A Submission in Response to

THE SYDNEY CBD SOUTH EAST LIGHT RAIL (CSELR): MODIFICATIONS REPORT

By

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Greg Sutherland –

- holds degrees in Electrical Engineering and Arts (majors in Physics and History) from Sydney University.

- is a Fellow of the Institution of Engineers, Australia and Member of the Australian Institute of Management.

- has extensive experience in Transport and Logistics and the design, operation and maintenance of large facilities operating 24/7.

- has held positions at senior level in the NSW state public sector including major technical, management and policy roles.

- is the author of the NSW Transport Department's publication "Light Rail: Its Evolution and Potential for NSW" (ISNN 1037-6305).

- has served as a Senior Transport Adviser to a former NSW Minister for Transport.

- has a significant knowledge of current light rail practice based on ongoing contacts with experienced light rail professional practitioners both in Australia and Overseas and an extensive program of international visits and local discussions extending over a considerable period. Cities and tramway/light rail systems covered include:

  Adelaide, Barcelona, Basel, Bergen, Berlin, Bern, Bonn, Bordeaux, Boston, Bratislava, Bremen, Brest, Brno, Brussels, Charlotte, Calgary, Chicago. Dallas, Denver, Dijon, Dortmund, Dresden, Dublin, Dusseldorf, Edinburgh, Edmonton, Frankfurt, Geneva, Goteborg, Graz, Grenoble, Hanover, Helsinki, Houston, Innsbruck, Karlsruhe, Koln, Kosice, Le Havre, Le Mans, Leipzig, Linz, Lisbon, London (Croydon), Los Angeles, Lyon, Marseille, Melbourne, Memphis, Milan, Minneapolis, Montpellier, Mulhouse, Munich, Nantes, New Orleans, Nice, Norfolk, Norrkoping, Nurnberg, Orleans, Oslo, Paris, Phoenix, Portland, Porto, Potsdam, Prague, Salt Lake City, San Diego, San Francisco, San Jose, Seattle, St Louis, Stockholm, Strasbourg, Stuttgart, Tampa, Tacoma, Toronto, Trondheim, Vienna, Zurich.

- is a long standing Director of the Sydney Tramway Museum. (The Museum is Australia's largest and ranks in the top 10% of Tramway Museums worldwide.) He was the Project Manager responsible for the successful conversion of the Royal National Park railway line to an operating tram line subsequent to the NSW Railways ceasing services on this branch line.

Preamble

The Author of this submission has previously made a Submission in Response to the Sydney CBD South East Light Rail (CSELR): Environmental Impact Statement.

The full version of this Submission can be viewed at

http://majorprojects.planning.nsw.gov.au/?action=view_submission&job_id=6042&submission_id=89887

It is also described as Submission No. 259 in the Submissions Report prepared by Parsons Brinckerhoff and issued by TfNSW - Submissions Report incorporating Preferred Infrastructure Report. This Submission Report can be viewed at

https://majorprojects.affinitylive.com/public/a09c6493c9ae47720ca17be3fcaf1556/Submissions%20Report%20incorporating%20Preferred%20Infrastructure%20Report_Volume%201_Part%20A.pdf

Contents

Executive Summary

There is little doubt that there is strong community and business support for the construction of the CSELR with the project being seen as an essential component of Sydney's future public transit infrastructure.

The author of this submission is pleased to place on record his support for the CSELR project and to commend Minister Berejiklian and the NSW Government for initiating and progressing its development.

Without an effective and efficient CSELR Sydney will be unable to maintain its pre-eminence in public transport infrastructure and service in Australia. This means that it is imperative that the best possible and most cost effective outcomes are achieved throughout the project.

The Recommendations in the following pages are aimed at addressing the issues outlined above and improving operational robustness. Their implementation will contribute in a positive way to the environmental impact of the CSELR. They are strongly commended.

Recommendations

That the NSW Government established an independent light rail oversight group, selected by the government rather than the bureaucracy, to oversight the CSELR Project. Page 11

That the proposal to remove the World Square stop be rejected unless:

TfNSW can provide evidence that it has contacted The Physical Disability Council of NSW, and discussed options with the Council based on the above examples relating to Disability stops in streets with a gradient and has proved to the satisfaction of the Physical Disability Council that there is no other option but to remove the World Square stop, and

TfNSW can provide publically available documentation justifying its claim that the stop patronage is and will, in the future, not be sufficient to justify a stop at the World Square location. Page 19

In the light of the considerable additional costs involved in the implementation of the APS system,(some $150 million plus,) that any decision or recommendation involving the provision of APS by NSW Government agencies be deferred until a proper evaluation of the proposed power supply is undertaken. Given the specialist nature of such an evaluation a European consultancy with a proven record of LR system power supply and aesthetics should be engaged to undertake a design and pricing benchmarking exercise. Page 28

That, to ensure maximum positive environmental benefits, it be a condition of approval that grassed trackform be the preferred application in the Centennial Parklands, Randwick Racecourse, Moore Park and similar CSELR traversed areas. Page 33

That to ensure maximum environmental benefits with respect to appearance and safety a condition attached to the approval of the CSELR proposal be that the Over Head supply be single contact wire and that the more aesthetically acceptable European style of Overhead Design be adopted as the CSELR System Standard. The proposal not to affix OHW fixtures to existing structures along the route of the CSELR proposal should be rejected. Page 33

Given that the announced Preferred Bidder for the CSELR project has strong European (French and Spanish) experience TfNSW should draw upon this experience in setting the 'guidelines and standards' for the CSELR. Page 33

Figures

Getting it right? Or Spinning Away Valid Concerns

In my submission of response to the Sydney CBD South East Light Rail (CSELR) Environmental Impact Statement I drew attention, inter alia, to concerns relating to an insufficient level of relevant light rail expertise being provided by and within TfNSW and their consultants.

In response, consultants Parsons Brinckerhoff, stated in the CSELR Submissions Report:

"Construction planning for CSELR has drawn on the best expertise available in Australia and overseas in the development of light rail systems. This would be a key consideration in selection of the contractor to construct the project." (5.6.3),
and
"Transport for NSW has established a proposal team with direct light rail, rail and transport infrastructure expertise to procure and deliver the CSELR proposal. This approach has established a mixture of local and international experience that leverages lessons learnt and has created a highly capable and informed proposal team" (5.6.4)

Given this alleged level of expertise it is highly surprising that the Light Rail Submissions Report incorporates continued references to the Overhead Contact System (OCS) as "Catenary" (a version of OCS which incorporates multiple above ground wires incorporating a catenary construction form usually associated with heavy rail installations) rather than acknowledge that the majority of well designed light rail systems use a single wire for OCS. It is noted that the Modifications Report, now and belatedly given the time the incorrect terminology has been in use, refers to the overhead system as 'OHW'.

The following figures show catenary OCS in San Diego, USA and single wire OCS in Brest, France.

Figure 1 San Diego, USA Catenary Overhead

Figure 2 Brest, France Single Wire Overhead

The Modifications Report introduces the proposed use of Alstom's APS power supply in lieu of an on-board power supply system for the wire free area, Further technical comment will be made later in this submission but at this juncture the following should be noted.

The Report refers to APS as "Aesthetic Power Solution". The correct, and industry recognised definition, based on the original design and installation, for APS is the French term 'Alimentation par le Sol' (which translated into English becomes Ground Level Power Supply).

Note there is no reference to aesthetics but to quote a UK commentator on "Aesthetic Power Solution":
"That's a very slick marketing trick... sounds like the sort of thing an estate agent would do to try and make an unfashionable locality sound nicer."

Even the 2014 Alstom product catalogue refers to Ground Level Power Supply, see:

http://www.alstom.com/products-services/product-catalogue/rail-systems/Infrastructures/products/aps-ground-level-power-supply/

(It should be noted that pages 4, 5 and 6 of the catalogue have been photo shopped and are not real life examples.)

Another glaring error in the Modifications Report is the statement

"This type of power supply represents proven technology and has been installed in a number of light rail systems within Europe, including Bordeaux and Nice" (section 3.9.2).

It can be categorically stated that there is no APS installation in Nice, as can be seen in the following figure.

Figure 3 Nice, France Wire Free Area (note absence of APS third rail)

Despite the claims "*Construction planning for CSELR has drawn on the best expertise available in Australia and overseas in the development of light rail systems" and "Transport for NSW has established a proposal team with direct light rail, rail and transport infrastructure expertise to procure and deliver the CSELR proposal. This approach has established a mixture of local and international experience that leverages lessons learnt and has created a highly capable and informed proposal team"* the numerous errors and deficiencies contained in the TfNSW Response to Submissions Report and subsequently in the Modifications Report indicate that there is an ongoing need for an independent light rail oversight group selected by the government, rather than the bureaucracy, to be established to oversight the CSELR Project.

Recommendation:

That the NSW Government established an independent light rail oversight group, selected by the government rather than the bureaucracy, to oversight the CSELR Project. **Page xx**

Removal of World Square stop

It is a matter of considerable concern that the CSELR consultants are attempting to justify the removal of a stop at World Square due to an inability to meet Disability Compliance.

"In addition, the gradient of George Street at the proposed location of the approved World Square stop requires substantial street regrading to accommodate a fully Disability Discrimination Act 1992 (DDA) compliant stop. This includes the need to raise the Liverpool Street and George Street intersection and other changes to the existing level of the local road network including a number of retaining walls". 3.4.2

Included in my submission of response to the CSELR Environmental Impact Statement I quoted the need for the adoption of suitable standards to be applied to the CSELR. In particular my submission stated:

(Begin quote)

"For examples DDA Tram Stops

The following comments are included in the EIS documentation:

Chapter 5 –World Square Stop

p5.28

World Square stop

The World Square stop would be located to the north of Liverpool Street servicing the cinema entertainment and retail precinct, the northern section of Chinatown, and the World Square complex of restaurants, commercial towers and residential apartments.

The World Square stop would consist of a single, approximately 4.4-metre wide, 45-metre long central island platform within the centre of George Street, approximately 20 metres to the north of the intersection of George Street and Liverpool Street. The existing pedestrian crossings of George Street at Liverpool Street and Central Street (to the north of the proposed stop) would be maintained as part of the design of the stop, to allow pedestrians to access the island platform.

The existing street gradient means that street regrading would be necessary to accommodate a fully DDA compliant stop. The light rail tracks would be raised at the Liverpool Street and George Street intersection, to minimise the extent of cut into the existing road level. The island platform and tracks would be at an approximately 2.5 per cent gradient, would be cut into the existing road level up to approximately 330 millimetres, then tie back into existing street levels.

Northbound and southbound traffic lanes adjacent the stop would remain at their existing levels, and traffic barriers would be provided to maintain safe conditions for vehicles and pedestrians.

The compliers of the EIS should have been aware of the following (from the public record on the internet):

Client Design Requirements for Accessible Tram Stops

http://ptv.vic.gov.au/assets/PTV/PTV%20docs/Client%20Design%20Requirements/ClientDesignRequirements-TRAM-Dec2010.pdf"

(End quote)

Rather than adhere to an approach to the question of the street gradient based on sensible design it would appear that once again a heavy rail based and inflexible approach has been maintained by the consultants with scant regard being paid to the needs of persons with a disability who wish to utilise the CSELR.

By way of contrast the following extract from the Victorian Client Design Requirements for Accessible Tram Stops should be noted.

6.3 Ramps, Walkways and Landings

The longitudinal grade of the platform tram stop should generally be level but the context of the tram stop in the roadway may impose local grading issues. Melbourne trams rarely operate on grades more than 6 per cent (1 in 16.7). Platform tram stops have been developed with longitudinal grades for some sections up to 5 per cent (1 in 20) without evident problem or complaint.

It should also be placed on record that the Victorian Client Design Requirements for Accessible Tram Stops state:

EXCEPTIONS
Where space is not available to meet the minimum DSAPT requirements, an Exception process applies and the issue shall be referred to the Department of Public Transport (DOT) for consideration and approval. The Department may accept a proposal that does not meet DSAPT requirements only in certain circumstances. (1.0 Application)

Both Collins and Bourke Streets in the Melbourne CBD have numerous newly installed Accessible stops located on street gradients as does suburban Melbourne. In numerous countries modern tram/LRV stops provide Disability Access as a matter of course.

The following figures provide local and international examples:

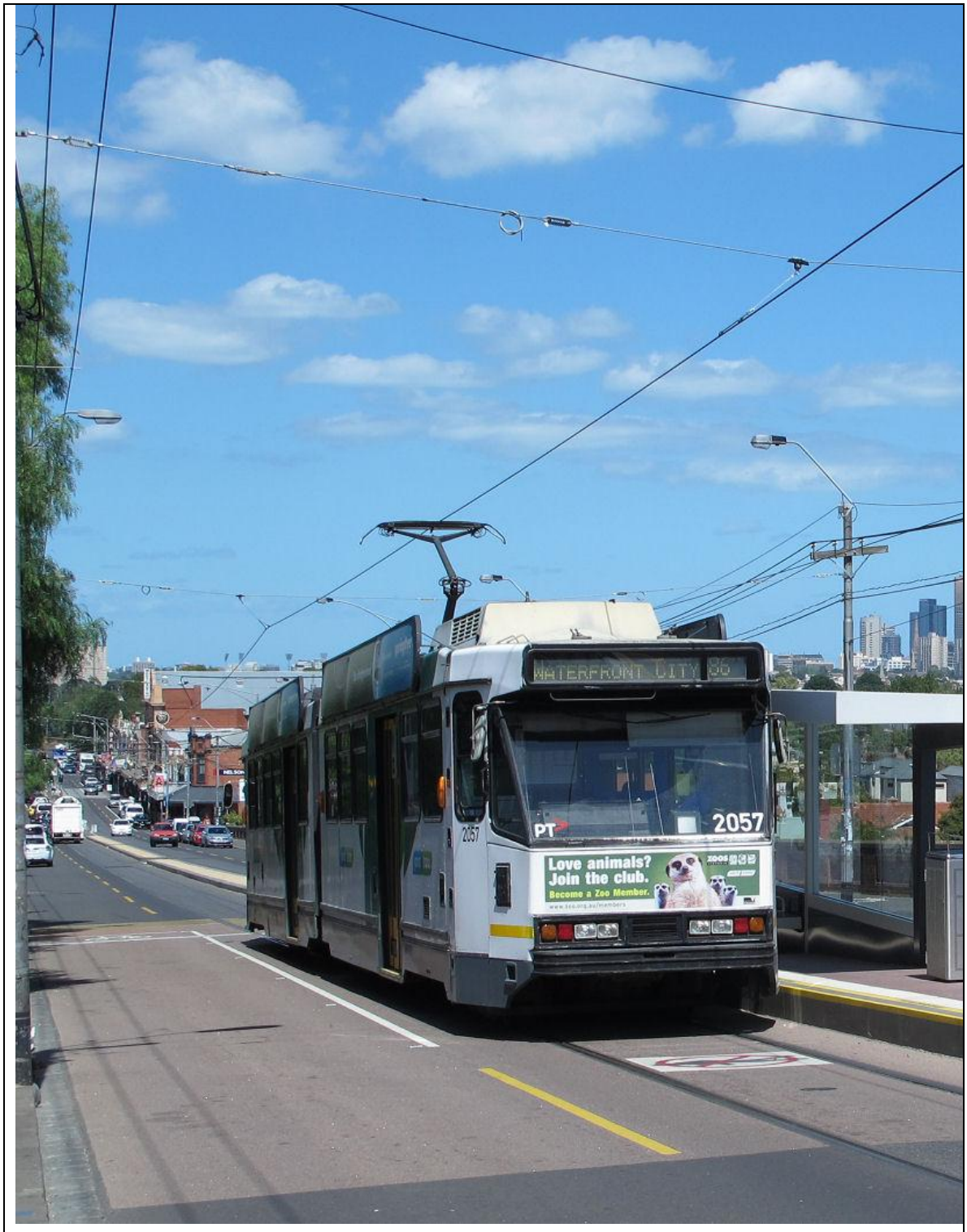

Figure 4 High Street, Melbourne (Mal Rowe photo(

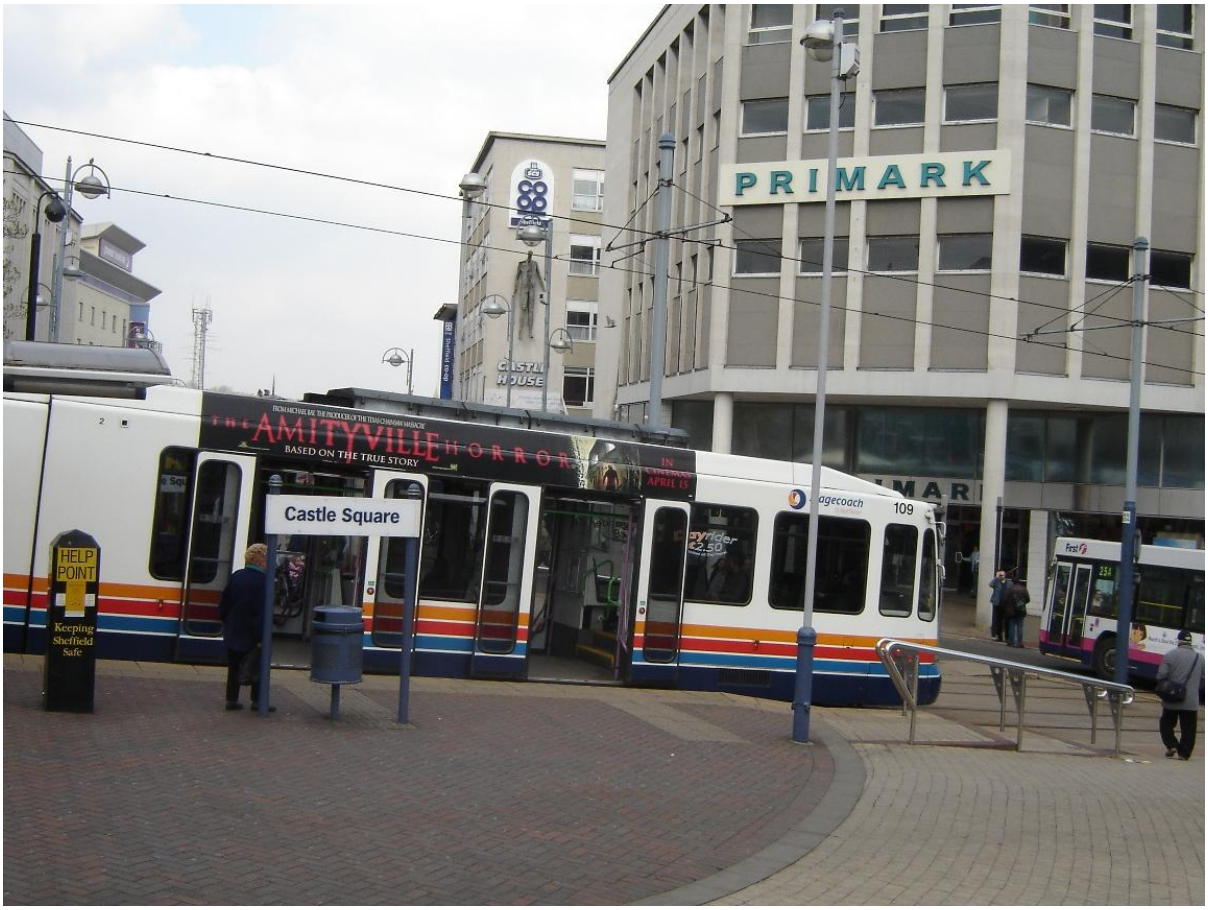

Figure 5 Sheffield, UK Castle Square stop (John Gilmour photo)

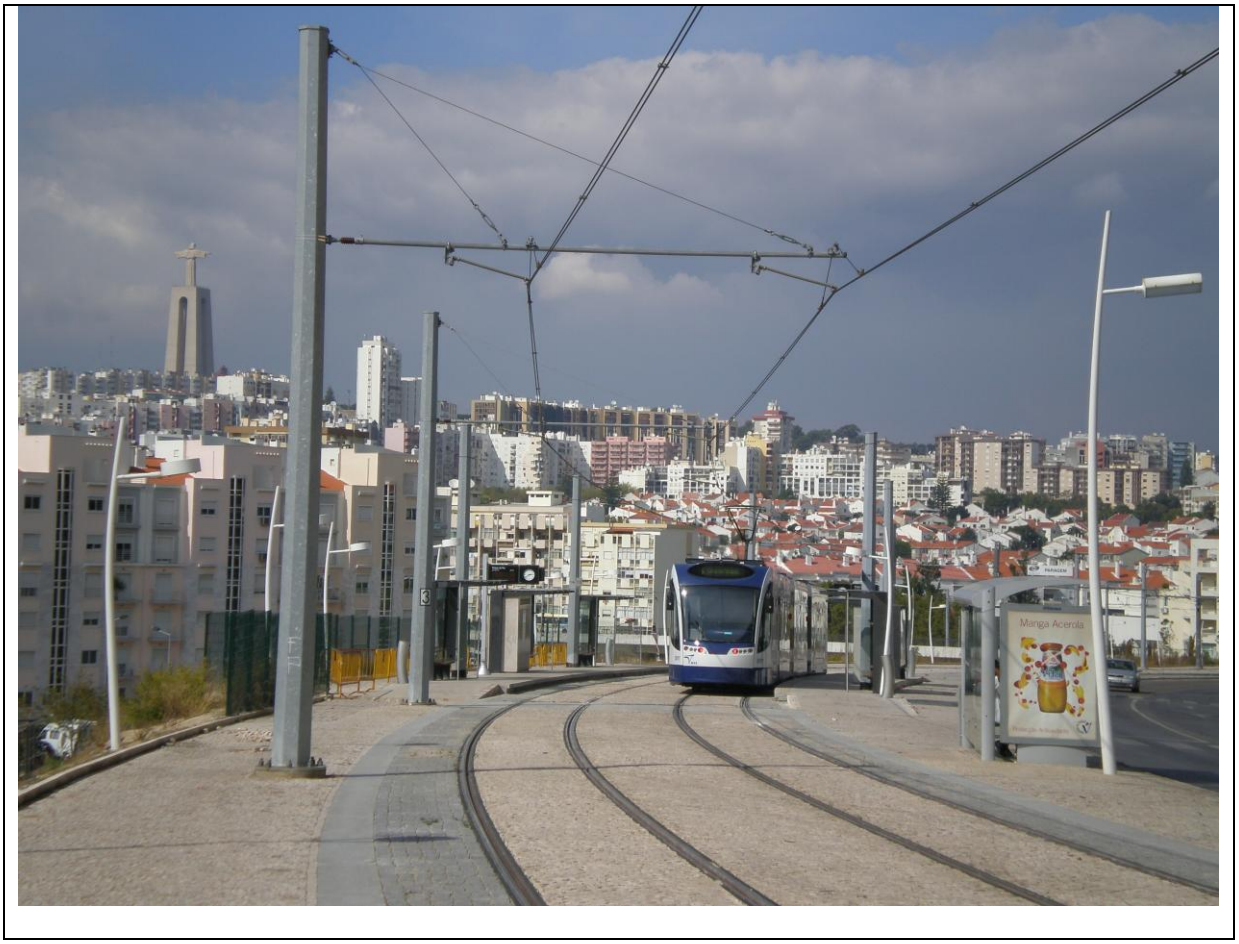

Figure 6 Parque da Paz stop Lisbon, Portugal (curve and grade) (Owen Brison photo)

See also an example in Brest, France as shown in Figure 2, earlier in this submission.

Why can't this be done in George Street?

Given that the question of Disability Access is of worldwide concern I sought comment from an American professional transit engineer, himself a person with a disability, who has been involved over a considerable time with the formal preparation of relevant US legislation.

This is the response I received

"For light rail USA ADA regulations do not require levelling beyond the natural grade if it is not readily achievable. They do not appear to understand "tram" which is not unusual and are thinking heavy rail or Regional Rail.

So they are off base, as long as the tram will interface with the platform safely and in an accessible manner (ie the ramp self levels to the ground and is not raised up on one corner, unlikely with most designs)

I am not familiar with the ins and outs of Australian law so cannot comment unless I have a chance to read them in their entirety and the background and precedents etc. but if low floor accessible buses can safely use the location and access to these buses is from the kerbside of the sidewalk (footpath), I can't see why trams cannot.

If this bus service is to be replaced by light rail this would actually mean a lesser service to people with a disability."

Given the serious issues outlined above it must be questioned as to whether TfNSW has sought advice or comment from an appropriate overall representative body such as the Physical Disability Council of NSW prior to issuing the Light Rail Modifications Report. If the answer is in the negative then the grounds for removal of the World Square stop are spurious.

In addition TfNSW's consultants contend:

Further investigation since the approval of the project has identified that the World Square stop would generate a lower patronage than the closest stops to the north and south (Town Hall stop is approximately 200 metres to the north and Chinatown stop is approximately 325 metres to the south).

The stop is therefore proposed to be removed as part of the modification to the approved project due to the low expected patronage, proximity to adjoining stops to the north and south (Town Hall stop and Chinatown stop respectively) and substantial engineering constraints. (3.4.2)

It should be noted that the removal of the World Square stop would create a distance between the Town Hall and Chinatown stops of 525 metres. In Dublin for the highly successful and well designed LUAS light rail the maximum distance between any two adjacent stops in the Dublin CBD is about 480 metres. Dublin is a much smaller city than Sydney with a much smaller population yet the proposed removal of the World Square stop due to alleged lower patronage is justified by 'investigations' which are not available for critical evaluation.

No reference (consideration?) is made to the fact that the section of George Street between the Town Hall and Chinatown is the steepest gradient in the transit corridor and the removal

of the World Square stop will require intending passengers, particularly those with disabilities, to undertake a 'challenging' trek particularly in inclement weather.

The absence of a World Square stop will also adversely impact on pedestrian movement along the already highly congested Cinema Strip and increase the already high level of congestion surrounding the Town Hall stop and Town Hall (Railway) station.

The area around the World Square site is also one of the few major redevelopment areas extant in the CBD. It is an ideal location for Transit Orientated Development and such development will add to the need for enhanced public transport. Has this scenario been considered in the patronage 'investigation'?

The proposed removal of the World Square stop is essentially based on two issues.

One the unproven claim by TfNSW that a Disability compliant stop cannot be constructed at this location. This is proven to be incorrect based on the foregoing Australian and International evidence. The removal would present an issue of unreasonable hardship for people with a disability access reaching a significant area within the CBD.

Second a claim, unsubstantiated by any hard evidence, that the stop is not and will not be required due to low patronage.

Overall it would not be reasonable to accept the overall proposal without demonstrated support.

Recommendation:

That the proposal to remove the World Square stop be rejected unless:

TfNSW can provide evidence that it has contacted The Physical Disability Council of NSW, and discussed options with the Council based on the above examples relating to Disability stops in streets with a gradient and has proved to the satisfaction of the Physical Disability Council that there is no other option but to remove the World Square stop, and

TfNSW can provide publically available documentation justifying its claim that the stop patronage is and will, in the future, not be sufficient to justify a stop at the World Square location.

Proposed use of Alstom's APS power

My submission in response to the CSELR EIS made detailed comments on the subject of Wire Free Operation. These can be found at pages 16 to 23 of the submission under reference.

The following extracts from the TfNSW consultant's documents provides the 'expert' Response to serious questions raised by numerous submissions in the EIS process:

"5.4.15 Catenary

Submissions expressed concern that the wire-free operation on George Street would add to the cost of vehicles and maintenance, detract from reliability, add additional weight to the LRVs and complicate the system. Some noted that overhead wires should span the CSELR system, with minimal support poles, and the wireless power proposal should be abandoned.

Response

Through consultation with City of Sydney, and in response to the George Street Concept Design (City of Sydney 2013a), the proposal includes wire-free running along the length of the proposed George Street pedestrian zone. This would minimise visual intrusion along one of Sydney's main streets, which includes a number of iconic buildings.

With regard to the extension of wire-free running to Circular Quay, this has been modified through further design development during the public exhibition. As a result, the wire-free zone within the CBD is now proposed between the Wynyard and Town Hall stops, with the section between Circular Quay and Wynyard stops powered by overhead wiring. Further detail and justification for this design change is included in section 6.3.2 of this Submissions Report.

There are a number of constraints to wire-free running along other sections of the alignment, including steep grades (e.g. on Devonshire Street and George Street south), the need for high speed running (e.g. through Moore Park) and the distance between charging points at stops, which make wire-free running either not feasible or not operationally efficient. For these reasons wire-free running would not be provided on all sections of the CSELR proposal. Further information on this issue is provided at section 4.5.3 of the EIS (Volume 1A).

Wire-free running in the in the George Street pedestrian zone is expected to be reliable, as within this section speeds would relatively low, gradients relatively flat and distances between stops relatively small, with charging of LRV batteries at each stop.

The design of the overhead wiring system, including pole configurations, would be further developed during detailed design and would take into account stakeholder views, operational requirements, best practice from other light rail systems, design and engineering constraints and environmental considerations. The CSELR proposal does not preclude the inclusion of additional wire-free sections should this be enabled by improvements in technology, or if proposed by the future Operator of the CSELR.

5.5.1 Power supply, catenary and wire-free technology

Submissions raising concerns around design of the CSELR power supply, including overhead wired and wire-free sections, and associated structures are summarised below.

• Centre poles, for example a central T-bar, should be used rather than poles on either side of the tracks.
• The design of the overhead supply should be a single contact wire and the more aesthetically acceptable European style of overhead design should be adopted.
• Opposes the proposal to not affix overhead wire fixtures to existing structures along the route.
• Consideration should be given to replicating the original 1890s design in locations where this would be appropriate for the streetscape.

Response

The power requirements of the CSELR have been assessed during development of the concept design including a design for the power supply system, comprising overhead wiring and wirefree technologies. Consideration of alternative technologies to supply power are discussed in section 4.5.3 of the EIS (Volume 1A) and section 5.4.15 of this Submissions Report.

The design of the CSELR power supply system, including overhead wiring pole configuration and wire-free power supply, has been developed in accordance with relevant guidelines and standards. The design would be further developed during detailed design and would take into account stakeholders views, operational requirements, best practice from other light rail systems, design and engineering constraints and environmental considerations.

Suggestions with regard to the design of the power supply system are noted and would be reviewed during detailed design."

Response (5.12.3)

Wire-free running is achieved by incorporating batteries and capacitors in each LRV for electricity storage with energy recovery through regenerative braking. Each LRV would be recharged at each stop through overhead charging units comprising a section of catenary for the length of the platform. Induction loop technology was also considered where the power cables are located underground and energy is supplied through magnetic induction. This

system was not adopted due to cost considerations and concerns regarding stray currents affecting utilities and underground structures.

Regarding the above it would not be unreasonable to draw the conclusion that the Responses would be an exercise in obfuscation worthy of inclusion in an episode of "Yes Minister".

Nevertheless it is worthy of note that the consultants now acknowledge in the Modifications Report the lack of practicality of battery and/or capacitor power supply systems they had originally proposed. This conclusion aligns with the findings of the Systra Report http://www.luascrosscity.ie/wp-ntent/uploads/2013/06/NA0004SystraReport.pdf referred to in my original submission (Page 17).

As a consequence the consultants are now proposing the use of the Alstom APS - 'Alimentation par le Sol' supply system (which translated into English becomes Ground Level Power Supply).

This is a better option than the consultant's original proposal but has major limitations which are discussed in the following section of this Submission.

Extent and Cost of Wire Free Power Supply

The extent of the proposed "Wire Free" section of the CESLR and its technical makeup has undergone a number of changes during recent times.

TfNSW's consultants current proposal for the power supply has now changed to the Alstom APS - 'Alimentation par le Sol' system or Ground Level Power Supply).

The extent of the "Wire Free" section in George Street as proposed in the TfNSW Submissions Report was proposed as Bathurst Street to Hunter Street.

This section was extended by action within the Department of Planning and Environment subsequent to the publication of the Submissions Report.

It is noted that the Department of Planning and Environment's Secretary's Environmental Assessment Report includes the following

Page 61

The Department also recommends that the Applicant minimise visual impacts of light rail infrastructure and hard landscaping elements, particularly overhead wiring. A design change made in the Preferred Infrastructure Report introduced catenary and supporting pole infrastructure between Circular Quay and Wynyard as it was stated that this would maximise the reliability of the service. This is in contrast to the EIS which showed this area as wire-free in recognition of the visual impacts of pole and wire infrastructure in the urbanscape of the CBD. Minimising visual clutter, particularly in the City Centre precinct is considered important in minimising impacts in this highly urbanised and significant area.

Sydney Harbour Foreshore Authority considers that given the significance of Circular Quay and its role as a gateway to Sydney Harbour, the introduction of catenary and associated poles would be detrimental to the future of this internationally iconic foreshore location and should be reconsidered.

The Department agrees and has recommended a condition of approval requiring that the section from Circular Quay to Wynyard and for the full extent of the pedestrian zone along George Street be wire free unless it can be fully demonstrated that catenary is required to maintain the reliability of the service

Table 3: Key issues raised by Councils

City of Sydney

- *wire-free pedestrianised section of George Street*

Table 16 – Visual Impacts from Preferred Infrastructure Report changes Precinct Changes to Visual Impact

City Centre Reducing the wire-free zone to between Wynyard and the Town Hall only. Overhead wiring and poles between Circular Quay and Wynyard would change the visual impact along Alfred Street (from a high beneficial impact to a moderate adverse visual impact) and along George Street to the northern extent of the pedestrianised area from a negligible impact to a moderate adverse visual impact.

This input from basically three sources, City of Sydney, Sydney Harbour Foreshore Authority and the staff of the Department of Planning and Environment resulted in the extension of the proposed and adopted extent of the "Wire Free" section of the CSESLR now encompassing Bathurst Street to Circular Quay.

Regarding, in particular, the City of Sydney's Response to the EIS page 37:
"6.0 Heritage Impacts
6.2 Impact on historic streetscapes and conservation areas
It is noted that pre-1960, the Light Rail route north of the intersection of Devonshire and Elizabeth Streets has previously held extensive tram tracks and associated infrastructure. Most of the listed heritage items along the route were built in a context of existing tramlines and catenary infrastructure."

The area referred to by the City of Sydney never had catenary infrastructure. All the OCS was single wire as was standard on the Sydney tramways.

A perusal of documentation from these three agencies reveals that they all incorporate continued references to the Overhead Contact System (OCS) as "Catenary". (See my earlier comments at page xx of this Submission.)

The Sydney Harbour Foreshore Authority's even goes to the extent of maintaining "*that given the significance of Circular Quay and its role as a gateway to Sydney Harbour, the introduction of catenary and associated poles would be detrimental to the future of this internationally iconic foreshore location and should be reconsidered*." A position supported by staff of the Department of Planning and Environment. Both these agencies appear to be unaware of or fail to appreciate that OCS single wire supply (not catenary) tramway power supply was a feature of the Circular Quay streetscape from the 1890s until the early 1960s.

Not only does this demonstrated lack of understanding of technical aspects of OCS raise the question of the credibility of the Secretary's Environmental Assessment Report regarding the decisions being made with regard to the wire-free zone it also calls into question the emotive language used to compare the alternatives as referred to in Table 16 and whether any reasonable evaluation of appropriate OCS designs was undertaken prior to the adoption of the requirement for a wire free power supply system from Bathurst Street to Circular Quay.

Now that TfNSW is proposing the use of APS it is of the utmost importance to consider the cost and operational implications of this proposal.

Many European professionals practicing in the light rail field have another, unofficial, definition of APS – Appallingly Pricey System

The cost parameters applying to APS using the little information publically available (It should be noted that Alstom internationally has gone to great pains to achieve total secrecy in this matter.) can be summarised to be as follows:

- Cost of track construction incorporating the APS third rail in the middle of the track -3 times the cost of conventional track. (Based on Construction Estimates).

- Cost of APS track side equipment is estimated to be $4M/km. (Based on figures quoted in the Systra Report).

- Additional cost per LRV for APS equipment $750,000. (Based on figures quoted in the Systra Report).

If we take into consideration the Bathurst to Circular Quay distance, 2 kilometres; the number of LRVs proposed – 30) and additional track construction costs associated with the APS track estimated at $60M/km, a budget figure can be determined for the addition of the APS.

Estimated additional cost to the CSELR project of TfNSW's APS proposal - $150 million!

Yet another glaring error in the Modifications Report, calling into question once again the expertise level of the Modifications Report is the statement:

APS is also considered to be one of the most available transmission power supply technologies, reducing the impacts of poor weather on system performance and providing light rail customers with greater reliability. (section 3.9.2).

While the semantics of the term "most available" could be debated it is simpler to turn to an authoriative report produced by professional electrical engineers well versed in transit power supply, the Systra report (previously referenced). To quote this report, which rebuts the weather and reliability contentions:

"4.5.2.1 Flooding
The APS power rail, like any power rail, cannot operate when it is covered by water, because such a situation would lead to current leak when the rail is powered up, and thus tripping of the circuit breaker protecting the traction power circuit.""

Sydney is well known for sub tropical storms and it is acknowledged by the City Council that flooding potential exists on the light rail route, notably at Alfred Street near Pitt Street (see p32 of the City of Sydney Response to the EIS). An admittedly extreme, but nevertheless real, example of trams operating in conditions which the APS could not cope with is shown in the following figure:

Figure 7 Rain in Castlereagh Street

The following quotations from the Systra report are also highly relevant, not only to the cost and reliability of the APS installation as proposed to be constructed, but for long term and ongoing costs associated with the commitment to a 'sole supplier'.

"For safety reasons, regenerative breaking is not possible when running with the APS system, thus energy efficiency is degraded by 15% to 20%.

It should be noted that on the French projects, the trams run most of the time on segregated rights-of-way, except at road intersections.

Beyond technical feasibility, contractual feasibility must also be determined.

APS has not been developed to be sold as a standalone product, however, but rather to provide Alstom a competitive advantage when selling trams.

The only approach to mitigate the long-term risk of monopoly for the procurement of new trams is to reach a contractual arrangement to this effect with the initial manufacturer. Such an agreement would oblige the manufacturer to supply any future tram suppliers with the components which ensure compatibility with the catenary-free infrastructure or to provide a detailed description of the interface between the trackside and the on-board equipment so that other manufacturers may design trams that are compatible with the proprietary infrastructure."

Summarising the above points:

- APS will increase the project cost by an order of $150 million.

- The use of APS will reduce the reliability of the light rail, particularly in inclement weather when the travelling public will be most dependent on the reliability of the system.

- The inability to incorporate regenerative braking will degrade performance, safety of the LRVs and energy efficiency.

- It will be necessary to ensure that the adoption of APS will not contribute to a monopoly situation applying to future procurement for the light rail system and its future extensions. Contractual feasibility will be an area of major concern.

- In the non segregated rights-of-way sections the APS third rail, being proud of the running rail level, will constitute a significant trip hazard in areas of high pedestrian activity.

- Every additional LRV purchased in the future for use on the Sydney Light Rail will have an additional cost increment of $ 0.75M above the base price to cover the fitment of APS.

It is worthy of note that APS or other wire free technologies have not been incorporated in the following historic major cities in their recently constructed light rail systems:

Paris (includes the eight lines T1 to T8)
Dublin
Edinburgh
Jerusalem
Bergen
Lisbon
Porto
Madrid
Barcelona

This is despite serious studies being undertaken relating to the cost and benefits and operational considerations either in-house or by appropriately qualified consultants, such as Systra for the Dublin LUAS light rail.

Overall it must be asked is Sydney justified in spending $150 million on APS technology, a system that adds much complexity , weight, cost and a hit in system efficiency rather than a system that is relatively simple and very efficient overhead wire (not catenary) just because it 'looks better'? The answer would appear to be evident in the light of the historic major cities listed above..

Recommendation:
In the light of the considerable additional costs involved in the implementation of the APS system, (some $150 million plus,) that any decision or recommendation involving the provision of APS by NSW Government agencies be deferred until a proper evaluation of the proposed power supply is undertaken. Given the specialist nature of such an evaluation a European consultancy with a proven record of LR system power supply and aesthetics should be engaged to undertake a design and pricing benchmarking exercise.

Aesthetics and Safety

In my response to the EIS documentation I made reference to the need to ensure appropriate and attractive elements be incorporated in the CSELR design. In particular I drew attention to the need for the incorporation, where appropriate, of Grassed Track, the support of overhead from buildings rather than poles where appropriate, as per European practice, the minimisation of the number of overhead support poles having regard to the minimisation of clutter on crowded CBD footpaths and the installation of sensitively designed overhead

In comparison with the voluminous amount of subsequent TfNS consultant commentary/justification referring to issues such as APS and tree impact the response the issues I raised would appear to have been glossed over or treated with disdain.

For example on page 5-75 of the Submissions Report prepared by Parsons Brinckerhoff for TfNSW the following ststement is made

"Consideration was given to grass bed track during the development of the definition design. While acknowledging that grass bed track could provide some benefits with regard to visual and landscape amenity along the alignment, the ongoing maintenance of the grass bed tracks, in particular watering requirements, was not considered to be economically viable or environmentally sustainable in the long term."

It is noted that the consultancy Parsons Brinckerhoff is an American based multinational organisation and the TfNSW CSELR Project Director is also American.

It is an interesting exercise to compare the type of light rail track running through the campus of an American university

Figure 8 Minneapolis Campus View

with its equivalent in a French university, as shown in the following photo:

Figure 9 Le Mans Campus View

A further comparison is the overhead as shown above with the installation on the Houston system shown below

Figure 10 Houston Overhead

A further example of the need to ensure the adoption from best practice from other light rail systems can be seen in the following TfNSW/PB statement

The design of the CSELR power supply system, including overhead wiring pole configuration and wire-free power supply, has been developed in accordance with relevant guidelines and standards. The design would be further developed during detailed design and would take into account stakeholders views, operational requirements, best practice from other light rail systems, design and engineering constraints and environmental considerations.

Suggestions with regard to the design of the power supply system are noted and would be reviewed during detailed design." (Response 5-63)

If we are to be serious about aesthetic design then there is a need to ensure that entrenched US design 'guidelines and standards' are not incorporated in the CSELR when superior European 'guidelines and standards are available.

Recommendations:

That, to ensure maximum positive environmental benefits, it be a condition of approval that grassed trackform be the preferred application in the Centennial Parklands, Randwick Racecourse, Moore Park and similar CSELR traversed areas.

That to ensure maximum environmental benefits with respect to appearance and safety a condition attached to the approval of the CSELR proposal be that the Over Head supply be single contact wire and that the more aesthetically acceptable European style of Overhead Design be adopted as the CSELR System Standard. The proposal not to affix OHW fixtures to existing structures along the route of the CSELR proposal should be rejected

Given that the announced Preferred Bidder for the CSELR project has strong European (French and Spanish) experience TfNSW should draw upon this experience in setting the 'guidelines and standards' for the CSELR.