

† This document is a working appraisal of the proponent's cost benefit analysis of the proposal. As the project has developed, more information has been provided, which may supersede or respond to questions arising from earlier assessments. This working appraisal was prepared in April 2011 as an input into the Project Assessment Brief prepared by the Office of the Infrastructure Coordinator.

WORKING APPRAISAL FOR BENEFIT COST RATIO MODERATION (2010/11 Submissions)	
<b>Project name</b>	Brisbane Cross River Rail
<b>Brief project description</b>	Cross River Rail is a proposed new 18 kilometre north-south rail line in Brisbane's inner city. It includes: <ul style="list-style-type: none"> <li>• 9.8 kilometre new underground tunnel</li> <li>• Three new underground stations at Albert Street, Woolloongabba and Boggo Road, in addition to an interchange station at Roma Street.</li> <li>• Four station upgrades</li> </ul>
<b>Reported BCR @ 7%DR</b>	1.26 (Jan 11), then 1.42 (12 April 2011)
<b>Capital cost total – undiscounted, outturned</b>	\$9,123 million (P50 – Jan 11; the capital cost in the economic appraisal includes the NW Transit Corridor connection tunnel which is not part of the direct funding submission to Infrastructure Australia).
<b>% costs bid for (where relevant)</b>	
<b>Source documents for review</b>	Business Case and certain technical appendices
<b>Date of review</b>	First Review based on initial submission documents. (11 Jan 2011) Second review based on the provision of the Turner & Townsend (T&T) cost plan Third review based on the response from SAHA / Deloitte addressing technical queries on the economic methodology (7 <sup>th</sup> Feb), responses to specific questions about costs (including the provision of the rolling stock benchmarking) and technical demand reports Fourth review undertaken on information received 12 <sup>th</sup> of April, responding to 18 <sup>th</sup> of March teleconference and including a number of sensitivities mentioned in the response to the economic correspondence (7 <sup>th</sup> Feb).
<b>Key changes from previous submissions</b>	N/A

This assessment was based on the proponent's December 2010 submission to Infrastructure Australia. As a result of the severe weather events over the summer of 2010-11, the Queensland Government announced that construction of the Cross River Rail project, proposed to commence in 2013, would be delayed by at least two years. Since then the proponent has been updating project information and addressing many of the issues identified in this assessment. An updated assessment will be provided once the proponent formally submits this information.

<b>OVERALL SUMMARY</b>	<p><b>Overall summary based on January 11 2011 review.</b> (2-3 paragraphs on overall robustness of analysis and major points raised)</p> <p><b>Costing</b> The additional costs for rolling stock should be validated, with confirmation as to whether contingency has been included for these. Subsequent follow up indicates contingency was not included. T&amp;T cost plan also indicates cost / car was benchmarked against international comparators and had input from QR. This documentation should be sought. Finally, the economic appraisal includes a \$1,450 million costs for the NW Transit Corridor. This cost does not appear to have been provided by Turner &amp; Townsend or have been peer reviewed.</p> <p>Detailed technical <b>demand</b> calibration and validation reports were not provided. A peer review has also not been provided. This is not implying concerns with demand, just that further information is required before full comments can be made. Specific attention may need to be focused on the impact of the NW Transit Corridor in the demand forecasts –while it reduces CBD alighting by 7%, an assessment of how much this assumption influences the economic appraisal should be undertaken. Conservative assumptions have been made by keeping land use fixed between the base case and option.</p> <p>In general, a detailed <b>economic appraisal</b> that demonstrates in-depth understanding of the theory and practical application of this theory, although demand inputs, cost inputs and base case specification require further investigation. Comments below should be interpreted within this context as a critical review of technical assumptions and applications – many of which could possibly be argued either way if there is strong supporting information. Further information would be useful to show the split of benefits between new and existing users and the impact of the inclusion of the NW transit Corridor in the base case and option on project viability. Externality costs for rail should be included and the rule of half should be applied to perceived reliability and crowding benefits for new users. A benefit ramp up should be applied to all new users. Additional clarification should be sought as to the treatment of decongestion benefits and why differing methodologies have been used for quantifying this (differing from both from ATC and RailCorp guidelines and differing within the appraisal between private transport and freight). The different results from these two methodologies should be reconciled.</p>
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Wider economic benefits (WEBs) have been calculated to a high standard using the most appropriate data available in Australia. While this may provide a degree of protection against down-side risk, it is not recommended that these be considered within the BCR given the lack of sufficient domestic or International studies to benchmark results, the considerable international and domestic debate around causality and applicability and the absence of any domestic or international *ex post* reviews which would allow for the testing of the DfT WEBs methodology. Given no studies have been undertaken understanding the actual realisation, not the theoretical possibility, of WEBs accompanying transport projects, caution is advised if the economic viability of a project rests upon these benefits.

#### Specific Question to proponent covering issues raised in table below.

##### Cost specific questions

- Can you confirm that the costs used in the appraisal are P50. When will the P90 cost estimates be used and when they are used, will they take on board Evans & Pecks comments that “the gap between P50 and P90 being narrower than expected for projects of this nature”. Peer Review pg 38. They suggest this could mean the P90 costs adjustment is too low. (pg 2).
- Why haven't the Evans & Peck peer review comments around escalation been included? Specifically, why hasn't escalation been applied to contingency?
- Rolling stock:
  - Can you please provide details on how the \$2.7 million / car rolling stock costs align to current QR procurement costs? T&T cost report indicates this was taken from ATC values, internationally benchmarked and had input from QR. This benchmarking and QR feedback should be provided as supporting evidence. [Benchmarking and further QR subsequently provided, see discussion under point 7.](#)
  - Has this unit cost been peer reviewed? Doesn't appear in peer review
  - Does this cost include contingency and if so, what level of contingency? Confirmation that no contingency has been included. This should be added to current costs.
  - Has the escalation applied also been applied to the contingency component of rolling stock?
  - What rate of inflation was used to calculate rolling stock escalation?
- Stabling and maintenance facilities Included in T&T cost plan subsequent reports.
  - What are the specific costs for the stabling and maintenance facilities required for this additional rolling stock and do they include land acquisition and contingency costs? Included in T&T cost plan subsequent reports.
  - Where are the stabling and maintenance facilities located? Included in T&T cost plan subsequent reports.
- What are the cost components of the NW Transit Corridor?
  - What level of confidence have the costs been prepared to?
  - Who undertook the project costing?
  - Have these NW Transit Corridor costs been peer reviewed?
  - What level of contingency is included within these costs?
  - Yeerongpilly and Dutton Park dedicated freight line is identified as a major capacity enhancer within the freight analysis: has this been costed and where do these costs appear in the appraisal? Answered in subsequent T&T cost plan.

##### Demand Specific Questions

- Is it possible to obtain the model calibration and validation reports which include the enhancements made to the BTS specifically for this project?
- Is there a peer review available, even if this is only the internal peer review document?
- What are the sources of supporting documentation backing up key assumptions – such as OVT weights and how these differ from other weights used in Australia and overseas?
- How is the issue of modelling Greenfield development addressed (ie origins or destination which have very little or no population or PT demand – ie are effectively a zero in the matrix)? If the demand model pivots of 2006 data, how does the pivot deal with these 'zero' cells?
- **Demand ramp up**
  - Not applying a ramp up in demand to existing rail users is debatable and possibly justifiable. However, why hasn't a ramp up been applied to new / shifting users and the other travel changes that stem from shifting users?
  - What is the BCR once an appropriate ramp up has been applied to new users (and the benefits associated with their changing travel behaviour)?

**Economic Specific Questions** economic specific questioned below acknowledged by proponent in subsequent correspondence, with undertaking to try and address / sensitivity check in subsequent round of analysis.

- **Out of Vehicle Weights** [acknowledged](#)
  - OVT weights are source to ATC Guidelines and Study Assumptions. However current weights are at the upper limits, or higher than the Australian weightings recommended by the ATC. Therefore, what underpins the Study Assumptions to justify adopting weights that do not align with the ATC Guidelines?
  - Is it possible to adjust these weights to test the implications the Study Assumptions have on the BCR?
- **Benefit distribution** [acknowledged](#)
  - What is the breakdown between new and existing public transport perceived user benefits?
- **Decongestion** – Instead of treating decongestion as an externality, the methodology captures perceived highway benefits and reduced vehicle operating costs. [acknowledged](#)
  - What is the justification for using this methodology as opposed to applying a decongestion parameter value as suggested by the ATC and RailCorp guidance or BTRE studies?
  - What would be the impact upon benefits if the ATC and RailCorp methodologies were used? If there is a difference, what accounts for this difference?

- Why is the ATC / RailCorp approach used for freight but not passenger / private transport? What is the justification for not using a consistent methodology?
- What vehicle occupancy factor has been assumed for perceived car user time?
- What is the implied vehicle operating cost in terms of cents / km?
- **Crowding** *acknowledged*
  - Is the demand model capacity constrained?
  - The same weights / methodology are used for busses – what is the distribution of crowding benefits between rail and bus?
- **Reliability** *acknowledged*
  - Is it possible to gain access to the underlying SystemWide technical note containing the methodology, assumptions and calculations?
- **Rule of Half** *acknowledged*
  - Is the rule of half been applied to the perceived crowding and reliability benefits realised by new users?
  - If the rule-of-half is not applied, how does applying it change the BCR?
- **Real escalation** *acknowledged*
  - What is the BCR and NPV when real escalation of 1.5% is not applied to capex, opex and the VoTT?
- **Externalities** *acknowledged*
  - Why have no externalities been calculated for the additional rail service KM accompanying the new rolling stock?

#### **Freight specific queries**

- **Underlying freight demand:** The current SAHA report and privately prepared ICRCS<sup>1</sup> that demand is based on external estimate growth in freight train movements, and this does not appear to have been based on underlying analysis of freight types and tonnages.
  - It may be useful if the 'demand validation exercise' discussed by SAHA p 59 could be provided
  - It would be useful if underlying freight demand growth or historical tonnages/train movements could be provided to substantiate the growth, and to understand if the assumption that freight will travel by rail not road if rail capacity is available
  - Please clarify whether there are road developments assumed in the patronage modelling that could make road more attractive than rail since the 2008 ICRCS study
- **Capex:** Please confirm that capex for the dedicated freight track between Yeerongpilly and Dutton Park is captured as it is the major contributor to increased freight capacity (SAHA p 59). Did the appraisal consider an option/sensitivity if the dedicated freight track and freight benefits are not included?
- **Trip length in benefit calculations:** Please clarify the road trip length considered alongside the 696km for rail. Will the dedicated freight line result in more/less km per trip and was this captured in the appraisal as a cost/saving?
- **Some economic parameters are 90% rural so benefits could be understated:**
  - The Melbourne Brisbane Inland Rail parameters that were applied to this analysis are principally rural (with 10% of the trip assumed as urban). Applying these may understate cost savings, crash savings and externalities
  - The operating costs for both road and rail are for long-distance, rural/highway trips (sourced from the Inland Rail study) so may also be understated
- **Decongestion value may be overstated:**
  - The appraisal uses a congestion value that was increased to 78 cents to reflect the higher commercial value of time (in order to adjust RailCorp's measure for car decongestion). However, when trucks are removed from roads to use rail instead, it is a mix of car/trucks/buses/etc remaining on the road network that will benefit. In fact, the mix of trucks in the project case, as a proportion of total traffic will have reduced. Hence it is unclear why a value of 78 cents is adopted. Weighting the RailCorp value by the vehicle composition of the AM peak is likely to produce a value more around the 45 – 50 cent mark. Can further justification on the calculation and justification for this assumption please be provided.

#### **Overall summary based on April 11 2011 review.**

Subsequent analysis by the proponent has addressed many of the issues raised. Three key points should be made:

- Many of the technical aspects raised in the initial review have undergone a sensitivity analysis which indicates that adjusting these resulted in lowering the BCR by a margin of up to 12%. When considering all these technical aspect it implies the BCR may be revised downwards by as much as around 25%. However, this would still result in the BCR falling within the plausible BCR range set by the initial sensitivity analysis.
- Concerns still exist over the specification of the base case and treatment of the NWTC (an input into the appraisal). Subsequent sensitivity analysis by proponent doesn't fully address these concerns (given there was inadequate time to re-run the demand model). This is an area which should continue to be explored due to major potential cost and demand implications.
- While many of the original cost queries have been addressed, revised data received on April 12 indicates that the PV of capital costs has been reduced by 12% (the primary driver behind the increasing of the BCR: 1.26 to 1.42). Further clarification from T&T and peer review from Evans & Peck should be sought if these revisions are to be included in the core outturn costs.

<sup>1</sup> See: [http://www.tmr.qld.gov.au/~media/dad2873f-663d-412f-bd56-b28938b45d1e/pdf\\_inner\\_city\\_rail\\_capacity\\_study\\_pre\\_feasibility\\_report.pdf](http://www.tmr.qld.gov.au/~media/dad2873f-663d-412f-bd56-b28938b45d1e/pdf_inner_city_rail_capacity_study_pre_feasibility_report.pdf)

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	1. Reported information (lift text directly if possible)	2. Supporting information provided (list key documents, not content)	3. Extra information required / requested / received	4. Benchmark / Questions / Things to look for	5. Assessment of variance or methodological weaknesses	6. Notes re: degree of variation to BCR (any calculation / reasoning)	7. One line summary of argument / rating	8. Rating
<b>Guidance</b>	"Cut and paste" text from proforma if possible	List supporting materials not included in proformas but included with bids (formally and informally)	List all information requested by IA: please note which materials were, and were not provided by jurisdictions. Also list areas to follow up / potential questions	See below	Insert the explanation of any differences or issues with theory, methodology or data used by the jurisdiction	Use this column, if required, to explain any reasoning for making an assessment of the scale of impact on the BCR, using figures if possible	Please insert one sentence summary of argument and conclusion reached	Significantly overstated; slightly overstated; broadly neutral; slightly understated; significantly understated.
<b>Robustness of demand forecast</b>								
1. Has demand been modelled in a robust and 'bottom-up' manner?	<p>Passenger demand undertaken by SKM – Aurecon JV, using the Brisbane Strategic Transport Model: Multi Modal Version.</p> <p>The model includes all modes and entire south east Queensland region.</p> <p>The model has undergone a range of enhancements to make PT forecasting more accurate specifically this project.</p> <p>Freight demand from Inner City Rail Capacity Study (2008), with further validation by CRR project team.</p>	<ul style="list-style-type: none"> <li>Business case documentation</li> <li>No Technical Transport Study (indicated as the report which contained the demand)</li> <li>No peer review is listed as having been undertaken on the demand</li> </ul>	<ul style="list-style-type: none"> <li>Technical Transport Study Report to be provided <b>Provided</b></li> <li>Should also seek: <i>Cross River Rail Benchmark Transport Model Report, March 2010</i> <b>Provided</b></li> <li><i>Transport model development report, June 2010.</i> <b>Provided</b></li> </ul> <p>Peer review. <b>Proponent has commissioned.</b></p>	<ul style="list-style-type: none"> <li>Has demand been modelled by a reputable transport modelling organisation?</li> <li>Evidence of use of a city wide travel model which adds the proposal as a new option &amp; measures diversions</li> <li>How close to capacity is the service in the high AM peak hour</li> <li>Have different fare levels &amp; elasticity been evaluated &amp; will service offer customer VFM against alternatives?</li> </ul>	<ul style="list-style-type: none"> <li>The demand calibration and validation report needs to be provided. <ul style="list-style-type: none"> <li>This will provide more supporting detail on assumptions within the demand modelling and (possibly) local justification for the use of OVT weights (see point 19)</li> </ul> </li> <li>The demand model peer review needs to be provided <ul style="list-style-type: none"> <li>Such a review would be expected in a project of this size.</li> <li>This is also important given that changes in consumer surplus used in the economics are extracted directly from the demand model.</li> </ul> </li> <li>Further information needs to be provided around freight forecast methodology and underlying assumptions. <ul style="list-style-type: none"> <li>For example, what are the underlying assumptions driving this growth?</li> <li>Are these bottom up or top down forecasts, driven by supply or demand?</li> <li>How does the policy environment effect these forecasts. – For example, Queensland Gov. required the Inland Rail study to constrain the growth of coal trains using the Western corridor. This constraint was not an infrastructure constraint, but rather a policy constraint imposed by the Government based on the externality impact of these trains on surrounding residential areas. While the CRR</li> </ul> </li> </ul>	Unable to ascertain without demand modelling technical paper, peer review and subsequent confirmation on points raised.	Peer review. <b>Proponent has commissioned.</b>	Peer review and full sensitivity analysis required on NWTC required before this assessment can be made.

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					<p>study has excluded these coal forecasts from the quantification, confirmation should be sought as to whether such policy constraints also exist on other freight lines examined (North Coast Line and Salisbury – Port).</p> <ul style="list-style-type: none"> <li>Do the stated increased freight forecasts restrict land-use and TOD opportunities?</li> </ul> <p>Further detail should be provided on the crowding modelling</p> <ul style="list-style-type: none"> <li>Does the crowding function influence mode choice?</li> <li>Are travel periods set? For example, are people allowed to trip re-time if services are heavily over-crowded or above capacity? This is the traditional response to crowding, hence if a certain proportion of total demand is assumed in the peak (and doesn't change throughout the appraisal period) then crowding will be overstated.</li> </ul> <p>Other modelling question</p> <ul style="list-style-type: none"> <li>How does the model deal with Greenfield areas or areas where there is little to no PT use in the validation year? Is a pivoting process used? What measures have been taken to ensure the accuracy of forecast from these zones.</li> </ul>			
2. Are the underpinning residential, employment and economic growth figures robust?	Land-use assumptions consistent with <i>South East Queensland Regional Plan</i> and the draft <i>Connecting SEQ2031</i>	<ul style="list-style-type: none"> <li>Business case documentation</li> </ul>	<p>Technical Transport Study Report. <b>Provided</b></p> <p>Peer review. <b>Proponent has commissioned.</b></p>	<ul style="list-style-type: none"> <li>Are current State or ABS projections used?</li> <li>Are central growth forecasts used?</li> <li>Are the transport demand forecasts directly linked to this data?</li> </ul>	<ul style="list-style-type: none"> <li>The same land – use assumptions appear to have been used in the base case and options.</li> <li>This is an appropriate methodology. It potentially means the full city shaping nature of the infrastructure isn't captured or that leveraging new land-use opportunities available due to the option are not included.</li> <li>The other approach, changing land-use between the base case and option, to try and capture potential land-use changes is highly subjective and can be prone to errors and optimism bias.</li> </ul>	Justified use of land-use.		Using fixed land use possibly slightly understates the BCR.

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3. Achievability of the demand forecast?			<p>Technical Transport Study Report to be provided. <b>Provided</b></p> <p>Peer review. <b>Proponent has commissioned.</b></p>	<ul style="list-style-type: none"> <li>Is the forecast justified by an in-depth analytical paper?</li> <li>Is the forecast endorsed by independent Expert Peer Review?</li> <li>Does forecast feature a gradual ramp-up (i.e. &gt;4yrs)?</li> <li>What % of patronage is induced demand (should typically be &lt;20%)?</li> <li>Forecast patronage has been benchmarked to be broadly consistent with outcomes achieved on similar services?</li> <li>Has the proponent factored the costs of greenhouse gas emissions into their economic planning, including obligations under the Carbon Pollution Reduction Scheme?</li> </ul>	<ul style="list-style-type: none"> <li>Demand modelling peer review report would assist in commenting on the achievability of demand.</li> <li>No ramp up of benefits is included within the economic appraisal. The report states that the benefits would be realised immediately by existing rail users. This is a plausible argument. However, a ramp – up should be applied to the benefits that stem from changing travel behaviour (ie the new rail users and their internal and external benefits). Given these are marginal users it is not justified to assume that travel behaviour will occur instantaneously. It would be valid to assume that the initial take up would be high (ie around 70% of benefits in the first year). Given that no breakdown is provided for new and existing rail users it is not possible to identify the impact this would have on the BCR. This would influence new user benefits, highway benefits (decongestion – given that full benefits are only realised when all potential users have switched to rail), fares, externalities etc.</li> <li>The demand uses a fixed number of transport trips (all modes) in the base case and option. The model does however capture trip redistribution, whereby either the origin or destination of the trip changes as a result of the project.</li> <li>While it would be ideal to capture induced demand, the fact that it isn't captured is an issue for most transport models.</li> </ul>	<ul style="list-style-type: none"> <li>Additional information required.</li> <li>Ramp up of benefits of new users should be applied.</li> </ul> <p><b>Demand ramp-up included in subsequent sensitivity analysis – reduces BCR by 1.4%.</b></p>		More analysis required
4. Sensitivity of BCR to demand	<p>BCR reduces to 0.89 when benefits (a proxy for demand, are reduced by 30%)</p> <p>Sensitivity analysis for NW Transit Corridor Costs – excluding the corridor would reduce CBD alighting by 7.0%.</p>			<ul style="list-style-type: none"> <li>Does a 30% drop in demand significantly alter the BCR?</li> </ul>		<p>Sensitivity analysis for NW Transit Corridor Costs – excluding the corridor would reduce CBD alighting by 7.0%. However, it is not clear what this 7.0% reduction would do for the economic appraisal – this would depend on the benefit profile of the users on the NWTC.</p> <p><b>Actual analysis, based on subsequent information, of the benefits associated with the NWTC are discussed below (Point 4).</b></p>	Not viable with a 30% reduction in demand.	
5. Is the base case realistic and fundable?	The base case and option both contain the North West Transit Corridor (NWTC).			<ul style="list-style-type: none"> <li>What is Base Case patronage growth – is it in line with historical trends?</li> <li>From the available information, is the base case capex and patronage a likely scenario, or is it overly</li> </ul>	There are questions which need to be addressed around the impact of the NW Transit Corridor, and \$1.5B tunnel connecting the CRR to NWTC, have on the options and base case demand. The NWTC is included for the 2031 model year for the base case and	<p><b>Proponents indicated there was insufficient time to undertake a full sensitivity analysis by re-running base case and option demand modelling. Instead, an external test was undertaken looking at the expected patronage of the tunnel</b></p>	Further demand modelling required.	Further analysis required

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				loaded or light?	<p>option. \$1.5 billion in costs have also been included in the option case to join the CRR to NWTC. This connection is reflected in demand for 2031.</p> <p>Responses indicate that costs are "long range planning costs used by TMR. As such, there is no detailed demand or peer review". In terms of demand, the impact of the tunnel connecting CRR and Alderley is summarised as: "in the without project case, the rail tunnel {the NWTC connector tunnel} does not connect to the existing rail network since CRR project is not implemented. However, in the project case, connection to the CRR project facilitates additional train services to be run and therefore generates project benefits to the without case."</p> <p>There are three issues this raises:</p> <ol style="list-style-type: none"> <li>1. The NWTC is an uncommitted project. What are the total capital costs of this assumption? Is it valid to assume this inclusion given it is uncommitted? This raises a broader question of uncommitted investment in the base case which should followed up with the proponent in order to make a judgement about whether the base case is reasonable (ie do minimum investment).</li> <li>2. What are the impacts on demand and benefits from assuming the NWTC in the base case and option? Assuming this in the 'domin' would increase rail demand to the CBD. Including the additional tunnel in the option case could then release further travel time savings to these users. Without the connecting tunnel these benefits may not be released. Furthermore, without the assumption of the NWTC in the base case then there also may be less users to receive benefits in the option. Assuming NWTC in the base case, then the connecting tunnel to CRR in the option is therefore potentially allowing for an unrealistic train plan (timetable) to be run through the demand model, inflating demand and benefits.</li> </ol> <p><b>Proponents offered to undertake a sensitivity test on the results without the NWTC tunnel if required. This offered should be requested and expanded to include the impact of assuming the completion of</b></p>	<p>and average time savings per trip.</p> <p>This sensitivity analysis indicated total passenger time savings benefits would fall by 7.7% if the tunnel was not included. The avoidance of the tunnel infrastructure costs outweighs the fall in benefits, hence the BCR actually rises under this scenario.</p> <p>However, this sensitivity analysis does not address this core question around the impact on demand, specifically around the impact of including this uncommitted infrastructure (NWTC) in the base case.</p> <p>Further demand modelling is required to satisfy concern around this base case specification.</p>		

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					<p><b>the unfunded NWTC in both the base case and option.</b> This will help ensure that the viability of the project isn't resting on NWTC and NWTC tunnel enabling an enhancement of timetables / train paths through greater integration into the network.</p> <p>3. The documents provided seek to downplay the issue indicating that because the connection in only modelled in 2031 it has minimal impact on the assessment. However, depending upon how benefits have been extrapolated, this assumption could be influencing demand back to 2021, given demand from 2021 onwards is often lineally extrapolated between the two observation years.</p>			
6. Does hourly patronage profile match conventional AM & PM peak flows	<ul style="list-style-type: none"> <li>PT modelled for a 24 hour basis, with annualisation factor of 280 applied</li> <li>Private vehicle travel modelled for a 24 hour period with a annualisation factor of 318 applied.</li> <li>Freight has used a factor of 8,400, based on 24 hour of operation a day over 50 weeks per year. This was based on Systemwide analysis.</li> </ul>			<ul style="list-style-type: none"> <li>Is the model scaled up to full year in a justifiable manner (e.g. annual patronage is normally 250-300 times AM high peak hour)?</li> </ul>	<p>PT and private vehicle annualisation factors are reasonable and based ATC recommendations.</p> <p>The logic and information underpinning the freight modelled time period and annualisation is less clear. Further information could be sought around:</p> <ul style="list-style-type: none"> <li>The information this factor is based upon;</li> <li>Whether using 24 hour days is valid, given that freight curfews imply 24 hours of operation is not realistic and should be explored.</li> </ul>			Neutral
<b>Robustness of cost base</b>								
7. Robustness of capex forecasts	<p>Capital costs have been provided by Turner &amp; Townsend, with peer review provided by Evan &amp; Peck.</p> <p>Rolling stock costs have also been provided by T&amp;T. These have not been peer reviewed.</p> <p>No stabling costs appear to have been included</p> <p>The economic appraisal includes a \$1, 450 million cost for the NW Transit Corridor. This cost does not appear to have been provided by Turner &amp; Townsend or have been</p>	<ul style="list-style-type: none"> <li>Business Case</li> <li>Peer Review of Cost Estimation</li> <li>Rolling stock benchmarking</li> <li>Revised capital costs, based on value engineering and refinement of design.</li> </ul>		<ul style="list-style-type: none"> <li>Is the capex estimate supported by significant in depth work?</li> <li>Was it produced by a reputable independent organisation?</li> </ul>	<p>While the peer review broadly supported the cost plan devised by T&amp;T, there are two key areas of divergence to note:</p> <p><b>1 - P50 to P90 adjustment.</b> Evans &amp; Peck suggests that the gap between a P50 (21% of estimated total project costs ex. escalation) and P90 estimate (29% of estimated total project costs ex. escalation) is too low. Evans &amp; Peck considers that an appropriate risk assessment has been undertaken, but that "the gap between P50 and P90 being narrower than expected for projects of this nature". (Peer Review pg 38). They suggest this could mean the P90 value is too low. (PR pg 2). A P50 estimate of contingency is \$1,146 million, a P90 is \$1,499 million,</p>	<p>Moving to the P90 calculated at 29% of project costs (ex. esc), changes the BCR from 1.26 to approx 1.21, a reduction of approx. 4.0%.</p> <p>Escalation issues do not influence the BCR.</p> <p>Subsequent submission indicates the PV of capital has decreased by 12% due to value engineering and refined design. This cost reduction is driven by value engineering and design refinements which re-examine at station design, revises down property acquisition costs based on current market conditions and past studies, changes in tunnelling strategies. Total savings were \$360million (real, 2010), however these have been offset to a</p>	<p>Divergence between T&amp;T costing assumptions and Evan &amp; Peck peer review should be investigated in more detail.</p>	Further consultation and documentation required.

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<p>peer reviewed.</p> <p>A dedicated freight line between Yeerongpilly and Dutton Park is identified as the primary driver of an increase in freight capacity. However, it is unclear whether this cost has been included within the analysis.</p> <p>T&amp;T cost plan report provided</p>				<p>a difference of \$353 million. Subsequent reviews by the proponent indicate that the P90 rate used is appropriate.</p> <p><b>2 - Escalation</b></p> <p>Although not of direct impact to the economic analysis, the peer review of costs identified \$395 million gap between T&amp;T escalation estimates and their estimates, using T&amp;T parameters. T&amp;T escalation is estimated at \$879 million, Evans &amp; Peck suggests \$1,274 million.</p> <p>The prime driver behind this difference is that T&amp;T does not apply escalation to risk (contingency) due to an agreement reached with DTMR. Other differences are driven by no allowance for escalation of insurance and security bonds (\$25M), land and property acquisition (\$43M) and minor corrections (\$70M).</p> <p>T&amp;T disputed these recommendations, suggesting they were captured elsewhere. However, after subsequent meetings between the peer review and project team (detailed in the peer review report), Evans &amp; Peck stand by their recommendations of higher escalation calculation.</p> <p>The submitted Business Case and economic appraisal retains the T&amp;T escalation estimates, not the peer review recommendation.</p> <p><b>Rolling stock</b></p> <p>T&amp;T have used a unit cost of \$2.7 million per car. 146 additional 3 car sets are therefore an additional \$1,158 million in costs.</p> <p>Confirmation should be sought from other industry sources as to the appropriateness of a unit cost of \$2.7 million. ATC guidelines provide very broad unit costs which appear to align with these unit costs. However, experience from other states suggests this figure could be low.</p> <p>Furthermore, given concerns raised around escalation of capital costs, the rate of escalation used for rolling stock should be clarified. Clarification should also be provided around whether contingency / risk costs have been included and whether escalation has been applied to these contingency / risk costs for the rolling stock procurement).</p> <p>Peer review does not appear to include rolling stock cost review.</p>	<p>degree by design enhancements of \$160million (real, 2010). These design refinements, and cost implications, should be subject to peer review if they are to form the core of outturn costs used.</p>		

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					<p>Subsequent information provides rolling stock benchmarks of 12 other domestic and international rolling stock costs have been used to support the \$2.7 real costs. However, this benchmarking document indicates that in Australia the average cost per car is \$3.7 million / car and in Qld, the average cost is \$3.4 million / car. As these are observed rolling stock costs contingency, profit etc is included within this cost. Proponents have undertaken to provide current QR rolling stock procurement costs / car.</p> <p>Proponents indicate rolling stock costs have been reviewed taking into account current macroeconomic conditions and the efficiencies expected to be provided by the "highly competitive New Generation Rolling Stock (NGR) procurement process" undertaken in Queensland. This NRG team has not been able to provide CRR with actual cost estimates due to the commercially sensitive nature of the procurement process, but "confirm that the Cross River Rail rolling stock estimate is reasonable, particularly from a whole of life costs used in the financial and economic evaluations"</p> <p><b>Stabling &amp; Maintenance facilities</b></p> <p>No stabling cost appears to have been included in the T&amp;T cost or have been reviewed in the Evans &amp; Peck peer review. There may be sufficient stabling within the current system, however an additional 143 – 3 car train sets is likely to stretch any additional capacity.</p> <p>It is also possible that additional rolling stock of this magnitude would mean there is a requirement for additional maintenance facilities.</p> <p>Both these costs should include land acquisition, escalation and contingency and be have undergone the same peer review process as other costs.</p> <p>T&amp;T cost report indicates \$91 million worth of stabling facilities has been included in out-turn costs.</p> <p><b>NW Transit Corridor</b></p> <p>Cost have been included for this, however the detail underpinning these costs is not clear.</p> <p>Benefits of the project without this inclusion in the cost or demand should also be included. This would help understand what is driving the project</p>			

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					benefits – for example, are the benefits accruing to CRR, or do the major project benefits only get released with NW Transit Corridor in place? Therefore, how sensitive is the current analysis to the inclusion / exclusion of the NW Transit Corridor assumption in costing and demand. (see further discussion in Point 5)  <b>Yeerongpilly and Dutton Park dedicated freight line.</b> Identified as the major capacity improver for freight transport, but unclear whether this has been costed in the appraisal. Included in costs.			
8. Robustness of opex forecasts	Prepared by Turner & Townsend.  Analysis was discussed with QR and TransLink to ensure consistency.	Business Case No peer review		<ul style="list-style-type: none"> <li>Is the opex estimate supported by significant in depth work?</li> <li>Was it produced by a reputable independent organisation?</li> </ul>	Bottom up, year by year analysis, which includes real escalation of labour costs and whole of life operating and maintenance costs.			Neutral
9. Consequential costs	Some consequential costs have been considered.			<ul style="list-style-type: none"> <li>Are consequential costs to other parts of the network or other stakeholders taken into account?</li> <li>E.g. land acquisition, higher costs due to the need to maintain service continuity &amp; / or constructing around live traffic</li> </ul>	Land acquisition costs are included within the costing estimate.  It is unclear of the disruptions that the construction of the CRR would have on other rail services before it opened. These do not appear to have been considered, but are likely to be relatively inconsequential given the magnitude of the project.			Neutral
10. Revenue treatment	Changes to producer surplus, including changes to the level of fare box revenue and changes in toll revenue are included within the appraisal.	Business Case and Economic Appraisal		<ul style="list-style-type: none"> <li>Is the treatment according to ATC guidelines and in line with best practice?</li> </ul>	Fare revenue appears to average about \$4 per user which is plausible.  It is debatable whether changes in toll road revenue should be included within the appraisal. However, they are included as a negative (ie toll revenues fall) and only total \$11M in PV terms. Hence, any possible theoretical implications of including toll revenue have not been examined given the lack of practical relevance to the project outcomes.			Neutral
11. Construction cost inflation	Turner & Townsend	Business Case		<ul style="list-style-type: none"> <li>Is the construction cost inflated by a margin above CPI (e.g. construction cost CPI)?</li> </ul>	Buildings and Architecture, Civil Construction and Rail Systems are all escalated at different rates which are, in general, all 4.0% per annum or greater.	Rates appear robust and were passed by peer review.  However the application of these rates to various capital cost items was questioned by the peer review (see Point 7 above).		n/a
<b>Key methodological questions</b>								
12. Inflation rate	Labour costs inflated at a real rate of 1.5% p.a. This reflects the difference between long term CPI growth and AWE growth			<ul style="list-style-type: none"> <li>What inflation rate is assumed and are any costs or benefits escalated by a different rate?</li> <li>Do values reflect realistic real wages growth (e.g. 1.5% per year)?</li> </ul>	Real escalation has been applied to benefits, opex and capex to ensure consistent treatment.  Calculations are consistent with ABS time series.  However, the use of real escalation	It is not possible to test the implication of excluding this assumption.  While it is recommended that this real growth be kept within the current analysis, further sensitivity testing should be requested which	Testing by proponent indicates the BCR falls by 12% when an assumption of real escalation to labour costs is not included to the	

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					raises is an interesting policy issue: should the escalation be state based or Australia wide, given that each state experiences different rates of escalation. One would expect Queensland's real rate would of 1.5% to be higher than that of other states over the past 10 – 15 years.	shows the BCR when real escalation is excluded from the benefits, opex and capex components.  If sensitivity testing shows that this does have a major impact on economic viability then further investigation and policy consideration may need to be directed towards the use of an appropriateness and rates of real escalation.	VoTT, opex labour costs and capex labour costs.	
13. Time period used	30 years from the first full year of benefits			<ul style="list-style-type: none"> <li>Is the period of assessment valid given the lifespan of the project assets?</li> </ul>	Aligns with ATC recommendations		n/a	Neutral
14. Residual value	Calculated using ATC Guidelines and assumptions from similar projects.			<ul style="list-style-type: none"> <li>Are residual values given when appropriate?</li> <li>Are the values used justified?</li> </ul>	Asset differ slightly from ATC Guidelines (they may be slightly higher) but are within a plausible range.	Changing methodology to reflect ATC values may have a downward impact upon residual value, however the impact of this in the overall scheme of the appraisal would be very minor given the residual value only makes up 2% of total benefits.	n/a	Neutral
15. Start and end timing, and phasing	Deferral modelled in the economic appraisal to reflect the change in timing (a response to the Qld flooding)			<ul style="list-style-type: none"> <li>Does benefit stream period start at the commencement of operation and cost stream at first expenditure?</li> <li>Are construction costs ramped up in according with standard construction timetables?</li> </ul>		Marginal increase in BCR		Neutral.
16. Benefits allocation		SAHA Economic appraisal  AECOM peer review		<ul style="list-style-type: none"> <li>Is the rule of half correctly applied (e.g. to benefits from existing PT users who change modes)?</li> <li>Are all significant benefits identified?</li> <li>Are all beneficiaries identified (e.g. benefits of roads to non road users?)</li> </ul>	<p><b>Rail Travel Time Savings –</b> Rule of Half appears to have been correctly applied, however it is done within demand model calculations so there is no way to validate.</p> <p><b>PT Treatment of decongestion –</b> the study currently captures the perceived highway benefits. These include perceived travel time savings and perceived vehicle operating costs.</p> <p>It is open to agreement as to whether these savings should be captured as a perceived cost. RailCorp guidance classes them as an externality when undertaking rail project, as existing road users do not alter their travel behaviour. Furthermore, the cost of one additional road user has wider congestion costs than those internalised to the person through travel time and vehicle operating costs, as their use of the road also imposes a cost on other users.</p> <p><b>PT Crowding</b>  The key to measuring crowding revolves around understanding whether the demand model has the ability to constrain PT capacity. Current documents do not answer this, although the full demand modelling report should.</p>	<p><b>Rail Travel Time Savings</b> A breakdown should be provided between existing and new rail users. This would provide further clarity on who the major beneficiaries of this project are. It would also help provide further sanity checks against other benefits such as fare revenue. Ramp up should also be applied to new users</p> <p>A breakdown should also be provided between rail and other PT users to better understand the distribution of benefits.</p> <p><b>PT Decongestion</b>  Clarification should be sought as to why decongestion has been treated as a perceived cost and not an externality.</p> <p>Further clarification should also be sought on reconciling the differences in the benefits received by existing road users when applying the two different methodologies – ie applying the unit cost to reduced road VKTs suggested by the ATC guidelines and RailCorp vs. the current approach adopted. This clarification should also cover why rail freight decongestion benefits have been treated differently (ie through the RailCorp and ATC methodology). In</p>	Proponents indicate applying the RoH to crowding and reliability are difficult to accurately achieve due to the structure of the demand model and it's treatment of new and existing users.	Slightly overestimated

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					<p>The weights used in the crowding methodology are reasonable.</p> <p>The Transport Outcomes study in the business case indicates that crowding is a major transport issue that the project will help alleviate. Sensitivity testing shows that excluding crowding from the analysis reduces the BCR from 1.26 to 1.06, a reduction of approx 15.9%.</p> <p>The same crowding methodology has been applied to busses. Therefore, further clarification should be sought as to the breakdown of benefits due to reduced crowding between rail and bus to better understand the distribution of benefits.</p> <p>Rule of half also does not appear to have been applied to the crowding benefits for new users. It should, given crowding is a perceived cost. Hence, this should be clarified. It should however be noted that the constraints of the demand model may make this difficult.</p> <p><b>PT Reliability Benefits</b></p> <p>This is very hard to measure well in appraisal, however the methodology used appears sound. It is based on work undertaken by SystemWide to understand what would happen to rail reliability given expected increases in demand. The economics then quantify this outputs. Further analysis of the SystemWide working paper would allow for greater analysis of their methodology. However the magnitude of the deterioration in reliability appears plausible.</p> <p>The economic quantification of reliability does not appear to have applied the rule of half to new rail users. This should occur given that reliability is a perceived benefit.</p> <p><b>Private Vehicle Resource corrected Vehicle Operating costs.</b> Applied correctly using RTA values</p> <p><b>Private Vehicle and PT Rail Externalities</b> Externalities for reduced car VKT's have been correctly calculated. However no cost has been included for the increase in rail externalities. This should be included.</p> <p><b>Freight</b></p> <p>Freight parameter values have been sourced from the Inland Rail study and appear to have been applied correctly.</p>	<p>2031, applying current method used in the proponent's economic appraisal results in \$254M benefits, using the unit cost approach gives \$111.3M.</p> <p>Sensitivity using the VKT approach to calculating a change in the cost of congestion indicates the BCR would fall by 8.4%. However, this calculation uses the RailCorp value of \$0.41, which is based on Sydney congestion costs.</p> <p><b>PT Crowding</b> Understanding the impact of applying the rule of half to new user crowding benefits is not possible given no breakdown between new and existing user benefits is given. Ramp up for new users should also be applied.</p> <p><b>PT Reliability Benefits</b> Understanding the impact of applying the rule of half to new users reliability benefits is not possible given no breakdown between new and existing user benefits is given. Ramp up for new users should also be applied.</p> <p><b>Private Vehicle and PT Rail Externalities</b> PT rail externalities need to be included.</p>		

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					One area potentially requiring further clarification is around the freight decongestion benefits. This calculation has adopted the RailCorp methodology, hence is not consistent with the approach used above to calculate decongestion benefits from people moving from road to rail.			
17. Sensitivity analysis – risks? (Capital costs – Construction duration – Operating costs – Discount rate at 10% - changes in oil price)	Comprehensive conventional sensitivity testing has been undertaken.			<ul style="list-style-type: none"> <li>Do the reported sensitivity tests, for instance to the price of oil, suggest significant risks surrounding the central case?</li> <li>How significant are +/-30% construction cost variations?</li> <li>Does economic viability become negative at a 10% discount rate?</li> </ul>	<p>Sensitivity tests include standard Treasury requirements and testing of some key assumptions in the methodology.</p> <p>Sensitivity analysis hasn't been undertaken on the price of oil.</p>		Project becomes non-viable under higher capital costs, lower demand forecast and 10% discount rate assumptions.	
18. Other methodological issues?	Constructor Profit has been removed when translating the T&T outturn costs into real cost for use in the economic appraisal.			<ul style="list-style-type: none"> <li>Any there any other issues regarding the accuracy of methodology used that may significantly impact on the comparability of the BCR?</li> </ul>	While the literature is not clear on this practice (as picked up by the peer review) the appraisal does sensitivity test the BCR if contractor profits are included.	Including contractor profit reduces the BCR from 1.26 to 1.21 (a drop of approx. 4%).	Including contractor profit reduces the BCR from 1.26 to 1.21 (a drop of approx. 4%).	Slightly overestimate.
<b>Values benchmarking</b>								
19. Value of time savings: business, non business, freight; and Vehicle operating costs	<p>Values of travel time for public transport, private transport and commercial vehicles have been sourced from NSW RTA, RailCorp, Austroads and ATC.</p> <p>The OVT weightings applied are sourced to ATC Guidelines and Study Assumptions</p>			<ul style="list-style-type: none"> <li>Are the values used recommended by the ATC?</li> <li>Are these constant real through analysis period or do they factor in real growth (i.e. caution if real growth is &gt;2%)</li> </ul>	<p><b>Values of Travel Time</b></p> <p>Parameter values used are consistent with existing literature.</p> <p>However, see discussion above around real escalation and the impact that has on benefits through the growth of values of travel time (Point 12 above)</p> <p><b>OVT Weightings</b></p> <p>OVT weightings are at the upper limits, or higher than the Australian weightings recommended by the ATC.</p> <p><b>Study Wait Time – 2.0</b></p> <p>ATC recommends an average of 1.4, with 2.0 reflecting international research. ATC literature review showed that 95% of all values fell within the range 1.04 – 1.77.</p> <p><b>Study Access Time – 1.7</b></p> <p>ATC suggests average of around 1.4, with 95% of results falling within the range of 1.15 – 1.56. 1.7 more closely resembles an international range.</p> <p><b>Study Interchange penalty – 10</b></p> <p>ATC recommends a penalty of 5 for a simple, between mode interchange, 7 for a more complex interchange and 10 for the most complex interchange between modes in different facilities. This value is designed to penalise interchanges – hence, infrastructure which leads to a reduction in interchanges results in a benefit</p>	<p>Adjusting the OVT weightings will influence the BCR. I suspect this will primarily flow through the Wait time weight, given it is also used in the reliability calculation.</p> <p>However, the ability to actually manipulate these could be very limited given all calculations are undertaken within the model on an OD basis. Hence, if these parameters have been included within the calibrating of the demand model, and this inclusion is backed up by the calibration report and peer review of modelling assumptions, then diverting from the ATC values could be justified.</p> <p>This should be investigated Further. These weights are source to ATC and Study Assumptions. Given many of the weights are above ATC recommendations, study assumptions should be provided to justify their use. Further analysis can then be undertaken on these assumptions.</p>	OVT Weightings Subsequent sensitivity analysis by proponent indicates that using ATC weights reduced the BCR by 2.8%.	Slightly overestimated

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					through the avoidance of this penalty.  <u>Study Rail Reliability Penalty – 2.</u> Same as wait time penalty. A higher, unexpected wait penalty could have been assumed, but as pointed out in the report, over time people change their travel patterns, so as to avoid this unexpected component.			
20. Value of carbon emissions	Standard ATC Rates			<ul style="list-style-type: none"> <li>Is there a nexus with the patronage forecast?</li> <li>Are the values used recommended by the ATC?</li> <li>Has the proponent calculated the direct emissions of their proposal? (i.e. include all carbon emissions from the construction or operation of the structure)</li> <li>Has the proponent calculated indirect emissions of their proposal?</li> </ul>				Neutral
21. Death/injury/crash costs, physical fitness and health impacts.	Austrroads sources			<ul style="list-style-type: none"> <li>Are the values used recommended by the ATC?</li> </ul>	n/a			Neutral
22. Noise, particle emissions and other environmental pollutants (NOX, NMVOCs, SOX, CH4, N2O) Noise impacts	ATC sources			<ul style="list-style-type: none"> <li>Are the values used recommended by the ATC?</li> </ul>	Calculated for car and freight, but not for new rail services.	Once calculated for new rail services BCR should decrease slightly.	Minor impact on BCR	Neutral