North West Corridor

Analysis of Heavy and Light Rail Options

Department of Planning, Transport and Infrastructure

Building a better working world

Parsons Brinkerhoff

SGS Economics and Planning

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Mr Phil Lawes
Department for Planning, Transport and Infrastructure
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11 September 2013

Reliance restricted

Analysis of Heavy and Light Rail Options for the North West Corridor

Dear Phil

I am pleased to submit to you our final report setting out the analysis of Heavy and Light rail options for the North West Corridor for the Department of Planning, Transport and Infrastructure (DPTI).

We would be happy to discuss with you any aspect of this report or our work and look forward to meeting with you to discuss this report in further detail.

Purpose of our report and restrictions on its use

This report was prepared on your instructions solely for the purpose of informing DPTI's assessment of rail options for the North West Corridor and should not be relied upon for any other purpose. Because others may seek to use it for different purposes, this report should not be quoted, referred to or shown to any other parties unless so required by court order or a regulatory authority, without our prior consent in writing.

Our report may not have considered issues relevant to any third parties. Any use such third parties may choose to make of our report is entirely at their own risk and we shall have no responsibility whatsoever in relation to any such use. This report should not be provided to any third parties without our prior approval.

We disclaim all responsibility to any other party for any loss or liability that the other party may suffer or incur arising from or relating to or in any way connected with the contents of this report, the provision of this report to the other party or reliance upon this report by the other party.

Liability is limited by a scheme approved under professional standards legislation.

Scope of our work

The scope of this analysis is designed to further develop the public transport options analysis to a point where a preferred option can be incorporated into ITLUS. Those options that have been considered within this analysis were agreed with DPTI and do not represent all possible public transport options for the corridor.

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The methodology adopted to undertake this work is based upon developing and testing the evidence base underpinning:

- Land use and transport goals and objectives for the North West Corridor
- Transport challenges and problems facing the North West Corridor
- Traffic assessment (demand, capacity and network analysis) to establish the relative performance of the options under consideration within this analysis.

Due to the preliminary nature of the information gathered this report does not seek to make recommendations in respect to which project options should be progressed for funding purposes.

The scope of our work has been to:

- Take an independent view of the demand and land use uplifts of the Project Options
- Document challenges and problems facing the North West Corridor
- Establish land use and transport goals and objectives for the North West Corridor
- Document policy alignment with current transport and land use objectives
- Agree a subset of Project Options for further analysis with DPTI
- Strategic fit of the Project Options in respect to the North West Corridor and ITLUS
- Utilise land use objectives and information generated to determine a shortlist of Project options and revised Base Case to be taken forward for further analysis.
- Review operating plan assumptions for Base Case and Project options
- Confirm run times and station locations for inclusion in MASTEM modelling and RailSys.

Exclusions to scope and limitations

- Procurement and financing considerations, including any review of the funding sources, potential financing solutions including availability and patronage based PPPs and likely future private sector appetite for various financing forms
- Risk analysis, including identification and quantification of the delivery, operational and financial risks of the Project Options
- Stakeholder engagement with parties within the North West Corridor including local governments, business and community groups.

The inputs into this evaluation do not represent the level of analysis that would have to be undertaken for this evaluation for final investment decisions to be undertaken. In particular:

- The demand modelling supporting this analysis is based on a fixed demand matrix, and therefore changes to land use and induced transport movements were excluded from this evaluation
- Those options that have been considered within this evaluation were at the express direction of DPTI and do not represent all potential project options
- We did not undertake any analysis to determine the appropriateness or accuracy of the inputs used in this analysis
- Benefits that would be realised by public transport users due to the provision of a more reliable service.

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Basis of our work

In undertaking the review we have relied upon background documents and information provided by DPTI and sub consultants. The timeframe for this analysis has limited our ability to review all project documentation on a detailed basis. Our work is based on the following:

- The Base Case and Project options taken forward for analysis
- The land use objectives for the North West Corridor are defined in the following overarching Government policies and planning documents:
    - The 30 Year Plan for Greater Adelaide
    - Inner Metro Rim Structure Plan
    - Master Plans for Transit Oriented Developments
- Run times have been derived through the RailSys simulation package for a variety of train and tram options.
- Fleet requirements - The estimates for train and tram fleet requirements for all services in Metropolitan Adelaide were derived directly for each unique service, defined by origin and destination, and service frequency.
- The respective Base Case and Project Case options were modelled using MASTEM v.3.1 with simulations conducted for 2021 and 2036.
- The traffic analysis undertaken is a high level review using information and data that was readily available. The analysis does not extend to include the impacts of tram operations along the Port Road median, nor along the Grange Road tram option to West Lakes.

We have performed research and analysis using the information above and other publicly available information drawn from a wide range of databases and on-line information which were available to us within the timeframe specified for preparation of this Report. We have not independently verified, or accepted any responsibility or liability for independently verifying, any such information nor do we make any representation as to the accuracy or completeness of the information.

Use of Sub Contractors

To assist in preparation of this Report, EY has relied on sub-contractors engaged for this analysis including:

Sub-contractor Name	Role
Parsons Brinkerhoff	• Analysis of the demand, capacity and network implications of the Project Cases.
SGS Economics and Planning	• Analysis of the land use implications of the Project Cases.

EY has conducted a high level review of the work undertaken by the sub-contractors to ensure consistency of the assumptions adopted. We have not verified the underlying accuracy of their work.

If you would like to clarify any aspect of this review or discuss other related matters then please do not hesitate to contact me on (02) 9248 4525.

Yours sincerely

Oliver Jones
Partner

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1. Key findings

Strategic level analysis has been undertaken on three public transport options (plus a number of variations within each option) in the North West corridor. Simplified, the options are:

- Electrification of the Outer Harbor rail line together with an extension of the light rail network to either via Port Road (option PC1) or along Grange/Findon Roads (option PC1B) to Woodville, with further extensions to West Lakes and Grange (the "heavy rail options").
- Conversion of the heavy rail line to light rail operations, with extensions to West Lakes and Grange (option PC2) (the "light rail option").

The analysis – summarised in Table 1 overleaf - suggests:

1. Maintaining a heavy rail service on the Outer Harbor line is likely to offer a significantly faster travel time for trips from the Lefevre Peninsula north of Port Adelaide to the Adelaide Railway Station. In total, a heavy rail service from Outer Harbor Station to Adelaide Railway Station is likely to be 15 minutes faster than a light rail service operating on the converted heavy rail corridor. However, the time required to reach street level from the heavy rail platforms means the difference in travel times for actual "end to end journeys" for many users is likely to reduce from 15 minutes to around 10 minutes.

2. In 2036 total network patronage is significantly greater for the train options than the light rail only option (c37,035 boardings per day for PC1 v 26,098 boardings per day for PC2 between Outer Harbor and the Adelaide Railway Station), principally reflecting the faster run times for train services.

3. Scenario tests suggest that investment in an underground city rail extension and/or a CBD light rail loop will not have a material impact on the preferred heavy/light rail option for the NW corridor.

4. The strategic level analysis indicates the following benefits of the light rail only option relative to the heavy rail options:

    - The ability to provide greater frequency of services
    - The ability to provide stations closer together
    - The ability to provide trams to service West Lakes, Port Adelaide, and to Semaphore
    - The ability to provide services into the heart of and across the CBD (not just at street level on North Terrace), to the new Royal Adelaide Hospital and broader health precinct, and provide better connections to the other tram line proposed under the draft Integrated Transport and Land Use Strategy.

5. Overall, dwelling and employment levels increase versus a "do nothing" base case for much of the corridor under all options. The dwelling and employment uplift is significantly stronger under the light rail only options. SGS has examined recent development along existing light rail corridors both in Adelaide and elsewhere and this has shown that light rail can unlock a higher increase in dwelling densities than other forms of transport. Unlocking increased uplifts (in both dwellings and employment) is an interaction between transport accessibility, land use controls / incentives and commercial feasibility. There is a feedback loop between these various aspects. The analysis suggests that a PC1C option could unlock 950 additional dwellings. However, modelling of other scenarios shows that land use / transport changes along the corridor could unlock up to 4,555 dwellings (PC2C). In order to unlock this scale of uplift under the PC1 options, the underlying modeling suggests that the optimisation process around those options should look at increasing frequencies on the tram line (as per point 4) and investigating policy interventions to better focus dwelling uplift (such as variable tax incentives).

Recommendation

The decision as to whether to further investigate the “light rail only” option or one of the options which combines heavy rail with light rail rests primarily upon the priority afforded to different policy objectives. The heavy rail options perform better from a travel time savings, overcrowding and amenity perspective; the light rail only option offers greater potential for land use change in the form of dwelling and employment uplift and those benefits identified in point 4.

On balance, under a traditional perspective on transport policy (which gives primacy to travel time savings) the significant travel time penalty for those travelling to and from the Lefevre Peninsula is the key differentiator between the options, and outweighs the potential dwelling and employment uplift differential between the heavy rail options and light rail only option. Of the options analysed, such a ‘traditional view’ suggests detailed investigations on the two options which combine continued heavy rail operations on the Outer Harbor line with extensions of the light rail network to West Lakes, Grange and Port Adelaide should be prioritised, rather than the “light rail only option”.

In contrast, under a policy position in which the potential to unlock land use change is prioritised ahead of traditional travel time savings and other transport benefits, then this recommendation would be reversed given the superior performance of the “light rail only” options in terms of uplift. However, as discussed in point 5 above, it would potentially be possible to improve the uplift from the mixed heavy/light rail options via a future option optimization process. Therefore, whilst at this stage of the analysis the modelling suggests the “light rail only” options provide more potential to unlock land use changes; future optimisation in relation to the PC1 options may alter this perspective. (Similarly, it may also be possible to reduce travel times, crowding disbenefits of the “light rail only” options through the optimisation process).

Regardless of which option (or options) are prioritised for further investigation, detailed optimisation and the testing of new and different sub-options (different alignments, station locations etc) will be essential to maximise the benefits of any future investment, minimize the trade-off between travel times and dwelling/employment uplift; and minimise its financial and wider social and environmental costs.

It should also be noted that several staging options exist and would be an important aspect of any further examination of the corridor. For instance, it would be possible to construct a tram down Port Road to Woodville (and potentially Port Adelaide) whilst continuing the heavy rail service (diesel or electric) in the rail corridor. This would allow a decision as to whether to extend trams to Outer Harbor (replacing the heavy rail service) to be taken in light of real world lessons from the impact of trams in part of the North West corridor.

The table below provides a summary of the analysis of the Project Options.

Table 1: Summary of analysis

	Project Case 1 Heavy rail and Light rail			Project Case 2 Light rail only	
	PC1	PC1B	PC1C	PC2	PC2C
	HR to Outer Harbor LR to Grange / West Lakes via Port Road	HR to Outer Harbor LR to Grange / West Lakes via Grange, Findon, Crittenden Roads	HR to Outer Harbor LR to Grange / West Lakes / Port Adelaide via Port Road	LR to Outer Harbor / Grange / West Lakes via rail corridor	LR to Outer Harbor / Grange / West Lakes via Port Road
Travel times (minutes)[1]	38	38	38	53	57
Patronage (2036)[2]	37,035	40,924	37,651	26,098	23,675
Uplift potential[3]					
Dwellings	740	1,485	950	3,040	4,555
Jobs	1,080	1,350	1,645	3,085	4,780
Infrastructure savings ($m)[4]	41.7	84.6	57.0	162.0	273.3
Staging potential[5]	Upgrade Torrens junction Continue with diesel trains in the short term Construct new tram line in stages.	Upgrade Torrens junction Continue with diesel trains in the short term Construct new tram line in stages.	Upgrade Torrens junction Continue with diesel trains in the short term Construct new tram line in stages.	Torrens junction not required Gauge convert/electrify for trams to Outer Harbor Extend to Grange and subsequently to West Lakes	Torrens junction not required Retain diesel trains to Pt. Adel. in short term Gauge convert/electrify for trams to Outer Harbor Construct tram line in stages.

1. Outer Harbor to Adelaide Railway Station.
2. Daily boardings from Outer Harbor to ARS. Tram patronage excludes boarding at stops from Rundle Mall to Glenelg.
3. Estimates relate to the incremental change for the whole of Adelaide relative to the revised Base Case with no initiatives from the 30 Year Plan for Greater Adelaide.
4. Real $, infrastructure savings from dwelling construction within existing urban area rather than new growth area for the period from 2021 to 2036 inclusive.
5. Options PC1, PC1B, PC2 and PC2C involve constructing a tram along Port Rd and would also allow for the rail to remain operating while the tram is constructed (e.g. a continuation of diesel operations until electrification is undertaken.

2. North West Corridor objectives and strategic context

2.1 Purpose of the analysis

The scope of this analysis is designed to further develop the public transport options analysis to a point where a preferred option can be incorporated into ITLUS. The scope of the analysis encompasses three broad phases as set out in the table below.

Table 2: Scope of the analysis

Phase 1 – Strategic considerations	Phase 2 – Determine analysis parameters	Phase 3 – Deliver analysis
Document challenges and problems facing the North West Corridor Establish land use and transport goals and objectives for the North West Corridor Document policy alignment with current transport and land use objectives Identify a long list of Project Options Articulate how the Base Case and long list of Project Options fit strategically with: • Revised land use and transport objectives • Wider Adelaide transport network plan (including revitalisation of Port Adelaide as an Identified Regional Activity Centre in the 30 Year Plan For Greater Adelaide) • CBD interface with the Project Options (for example, impact on CBD land use, public transport mode for a future city loop).	Confirm the functionality (and alignment) of the Base Case and long list of Project Options (Light Rail and Heavy Rail with Light Rail Elements). Utilise land use objectives and information generated to determine a shortlist of Project Options and revised Base Case to be taken forward for further analysis. Review operating plan assumptions for Base Case and Project Options. Confirm run times and station locations for inclusion in MASTEM modelling. Light rail run times will be updated to reflect times as modelled in RailSys.	Assessment of the Base Case and Project Options in terms of: • Review concept layouts • Demand Assessment • Network impacts • Capacity assessments • Land use considerations and quantification of uplift (in terms of dwelling and employment densities) • Updating of the MASTEM forecasts to reflect land use uplift in passenger demand

The objective of the analysis is to provide evidence around the particular options. The methodology adopted to undertake this work is based upon developing and testing the evidence base underpinning:

- Land use and transport goals and objectives for the North West Corridor
- Transport challenges and problems facing the North West Corridor.

The scope of the analysis specifically excludes:

- Procurement and financing considerations, including any review of the funding sources, potential financing solutions including availability and patronage based PPPs and likely future private sector appetite for various financing forms
- Risk analysis, including identification and quantification of the delivery, operational and financial risks of the Project Options
- Stakeholder engagement with parties within the North West Corridor including local governments, business and community groups.

2.2 Report structure

This Report comprises four sections which include the following topics.

Table 3: Report structure

Section	Title	Content
1.	Executive summary	A summary of key findings from the analysis of Heavy Rail and Light Rail options.
2.	North West Corridor objectives and strategic context	Background to the purpose of the analysis, study area, strategic land use considerations, modal transport options and short list of options for analysis.
3.	Demand, network impacts and capacity analysis	Operational assumptions including vehicle technology, run times, capacities and service frequencies, fleet requirements and travel time comparisons. Traffic impact assessment of the Project Options.
4.	Land use assessment	Land use objectives, key master plans for sites along the corridor, strategic assessment of options against goals and objectives and overall strategic alignment.

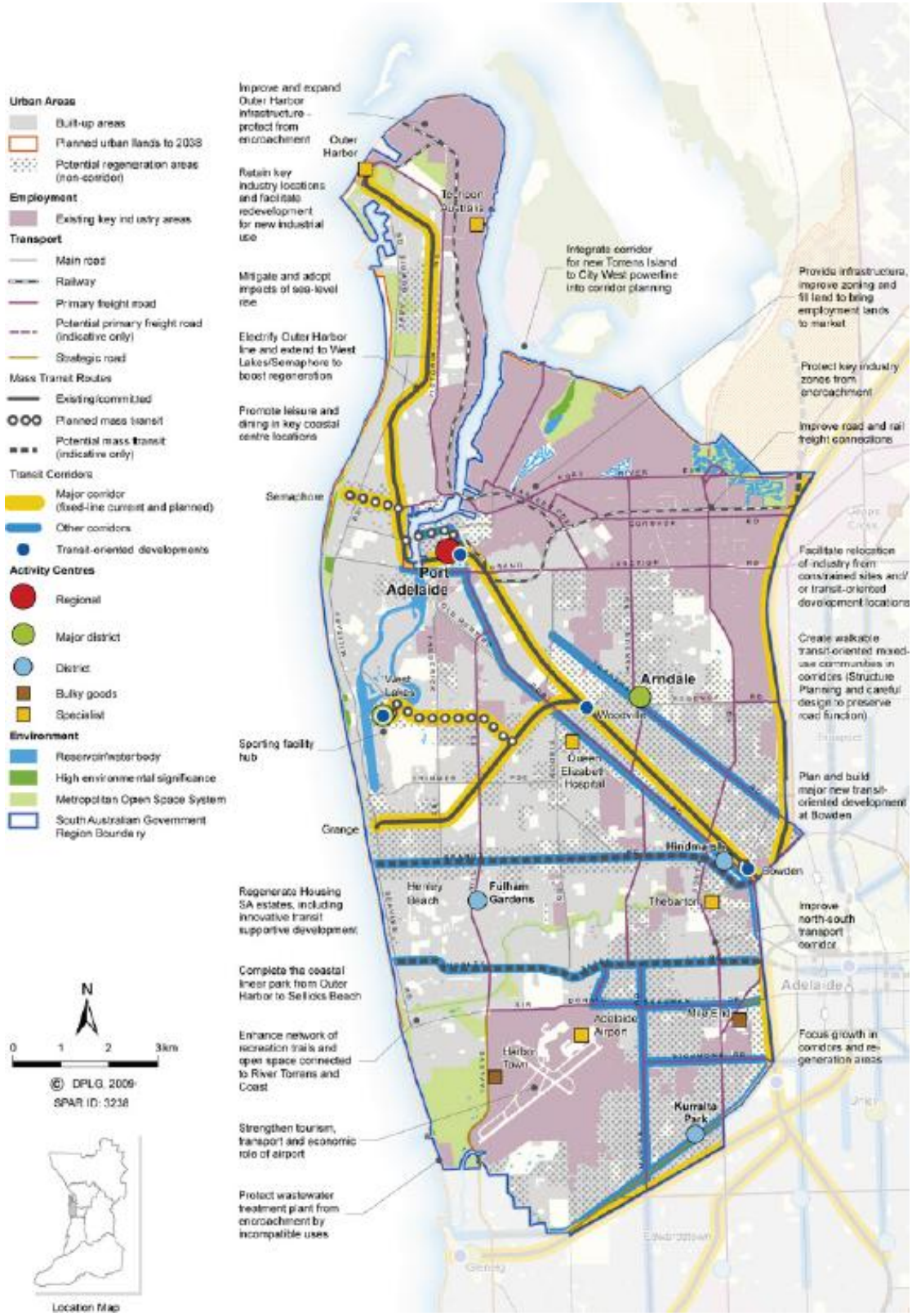
2.3 North West Corridor study area

The North West Corridor stretches from Bowden (located on the north western fringe of the parklands surrounding the CBD and North Adelaide) in a north westerly direction to the regional centre of Port Adelaide. The Corridor also encompasses the Lefevre Peninsula which extends northwards from Port Adelaide to Outer Harbor.

This Corridor is set out in the figure over the page and is defined by the yellow line indicating the existing heavy rail transit corridor.

The Corridor comprises the northern part of the “Western Adelaide” region in the context of *The 30 Year Plan for Greater Adelaide* and also encompasses existing and proposed corridors north of Henley Beach Road to the activity centres of Woodville, Grange and West Lakes.

Figure 1: Western Adelaide Directions Map



Source: Department of Planning, Transport and Infrastructure (SA), 2010

2.3.1 North West strategic land use considerations

The wider North West Corridor has a long established manufacturing and transport and logistics base, with a focus on Gillman, Port Adelaide and the Lefevre Peninsula regions; the Techport precinct is a more recently established major Defence hub. Other manufacturing and related activities are located across the region.

The North West Corridor includes a number of strategic sites identified for residential infill, urban nodes and activity centres. These are centre around the Bowden precinct in the south east, Woodville and West Lakes precincts to the west and Port Adelaide precinct in the north west.

The strategic land use considerations within the North West Corridor include:

- Increasing housing density along the length of the Corridor, particularly at rail stations and at Bowden
- Consolidating employment in and around railway stations along the Corridor and at Bowden
- Re-use of former industrial land along the corridor for housing including the Cheltenham Racecourse, the Actil site, and at Port Adelaide
- Creating alternative living/working choice options (changing demographics) along the North West rail corridor
- Improving self-containment levels in Port Adelaide
- Assisting in the revitalisation of Port Adelaide
- Strengthening the role of the Adelaide CBD (employment and residential)
- Opening possible transport options at West Lakes with the move of AFL football away from AAMI Stadium.

2.3.2 North West Corridor transport context

Historical context

Rail and tramways have a long history in the North West Corridor and Port Adelaide regional centre.

The rail line from Adelaide to Port Adelaide has been in operation for many years, fist opening in 1856, with stations at Bowden, Woodville, Alberton and Port Adelaide. The line was subsequently extended:

- From Port Adelaide to Largs Bay in 1882 and the newly established Outer Harbor from 1908.
- From Woodville to Grange in 1882.

The operation of trams in Port Adelaide also has a long history dating from the First World War, with the laying tracks from the Jervois Bridge through Port Adelaide to Albert Park and Rosewater in 1914. Lines to Semaphore, Rosewater and Albert Park were opened in 1917 with services from Semaphore to Albert Park and Largs to Rosewater. These trams operated in the Port Adelaide district until 1935.[1]

[1] *Adelaide Road Passenger Transport 1836 -1958*, J. Radcliffe and C. Steele, Libraries Board of South Australia 1974

Transport policy context

In the 2008-09 State Budget the South Australian Government announced the Future Public Transport Network strategy.

This policy involves a program of initiatives designed to improve the public transport system to deliver on South Australia's Strategic Plan (SASP) target of an "increase the use of public transport to 10% of metropolitan weekday passenger vehicle kilometres by 2018".

To achieve the level of service necessary to increase patronage to meet the SASP target 63, the Government has proposed that the network will be improved through track upgrades and electrification, train and bus rolling stock will be replaced and increased, and on-road bus priority measures implemented. In addition, interchanges, stations and stops will be upgraded and system-wide passenger information measures will be introduced.

The following initiatives are relevant to the North West Corridor:

- Completion of the Rail Revitalisation Project on the Outer Harbor and Grange rail lines, including bridge and signalling system reliability upgrades, gauge standardisation and supporting asset management systems
- Introduction of a new smart card ticketing system
- Purchase of new light rail vehicles
- Electrification of the rail network (subject to funding in future years)
- Commencement of conversion of the most recently purchased diesel railcars to electric operation as rail lines are progressively electrified
- Upgrading of interchanges, stations and car parking
- DDA and security improvements across the public transport network
- Tram extensions from City West to the Adelaide Entertainment Centre (AEC). Connection to the Outer Harbor rail line and further tram extensions to West Lakes and Port Adelaide were proposed but have been suspended indefinitely.

In 2013 DPTI has been developing an Integrated Transport and Land Use Strategy. The analysis in this Report has been undertaken in the context of ITLUS.

Transport in the North West Corridor

The Corridor has effective transport linkages providing accessibility for employees and industry:

- Strong road linkages for passenger and freight movements: Port River Expressway, Grand Junction Road, Port and Torrens Roads, Grange Road and Tapleys Hill Road. Closer to the City, the South Road corridor provides accessibility of heavy truck movements to the region. The recently completed Port River Expressway provides important freight access from the National Highway system to the Wingfield/Gillman precincts, and to Port Adelaide and Outer Harbor.

- The widely-distributed employment nodes in the region have influenced the ability for public transport to be an effective mode for travel to work. This has been compounded by shift work.

- Public transport access is provided in two forms:

  - A radial train service linking the Adelaide CBD to Outer and to Grange. This rail corridor ranks third of all the rail corridors in Adelaide in terms of daily passenger uplift. (Base case 2036 rail patronage is estimated at 23,500 daily boardings; this compares with some 41,600 boardings on the Gawler line, and 31,000 boardings on the Seaford/Tonsley line; the Belair line is forecast to carry in the order of 8,000 passengers per day.) There is also a spur line from Woodville to Grange.

  - Train services have also been historically complemented by a bus network that has:

- Focused on the Port Adelaide centre for transfer to City bound buses
- Provided an important access role to the West Lakes, Port Adelaide and Arndale district centres
- Provided limited cross suburban bus services linking centres.

Historically the Outer Harbor rail service has primarily provided a longer distance commuter role, linking the North West to the City; intra-regional passenger movements are understood to have been relatively minor. The train service has not provided convenient access to Port Adelaide, with the Port Adelaide station being located on a viaduct at the southern extremity of the centre.

Public transport in the North West Corridor is essentially independent of services in other major corridors of Adelaide.

2.4 Options analysis

A Base Case and a list of options have been developed consistent with the strategic land use considerations. These options were agreed with DPTI and were limited to Heavy Rail and Light Rail modal solutions.

The following principles established by DPTI were also considered in developing the project options:

- The overarching objective of assessing the relative merits of electric train and/or tram services as an alternative to the current diesel train services in the North West Corridor between Outer Harbor and the Adelaide Railway Station
- Tram services should be included in the respective options to link into the proposed urban development node at West Lakes to facilitate value uplift in residential and commercial development in the precinct
- Tram services should serve the Port Adelaide regional centre where it is feasible to do so, as a means of contributing to urban renewal objectives for the historic precinct
- Bus service arrangements remain fixed to ensure assessment only of the merits of the respective options
- The patronage impacts of a proposed underground City train link and City tram loop are to be assessed (but not the feasibility of the link and loop per se).

These requirements led to the development of the following short listed core Electrified Heavy Rail and Light Rail options to assess the merits of these modal services.

Table 4: Modal transport options

Options	Year	Description
Base Case – Do Minimum	2021	A “Do minimum” case incorporating completion of the electrification of the Gawler and Seaford rail lines. Also includes committed station upgrades, Tonsley line upgrade, and new park-and-ride facilities. This case enables incremental assessment for alternative light and heavy rail options for the North West Corridor. It includes the public transport infrastructure and service improvements which would occur in the absence of electrified heavy rail or light rail.
	2036	As per 2021, plus additional station upgrades, It also includes proposed train extensions into new growth areas. These are also included in the respective project cases so that they have no net influence on the analysis.
Base Case – City rail link / tram loop	2036	As per Base case above, but including a City underground rail and link and a City tram loop.
Electrified Heavy Rail Options		
Project Case 1 (PC1)	2021	Electric train service from Outer Harbor to Adelaide Railway Station (ARS), retaining diesel trains from Grange to ARS. No trams to West Lakes/Grange.

Options	Year	Description
	2036	Electric trains from Outer Harbor to ARS, with tram service along Port Road to Woodville, thence to West Lakes and Grange.
Project Case 1A (PC1A)	2021	As per Option PC1.
	2036	As Option PC1 with CBD rail link and City tram loop. Rail services are assumed to be through linked via the rail link.
Project Case 1B (PC1B)	2021	As per Options PC1.
	2036	Electric trains from Outer Harbor to ARS, with tram service along Grange Road, Findon Road and Crittenden Road to Woodville, thence to West Lakes and Grange.
Light Rail Options		
Project Case 2 (PC2)	2021	Tram service from Outer Harbor to ARS tram stop along the existing rail corridor, with extension to Grange.
	2036	As per 2021, with tram extension to West Lakes.
Project Case 2B (PC2B)	2021	As per PC2.
	2036	As per PC2 with CBD rail link and City tram loop.

Following discussions with DPTI on 16 August 2013, the following two additional Project Cases were identified.

Table 5: Additional modal transport options

Options	Description
Electrified Heavy Rail Options	
Project Case 1C (PC1C)	As per Option PC1, with a tram service extending from Port Adelaide along the Commercial Road / Port Road median to the Adelaide Entertainment Centre, thence through the City to South Terrace.
Light Rail Options	
Project Case 2C (PC2C)	As per Option PC2, but with the tram located along the Port Road median from the Adelaide Entertainment Centre to Outer Harbor, thence along the rail corridor from Glanville to Outer Harbor.

These options are illustrated graphically in Appendix A.

The timings set out for the Project Cases above are indicative only. They are subject to change, but have been assumed as the basis for the strategic level analysis in this Report.

3. Demand, capacity and network analysis

3.1 Introduction

The overarching objective of the demand, capacity and network analysis is to establish the relative performance of the options under consideration in this Report.

The analysis was addressed through a process that considered:

- Modelling of future patronage demand in response to a series of modal options
- Assessment of operational performance of these options with reference to:
  - Relative travel times
  - Operational capacities of the corridor
  - The ability to accommodate forecast patronage demand by trains and trams operating at service frequencies that will attract passengers and provide for a comfortable standard of service within corridor operational capacities
  - The impacts of train and tram services on the road network where services cross arterial roads or run on street (trams).

3.2 Operational assumptions

This section of the Report outlines the key operational assumptions that have been adopted for the analysis of project options. Further detail can be found in Appendix B to this Report.

3.2.1 Vehicle technology

The analysis in this Report is based on the train and tram vehicle technologies set out in the following table.

Table 6: Vehicle technology

Mode	Technology
Electrified trains	Bombardier 4000 class cars, having 80 seats per car
Trams	Bombardier Flexity-2 trams, having a length of 43 metres, with of 2.4 metres (consistent with existing Adelaide tram fleet) and 74 seats per tram.

Source: Parsons Brinkerhoff

These technologies have been adopted to align with the trains purchased for the electrified Seaford to Adelaide rail line and the next generation of Flexity trams that currently operate on the Adelaide tram network.

While it is possible to configure the Flexity-2 trams with fewer seats than outlined in the table above, this has typically been done in European cities where trams operate over short routes. For longer trips such as Outer Harbor to the Adelaide Railway Station a higher proportion of seats is considered desirable and has been adopted for the analysis in this Report.

3.2.2 Vehicle planning capacities

Vehicle planning capacities were derived from specifications for the respective train and tram technologies. Analysis of capacities was based on the following criteria:

- Seating capacities as described in section 3.2.1
- Desirable planning capacities based on a rate of four standees per square metre
- Maximum planning capacity of five standees per square metre
- Crush load of six standees per square metre

- No coupling of trams given the design length of 40 metres for tram stops along the existing Adelaide tram network.

The table below summarises the capacity values derived on the basis of these principles.

Table 7: Vehicle planning capacities

Vehicle type	Number of seats	Desirable planning load	Maximum planning load	Crush load
Flexity-2 Tram				
Single car	74	191	222	250
4000 Class Train				
3 cars	240	438	486	540
4 cars	320	604	668	740
6 cars	480	906	1002	1110

Source: Parsons Brinkerhoff

3.2.3 Service and travel run times

Run times have been derived through the RailSys simulation package for a variety of train and tram options. This simulation is based on a set of parameters including:

- Vehicle performance (determined through traction curves for acceleration, cruise and deceleration performance)
- Average dwell time at each station
- Tram travel time on-street (actual travel speeds, the impacts of traffic signal operation and other traffic).

These RailSys simulations were undertaken for Bombardier 4000 class electric trains and for Flexity trams (which closely approximates the performance of proposed Flexity-2 trams).

Travel times derived from RailSys simulation runs are summarised in the table below and have been incorporated into the demand analysis.

Table 8: Travel times

Line section	Run time (minutes)		Comments
	Trains PC1, PC1A, PC1B	Trams* PC2, PC2B	
Outer Harbor – Woodville	25	29	Includes 4 minutes on-street running through Port Adelaide
Woodville – Bowden	9	-	
Woodville – AEC	-	12	Includes time to cross to inbound Port Road carriageway
Bowden – ARS	4		
AEC – ARS tram stop	-	12	Includes on street running from AEC to ARS tram stop
Total OH to ARS	38	53	

Source: Parsons Brinkerhoff

** The estimated run time for PC2C where the tram runs down Port Road is 57 minutes.*

Key findings from this analysis include:

- Trains offer a significantly faster travel time for longer distance trips from the Lefevre Peninsula north of Port Adelaide to the ARS
- Trams have a four minute run time penalty between Outer Harbor and Woodville, attributable to the on-street running through Port Adelaide
- Between Woodville and Bowden/AEC trams have a combined 3.3 minute headway compared to 10 minutes for trains.

The analysis has assumed a five minute allowance for train passengers to walk from the ARS platforms to the North Terrace tram stop. The difference in travel times reduces from 15 minutes to 10 minutes. This assumption is reflected in the patronage forecasts.

3.2.4 Fleet requirements

The estimates for train and tram fleet requirements for all services in Metropolitan Adelaide were derived directly for each unique service, defined by origin and destination, and service frequency.

The calculations were conducted for each respective Base Case and Project Case for 2021 and 2036 as set out in the tables below. These estimates do not include allowances for maintenance or spares.

Table 9: Estimated fleet requirements 2021

Mode	Option		
	Base Case	HER PC1, PC1A, PC1B	Tram PC2, PC2B
Trains	59	60	48
Incremental to the Base Case	-	+1	-11
Trams	26	26	38
Incremental to the Base Case	-	-	+12

Source: Parsons Brinkerhoff

Table 10: Estimated fleet requirements 2036

Mode	Option						
	Base Case	Base Case Link/Loop	EHR PC1	EHR PC1A	EHR PC1B	Tram PC2	Tram PC2B
Trains	54	72	57	72	57	48	65
Incremental to the Base Case	-	-	+3	-	+3	-6	-7
Trams	71	84	79	92	81	98	111
Incremental to the Base Case	-	-	+8	+8	+10	+27	+27

Source: Parsons Brinkerhoff

3.3 Demand forecasts

3.3.1 Process adopted

The respective Base Case and Project Case options were modeled using MASTEM v.3.1. Simulations were conducted for 2021 and 2036 and the outputs from this modelling include:

- Detailed public transport passenger statistics
- Transit line reports of run times and coded headways
- Summary loadings at key sections along the North West Corridor
- Detailed line loading data.

3.3.2 Summary results

The table below provides a summary of forecast passenger boardings for each of the Project Cases in 2021. Detailed forecast passenger boardings are presented in Appendix B.

Table 11: Summary of patronage forecasts by options (boardings/day): 2021

Corridor section	Daily boardings by Option	
	EHR Options PC1, PC1A, PC1B, PC1C	Tram options PC2, PC2B, PC2C
Outer Harbor – St Clair	7082	4782
Grange – Albert Park	3002	2093
Woodville – Bowden	4295	4173
AEC – City West (tram)	3483	4233
ARS (tram)	1438	2164
Sub-Total Train/Tram	19300	17445
Adelaide Railway Station	4106	-
Total Corridor Boardings	23406	17455
Rundle Mall – City South	11436	14313
South Terrace - Glenelg	10859	10873
Sub Total Tram	22295	25186
Total Boardings (incl ARS)	45701	42631

Source: Parsons Brinkerhoff

The key findings from the above patronage forecasts for 2021 include:

- Overall total corridor boardings are similar across all train and tram options
- Patronage between Outer Harbor and St Clair is significantly higher for the train than the tram option, reflecting faster run times for train services.
- Patronage between Woodville and Bowden is marginally higher for the train than the tram option, again reflecting the faster run times for train services.
- Boardings between the AEC stop and the city are higher for the tram option.

The table below provides a summary of forecast passenger boardings for each of the Project Cases in 2036.

Table 12: Summary of patronage forecasts by options (boardings/day): 2036

Corridor section	Daily boardings by Option						
	PC1	PC1A	PC1B	PC1C	PC2	PC2B	PC2C
Outer Harbor – Port Adelaide	7577	7370	7559	7465	5198	5179	4994
Alberton to St. Clair	1871	1826	2011	1824	1240	1215	895
West Lakes – Tapleys Hill Road	1696	1672	1960	1718	1560	1534	1430
Grange – Albert Park	1692	1641	1527	1672	2067	2034	2054
Woodville – Bowden	4836	5243	7872	4622	6892	6754	-
Woodville Rd – Coglin St	2855	2549	-	3303	-	-	4257
QEH - Hindmarsh	-	-	5211	-	-	-	-
Woodville Rd – Pt Adel	-	-	-	704	-	-	-
AEC – City West (tram)	6000	5554	5712	6295	5918	5676	6957
ARS (tram)	2487	3284	2397	2856	3223	5232	3088
Sub-Total Train/Tram	29014	29139	34249	30459	26098	27624	23675
Adelaide Railway Station	8021	n/a	6675	7192	-	-	-
Total Corridor Boardings	37035	n/a	40924	37651	26098	27624	23675
Rundle Mall – City South	15707	11903	15434	16589	18842	14502	18361
South Terrace - Glenelg	13965	12667	13969	13960	14560	13344	14669
City tram loop	-	3273	-	-	-	4434	-
Sub Total Tram	29672	27843	29403	30549	33402	32280	33030
Total Boardings (incl ARS)	66707	n/a	70327	68200	59500	59904	56705

Source: Parsons Brinkerhoff

The key findings from the above patronage forecasts for 2036 include:

- The faster train service outperforms the tram service between Outer Harbor and St Clair due to slower tram travel times on street through Port Adelaide
- Between Woodville and Bowden/AEC, the tram option outperforms the train service due to a combined tram service headway of 3.33 minutes compared to 10 minutes for the train service.

3.3.3 Passenger travel patterns

Analysis was undertaken to assess broad travel patterns of passengers boarding along different sectors of the corridor.

The assessment was prepared for the core options PC1 and PC2 for the Peterhead to Glanville sector north of Port Adelaide. This link between Peterhead and Glanville stops was selected to analyse passenger loadings along sections of the corridor and inform trip length characteristics for outer areas of the North West corridor.

Peterhead to Glanville: PC1

The main findings from this analysis comprise:

- Approximately 41% of train passengers along the corridor between Outer Harbor and the ARS would board trains north of Port Adelaide
- Approximately 53% of passengers on board trains between Peterhead and Glanville stations travel the full length of the corridor to ARS.

Peterhead to Glanville: PC2

The main findings from this analysis comprise:

- Approximately 18% of patronage along the corridor between Outer Harbor and the ARS tram stop boards tram services north of Port Adelaide.
- Approximately 44% of passengers on board trams between Peterhead and Glanville travel the full length of the North West Corridor to the ARS tram stop.

The analysis indicates that with the train option (PC1), a higher proportion of patronage is generated along the Lefevre Peninsula north of Port Adelaide. A higher proportion of passengers from the Lefevre Peninsula travel the full length of the corridor to the ARS in this option. This reflects the faster travel times compared to the tram option (PC2).

3.3.4 Scenario tests

The demand modeling incorporated scenario tests conducted for Project Cases PC1A and PC2B which assume the inclusion of a City underground rail link and a City tram loop. These scenario tests demonstrate:

- The underground rail link provides for improved City train passenger distribution and an increase in overall rail patronage from improved City accessibility
- The forecast patronage on the tram loop in 2036 is modest ranging from 3,273 to 4,434 daily boardings.

3.3.5 Crowding assessment

An assessment of crowding costs for train and tram passengers was undertaken for the respective Base Case and core Project Options (PC1 and PC2) in 2021 and 2036, drawing on the process described in the Australian Transport Council Guidelines (Volume 4, section A.3).

DPTI has previously developed a procedure for estimating crowding costs based on the ATC guidelines and this has been adopted for the crowding assessment.

The analysis shows an increase in passenger crowding disbenefits under tram option PC2 compared to PC1. A summary of the analysis shows:

- For PC1 an increase in AM peak period patronage of approximately 13% compared to the Base Case at 2036, accompanied by an increase in the time spent in crowded conditions. Crowding disbenefits increase by 83% relative to the Base Case in 2036.
- For PC2 a decrease in AM peak period patronage of approximately 10% compared to the Base Case at 2036, but with an increase in the time spent in crowded conditions by a factor of around 350% compared to the Base Case.

Further detail on the crowding analysis can be found in Appendix B (section 5.6).

3.4 Traffic impact assessment

3.4.1 Process adopted

A high level investigation of the road network impact of the Project Options has been undertaken. The purpose of this investigation was to identify potential issues on the road network associated with the Options and possible measures required to alleviate these issues.

The potential issues associated with the public transport improvements incorporated within the Project Cases includes:

- Increased delays at existing rail and tram level crossings
- New tram crossing of existing roads
- New tram crossings of existing intersections
- Accommodating new tram lines within existing road cross sections.

3.4.2 Summary analysis

The traffic analysis undertaken is a high level review using information and data that was readily available. The analysis does not extend to include the impacts of tram operations along the Port Road median, nor along the Grange Road tram option to West Lakes.

The improvements identified through the review of the sites that could be impacted by the Project Options includes:

- For tram Project Options PC2 and PC2B, Kilkenny Road requires dual laning for an approximate distance of 110 metres either side of the existing level crossing
- For tram Project Options PC2 and PC2B, Woodville Road requires the existing boom gate level crossing to be removed and replaced with traffic signals (assuming the road cross section remains at four lanes)
- New signalised crossing of the inbound carriageway of Port Road at Bowden
- Upgrade of the Commercial Road / St Vincent Street intersection to accommodate trams turning into Port Adelaide
- Proposed removal of two traffic lanes from St Vincent Street between Commercial Road and Nelson Street
- New traffic signals at the Hart Street / Carlisle Street intersection to permit turning trams
- New signals at the Carlisle Street / Causeway Road to facilitate tram entry into the Glanville Station

Further detailed analysis is found in Appendix B.

4. Land use assessment

4.1 Introduction

The land use assessment covered in this section of the Report was developed by SGS Economics and Planning and is provided in two phases, as follows:

- Phase 1: document the key land use challenges, define land use goals and objectives for the North West Corridor
- Phase 2: estimate the land use uplift, in terms of population, dwellings and employment (by major industry group) over the medium to long term.

4.2 Land use challenges and objectives

The land use objective for the North West Corridor are defined in the following overarching Government policies and planning documents:

- The 30 Year Plan for Greater Adelaide
- Inner Metro Rim Structure Plan
- Master Plans for Transit Oriented Developments

These are summarised in the remainder of this section of the Report.

4.2.1 30 Year Plan for Greater Adelaide

The 30 Year Plan for Greater Adelaide anticipates a population increase of 560,000, approximately 258,000 additional dwellings and the creation of at least 282,000 jobs over 30 years.

In accommodating that growth the plan identifies a new urban form. Characteristics of this new urban form include:

- Concentrating new housing in existing areas
- Locating new housing and new jobs in transport corridors
- Establishing new transit-oriented development
- Increasing densities around stations and transport interchanges
- Creating vibrant mixed-use precincts
- Revitalising the Adelaide City centre and other higher-order activity centres.

To achieve the new urban form requires the transition from the current urban development pattern of 50 per cent of new development in infill locations and 50 per cent in greenfield areas to 70 per cent infill development and 30 per cent greenfield over 30 years. This will result in more than 50 per cent of the region's new housing growth being concentrated in transit corridors that have, or are planned to have mass transit.

The various heavy and light rail options being assessed in this Report are located in the western region of Greater Adelaide.

The Western Region has a target of an additional 83,000 people over 30 years. Approximately 75% of this new population, or 62,100 people, are to be located within transport corridors including Transit Oriented Development sites (TODs). 42,560 new dwellings are to be developed in the western region with 33,060 to be located in corridors (including TODs) and 9,500 outside corridors. The region has a target of 40,500 additional jobs over 30 years.

The Plan identifies:

- Four TODs in the western region: Bowden, Woodville, Port Adelaide and West Lakes

- Corridors for increased densities in the region: Adelaide – Outer Harbor rail corridor, Woodville – Grange rail corridor, Grange line – West Lakes planned mass transit corridor, Grange Road potential mass transit corridor, major road corridors including Port Road.

4.2.2 Inner Metro Rim Structure Plan

Broadly defined, the Inner Metropolitan Rim is the part of inner metropolitan Adelaide adjacent to the parklands and roughly within one km from the outer edge of Adelaide's Central Business District. Given the existing concentration of infrastructure, employment opportunities, mixed-use infill corridors identified in *The 30-Year Plan for Greater Adelaide*, access to public transport, and proximity to the CBD, it is considered to be an important area for future development.

To help guide future development in these locations, the State Government released the Inner Metro Rim Structure Plan to further refine the directions set out in *The 30-Year Plan for Greater Adelaide*.

The inner rim has been divided into 14 sectors as set out in the Figure below.

Figure 2: Sector plan boundaries

Source: Department of Planning, Transport and Infrastructure (SA), 2012

Most relevant to the North West Corridor is Sector 13 (River Torrens (West) – Sixth Street), centered on Port Road between the northern edge of the parklands and South Road.

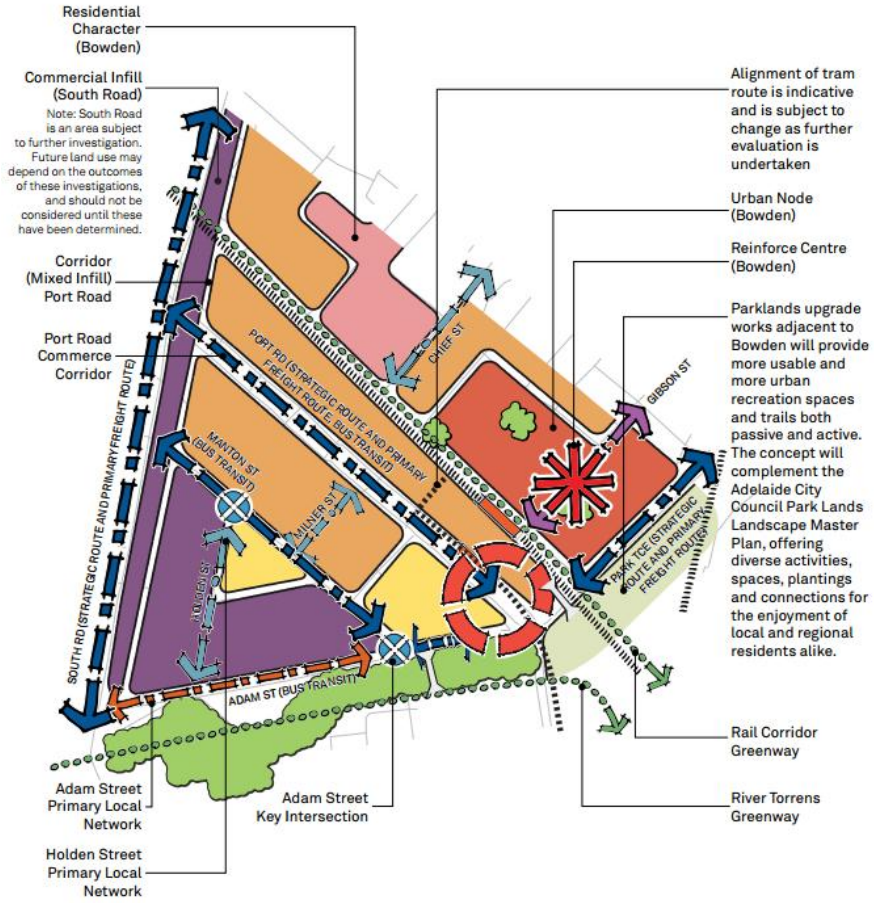
Sector 13 is set out in the following figure and key built form elements identified for this sector include:

- A 'Port Road gateway' at the corner of Port Road and Park Terrace with a vision for 6-14 storey buildings with commercial and office uses on the ground level with office and residential above.
- Higher density mixed use development for the majority of the sector including:

- 4-6 storey development along Port Road
- 3-8 storey buildings along Gibson Street, Bowden's proposed high street
- 3-14 storeys in the immediate surrounds of Gibson Street.

- Commercial infill development of 3-5 storeys along Adam Street and South Road with 4-5 storey building heights at the intersection of Manton and Holden Streets.

Figure 3: Sector plan 13



Source: Department of Planning, Transport and Infrastructure (SA), 2012

4.2.3 Key corridor master plans for Transit Oriented Developments

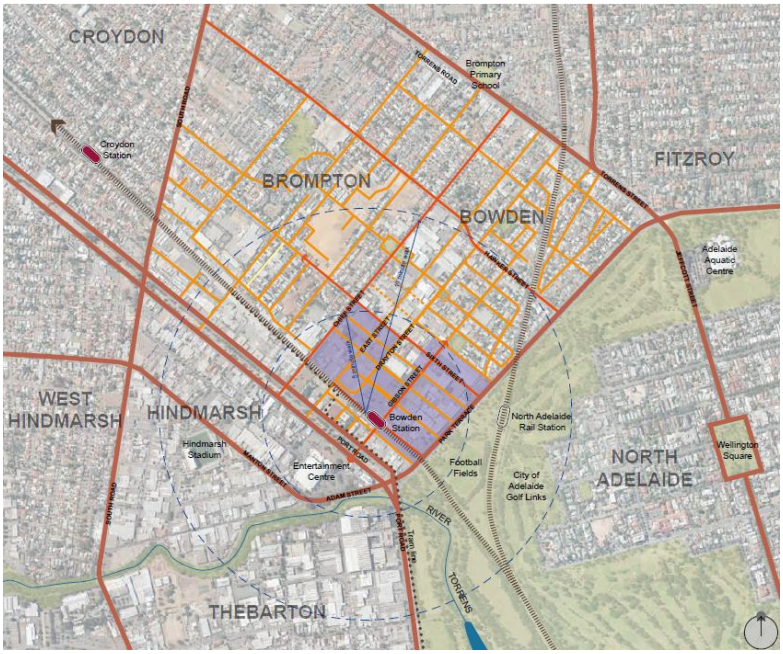
In the western region four sites for Transit Oriented Developments were identified in The 30 Year Plan for Greater Adelaide: Bowden, Woodville, Port Adelaide and West Lakes.

Bowden

The site covers approximately 40 hectares predominantly located north of the Outer Harbor Rail Line and approximately three kilometres north-west of the Adelaide CBD.

The site includes the Bowden Urban Village (approximately 20 hectares), a small strip of land between the train line and Port Road and two former industrial sites: the former Clipsal factory site and the Origin Energy site.

Figure 4: Bowden context map



Source: Annand Alcock Urban Design and LFA Pacific, 2011

The site has been divided into six precincts. Development of these precincts is anticipated to include areas of low to mid rise residential development (the Urban Village component of the site is anticipated to yield 2,400 new dwellings at a site density of 145 dwellings per hectare); a retail and mixed use core; a Port Road Gateway with significant commercial based mixed use development and commercial and mixed use development along Port Road. The railway line is to be undergrounded to enable the development of Bowden Station Square which is to be the focus of the village where the rail interacts with the commercial, retail and community heart.

Figure 5: Bowden precinct map

Source: Annand Alcock Urban Design and LFA Pacific, 2011

Woodville

The study area is located approximately 7.5 kilometres north-west of the Adelaide CBD. It is centred on Woodville Road between Torrens Road and Port Road and consists of land covered by the Woodville District Centre Zone.

The Woodville Railway Station is located centrally in the study area and is the junction of the Outer Harbor and Grange train lines.

Figure 6: Woodville study area

Source: Jensen Planning + Design, 2010

Key elements of the Woodville Village master plan include:

- A gateway to the study area with increased densities of 4-6 storeys and mixed uses at the Port Road/ Torrens Road junction but with a particular focus on health services.
- A civic and retail heart with a mix of retail, residential and commercial uses in 4-6 storey buildings lining Woodville Road.
- New residential development with a mix of medium and higher density housing options in medium to high rise buildings.

Port Adelaide

Planning for the revitalisation of Port Adelaide has been the subject of a number of plans over the past twenty years. Renewal SA is currently working with the community to create a 'living port'. The aim is to have more people living, working, investing and spending time in Port Adelaide.

Together with City of Port Adelaide Enfield, Renewal SA has commenced promoting a series of events and infrastructure works to increase public open space areas, restore historic building and activate Port Adelaide for both locals and visitors.

These projects are intended to revitalise the use of land and space at Port Adelaide, providing access to the waterfront of the Inner Harbour. With these investments and initiatives over time it is intended that Port Adelaide attract more private sector investment which aids in the revitalisation of the centre.

West Lakes

West Lakes is the site of the current AAMI Stadium home to the SANFL. From 2014, AFL games will move to the redeveloped Adelaide Oval. This has presented the opportunity for a significant urban renewal. The Development Plan Amendment (DPA) to allow this renewal to take place was on was on public consultation during February and April 2013. The DPA proposes a mix of uses and higher density housing for the area affected. It introduces:

- An Urban Core Zone to support compact, medium to high density development around public transport improvements
- A Main Street Policy Area to support a hub for community activities, residents and businesses.

4.2.4 Distillation of challenges, goals and objectives

From the above review of The 30 Year Plan for Greater Adelaide and of completed master plan for TODs within Western Adelaide (which cover the North West Corridor), the following distillation of land use challenges, goals and objectives can be conceived:

- Increased residential and commercial density (in the TODs and along corridors)
- Higher densities at key intersections / gateways (at the edge of relevant TODs)
- Mixed uses (within TODs and along corridors)
- Integration of train stations (with surrounding land uses)
- Improved public realm (in TODs and corridors specifically, and more generally)
- Revitalising the Adelaide City centre and other higher-order activity centres.

The following table provides a strategic assessment of the heavy rail options against the land use goals and objectives.

Table 13: Strategic land use assessment

Land use characteristic	Heavy Rail Options	Light Rail Options
Increased residential and commercial density (in the TODs and along corridors)	Heavy rail is likely to intensify density around stations but with more limited development along the corridor. This may be dependent to some extent on the spacing of stations.	Light rail is likely to have a greater benefit for development along the rail corridor, as well as in the TODs (outside of the immediate catchment of the station). However, the intensity of development that eventuates may be less around railway stations than with heavy rail. This may be dependent to some extent on the spacing of stations/ the number of light rail stops. Given the larger footprint of development opportunities enabled by light rail, i.e. along the corridor, the actual delivery of increased residential and commercial density might be better facilitated under Option 2.

Land use characteristic	Heavy Rail Options	Light Rail Options
Higher densities at key intersections / gateways (at the edge of relevant TODs)	Heavy rail could contribute to higher density development at these locations if they are close to a train station. However, the intensity of development in these locations will be heavily impacted by other factors including the commercial viability of higher density development.	Light rail could contribute to higher density development at these locations if they are close to a train station/ stop. However, intensity of development in these locations will be heavily impacted by other factors including the commercial viability of higher density development.
Mixed uses (within TODs and along corridors)	Would promote mixed uses but would be focused around railway stations.	Would promote mixed uses at stations and also along corridors.
Integration of train stations (with surrounding land uses)	Heavy rail corridors have limited permeability and restrict movement across the corridor. However, this can be overcome by undergrounding the railway station, as proposed in Bowden.	Light rail corridors and stations are more open and permeable than heavy rail and therefore better enable land use integration.
Improved public realm (in TODs and corridors specifically, and more generally)	Public realm improvements are possible along a heavy rail corridor and at stations. However, the scale and permeability of heavy rail can impact the quality of public realm improvements. Undergrounding the station can ameliorate some of those impacts and potentially provide more public space in centres.	The permeability and scale of light rail lines and stations makes it more amenable, enabling better quality public space both along the corridor and at stations/ stops.
Revitalising the Adelaide City centre and other higher-order activity centres*	The termination of the line at the Adelaide Railway Station, located on the northern edge of the CBD, would have benefits for the development of the northern end of the CBD (which is already the centre of commercial employment) but with more limited impact for the CBD as it extends south.	The flexibility of light rail means it could travel down King William Street terminating centrally in the CBD at Victoria Square or even further south. This would contribute to the revitalisation of a greater area of the CBD.

*This analysis excludes the underground CBD link and City tram loop options.

While both options contribute to the land use objectives distilled from available policy documents and plans, the light rail options appears to provide greater support.

Light rail supports intensification of development in both TODs and along transit corridors, is better able to be integrated with surrounding land uses, better supports improvements to the public realm both at stations and along the corridor, and is more flexible enabling the line to extend into the CBD.

4.3 Land use uplift

The objectives of the land use uplift analysis is to ensure that the strategic and detailed analysis appropriately accounts for the land use uplifts that can be linked with each of the various public transport options.

In accounting for the expected land use uplifts, it is expected that light rail and heavy rail options may reposition different areas within the North West Corridor with respect to their ability to accommodate and attract housing and employment growth. Moreover, the different options may also reposition the North West Corridor with respect to the share of metropolitan housing and employment growth that it might gain over the forecast period.

4.3.1 Outputs

To meet this objective, SGS has produced the following outputs for each Travel Zone (TZ) included in MASTEM across the North West Corridor (and by default Metropolitan Adelaide) for the period out to 2036.

- Total population
- Total employment
- Employment by industry

SGS has compiled the data-sets prepared for the MASTEM Base Case land use projections for the period 2011 to 2036. The baseline 2011 and 2036 land use projections in terms of households and employment are set out in the table below.

SGS has also estimated revised Base Case 2036 household and employment figures for each geography on the basis that the initiatives contained within the 30 Year Plan for Greater Adelaide were not implemented and therefore development occurs in line with general market trends. The results of this alternative analysis are presented here. It should be noted that the economic analysis in this report uses the MASTEM Base Case and not the revised base case developed by SGS for the purposes of dwelling and employment forecasting.

Table 14: Household and employment 2011 and 2036 baselines

	2011 Baseline		Base Case 2036		Revised Base Case 2036 (No 30 Year Plan)	
	Households	Jobs	Households	Jobs	Households	Jobs
North Haven	6,445	3,165	7,417	3,335	7,000	3,050
Largs Bay - Semaphore	7,500	2,830	10,658	3,465	9,500	2,680
Port Adelaide	5,325	9,195	7,260	10,645	6,800	10,330
Woodville - Cheltenham	6,690	7,210	11,663	7,965	9,000	6,155
Beverley	3,480	5,695	5,320	6,105	4,600	5,615
Royal Park - Hendon - Albert Park	2,710	3,015	3,226	2,670	3,100	2,585
West Lakes	6,895	4,000	8,841	5,530	8,700	5,435
Seaton - Grange	7,695	1,745	9,940	1,885	9,100	1,315
Hindmarsh - Brompton	8,085	10,425	14,146	11,880	12,900	11,035
Northwest Corridor - Subtotal	54,825	47,280	78,471	53,480	70,700	48,200
Rest of Adelaide	496,895	455,233	666,305	587,612	674,076	592,892
Total Adelaide	551,720	502,513	744,776	641,092	744,776	641,092

Source: SGS Economics and Planning

SGS has reviewed these projections to assess how each geography is forecast to capture population and employment growth in the future given existing knowledge. Combined with history development data, the relative 'practicality' and 'feasibility' of land development/ redevelopment along and across the North West Corridor is assessed and, if available, the relative feasibility of development along the corridor compared with other areas across the metropolis.

SGS has generated estimates of Effective Job Density (EJD) across the metropolis under each competing public transport option. This has identified the degree to which the corridor is effectively 'repositioned' from a transport perspective when compared with other areas of the metropolis; thereby informing the degree to which population and employment might be attracted to the corridor. There are also flow on effects across the whole of Adelaide. Development being drawn into

the corridor from other parts of Inner Adelaide appears to open up opportunities for more urban consolidation.

The incremental dwelling and employment uplift projections for each of the Project Cases relative to the Revised Base Case 2036 (No 30 Year Plan) are set out in the tables below. The estimate for the Total Adelaide area shows the urban consolidation flowing from the North West project options.

Table 15: Dwelling uplift

		Dwelling uplift					
	PC1	PC1A	PC1B	PC1C	PC2	PC2B	PC2C
North Haven	30	25	20	35	185	255	220
Largs Bay - Semaphore	45	45	30	55	270	350	265
Port Adelaide	80	75	75	145	325	250	475
Woodville - Cheltenham	30	30	15	55	200	320	220
Beverley	15	10	10	15	85	135	80
Royal Pk -Hendon- Albert Pk	10	10	10	10	110	90	95
West Lakes	50	45	70	70	340	290	415
Seaton - Grange	50	45	10	75	240	330	280
Hindmarsh - Brompton	330	95	45	370	325	435	520
Northwest Corridor - Subtotal	640	380	285	830	2,080	2,455	2,570
Rest of Adelaide	100	2,385	1,200	120	960	1,685	1,985
Total Adelaide	740	2,765	1,485	950	3,040	4,140	4,555

Source: SGS Economics and Planning

Table 16: Employment uplift

		Employment uplift					
	PC1	PC1A	PC1B	PC1C	PC2	PC2B	PC2C
North Haven	65	60	55	95	200	265	230
Largs Bay - Semaphore	115	115	100	100	305	385	290
Port Adelaide	310	305	305	105	370	460	875
Woodville - Cheltenham	55	55	40	200	195	315	215
Beverley	20	15	15	85	75	125	75
Royal Pk -Hendon - Albert Pk	15	15	15	55	55	85	90
West Lakes	150	145	170	55	310	360	515
Seaton - Grange	150	145	110	415	310	395	335
Hindmarsh - Brompton	155	15	5	450	155	265	315
Northwest Corridor - Subtotal	1,035	870	815	1,560	1,975	2,655	2,940

		Employment uplift					
	PC1	PC1A	PC1B	PC1C	PC2	PC2B	PC2C
Rest of Adelaide	45	2,330	535	85	1,110	1,560	1,840
Total Adelaide	1,080	3,200	1,350	1,645	3,085	4,215	4,780

Source: SGS Economics and Planning

Overall, dwelling and employment levels increase versus a "do nothing" base case for much of the corridor under all options. The dwelling and employment uplift is significantly stronger under the light rail only options.

SGS has examined recent development along existing light rail corridors both in Adelaide and elsewhere and this has shown that light rail can unlock a higher increase in dwelling densities than other forms of transport. Unlocking increased uplifts (in both dwellings and employment) is an interaction between transport accessibility, land use controls / incentives and commercial feasibility. There is a feedback loop between these various aspects.

The analysis suggests that a PC1C option could unlock 950 additional dwellings. However, modelling of other scenarios shows that land use / transport changes along the corridor could unlock up to 4,555 dwellings (PC2C). In order to unlock this scale of uplift under the PC1 options, the underlying modelling suggests that the optimisation process around those options should look at increasing frequencies on the tram line and investigating policy interventions to better focus dwelling uplift (such as variable tax incentives).

Further detail on the land use implications of the Project Options can be found in Appendix C.

Appendix A Project Option Maps

Appendix B Parsons Brinkerhoff Transit Options Assessment

Appendix C Land Use Impacts

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