Government concluded that the extension of the light rail service from Lilyfield to Dulwich Hill will cost \$176 million dollars and that completion will take until 2014.

This is particularly apposite given that the costs of commissioning the existing sections of the light rail service are publicly known, and the extension from Lilyfield to Dulwich Hill has the same

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29 <http://www.artc.com.au/library/IRAS%20WP3%20Stage%201%20Capital%20Works%20Costings%20090505.pdf>



engineering requirements (stop construction, overhead wiring, signalling and electricity supply) as the extension from Wentworth Park to Lilyfield, and will be undertaken by the same operator.

The facts are these:

- The 5.5 kilometre rail line between Lilyfield and Dulwich Hill is presently unused and in September 2010, was completely refurbished. Ballast was renewed, and every wooden sleeper was replaced with a concrete one. New track was laid. Work was done to a higher build quality than the standard required by ARTC to carry rail freight between Melbourne and Sydney.
- The track will require little or no maintenance in the years to come.
- The first 3.6km of the light rail service from Central to Wentworth Park cost \$65m in 1997 \$21.5m of the \$65m came from the Commonwealth Better Cities program.
- The extension (3km) from Wentworth Park to Lilyfield came in at \$20m of which the NSW government paid \$16m (in year 2000 prices). Therefore the cost was less than \$7 million per kilometre. That cost included 4 stops, all overhead wiring, signals and minimal but entirely adequate track refurbishment.

It is worth quoting from the article "What's stopping the light rail? An old piece of paper" that appeared in the 17 September 2011 edition of the Sydney Morning Herald<sup>30</sup> regarding the extension:

And the company was also given exclusive rights to add to the Central to Lilyfield light-rail line for the next 30 years.

The Transport Minister, Gladys Berejiklian, confirmed this week that this meant the company was paying for the extension to Dulwich Hill.

"As part of the current agreement with Metro Transport Sydney, MTS will finance the costs associated with the design, construction and operation of the inner-west extension, including the procurement of the required rolling stock," Ms Berejiklian said.

She said the company's costs would be repaid by the government over the term of the contract. That contract goes for at least another 13 years.

It remains unclear then why, if MTS is responsible for procuring the extension from Lilyfield to Dulwich Hill, the government is asserting it cannot be finished until 2014.

EcoTransit Sydney shares the Herald's puzzlement at the cost and the delay. On what possible basis, therefore, could the NSW Government arrive at a figure of \$176 million for the extension? Adding \$25 million for the cost of the already completed total refurbishment of 5.5 km twin rail track to the \$176 million estimate gives a round figure of \$201 million or approximately \$36 million per double track kilometre. This is four times higher than the actual per-kilometre cost of the 3 km extension from Wentworth Park to Lilyfield adjusted for inflation.

The inquiry should satisfy itself that such an inflated figure was not arrived at in order to radically skew the benefit-cost ratio and justify the deferral of the project. It should require that Transport for NSW and Treasury table the documents showing the assumptions and cost estimations used to arrive at the \$176 million figure and require testimony under oath from the officials who prepared the estimate.

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30 <http://www.smh.com.au/nsw/whats-stopping-the-light-rail-an-old-piece-of-paper-20110916-1kdv7.html>