Chapter 6. Project development and alternatives

6.1 Project development history

The North West Rail Link was initially identified in *Action for Transport 2010*, released in 1998. Since then, a number of studies have been completed to assess the feasibility of the North West Rail Link, including an assessment of alternative modes and alignment options. Design development of the North West Rail Link has been guided also by land-use planning and development.

Figure 6.1 provides an outline of the project development since 1998. Between 1998 and 2005, the North West Rail Link Project was managed by a Project Control Group, comprising the former Transport NSW, Rail Infrastructure Corporation and the State Rail Authority (now Ministry of Transport/Department of Planning and RailCorp).

In 2000, a prefeasibility assessment was completed. This study included consideration of a number of travel modes including light rail, bus transitways and heavy rail. The conclusions of the prefeasibility study indicated that:

» A North West Rail Link would be feasible from an engineering and technical perspective;

» Sufficient level of patronage would be generated to support a heavy rail link;

» The rail link should be constructed as a single stage to Rouse Hill; and

» Given the rate of urban development, corridor preservation would be the priority.

Between 2001 and 2002 a range of studies were undertaken to inform engineering design development. The 2001 Engineering Design Study (ARUP, 2001) identified a preferred alignment and this was released publicly in the 2002 North West Rail Link Overview Report, Connecting Communities. The Overview Report was released for public information and comment to inform project development. It was acknowledged at the time that, due to demands on rail funding and the focus on rail safety and reliability, the priority for the development of the project would be corridor preservation and further design development. In 2003, the former Department of Urban Affairs and Planning purchased properties at Franklin Road, the site for the first station on the proposed alignment.

In 2003, Baulkham Hills Shire Council released the Balmoral Road Release Area structure plan to inform the re-zoning of this area. In response to submissions from the 2002 Overview Report, and to inform planning of the Balmoral Road Release Area, a number of design refinements through the Balmoral Road Release Area and the Norwest Business Park occurred. Similarly, planning for the Rouse Hill Regional Centre has accommodated a future North West Rail Link.

Between 2003 and 2005, a number of detailed studies were undertaken. These included more detailed consideration of patronage, alternative modes, economics and design development.

Since November 2005, and as part of the TIDC Project Review, additional design alternatives were identified. Work is continuing to assess the viability of these alternatives and at this stage detailed environmental assessment has not been undertaken. As a result, the alternatives under consideration have not been incorporated within the concept plan and environmental assessment.

Consideration of alternatives, including the alternatives currently under consideration and their development, is discussed further in the following section.

6.2 Alternative modes and alignments

Alternative modes and corridors were previously considered by the NSW Government against the need to determine which option (mode or corridor) would best meet the transport, land use, environmental and social objectives and provide the best value for money for the growing North West region. The review of alternatives included consideration of over 140 options based on previous technical studies, agency consultation and public submissions to the NWRL Overview Report (Transport NSW, 2002) including:

» Heavy rail options;

» Light rail options;

» Transitway options; and

» Local bus options.

A staged approach was undertaken to evaluate alternatives, with a preliminary qualitative assessment followed by more detailed quantitative multi criteria analysis incorporating evaluation of cost and patronage.

To permit a manageable evaluation of identified the options, the long list of options were combined into groups at a corridor level. This resulted in groups of 11 heavy rail options, 15 light rail options and 15 transitway options. These groups were further reduced through a preliminary multi-criteria evaluation to 20 options, consisting of six heavy rail, eight light rail and six transitway options. More detailed assessment on the 20 options was undertaken so that detailed evaluation criteria could be applied.

Eleven criteria were developed and agreed by the Project Control Group for the purpose of assessment. Criteria are summarised in Table 6.1.

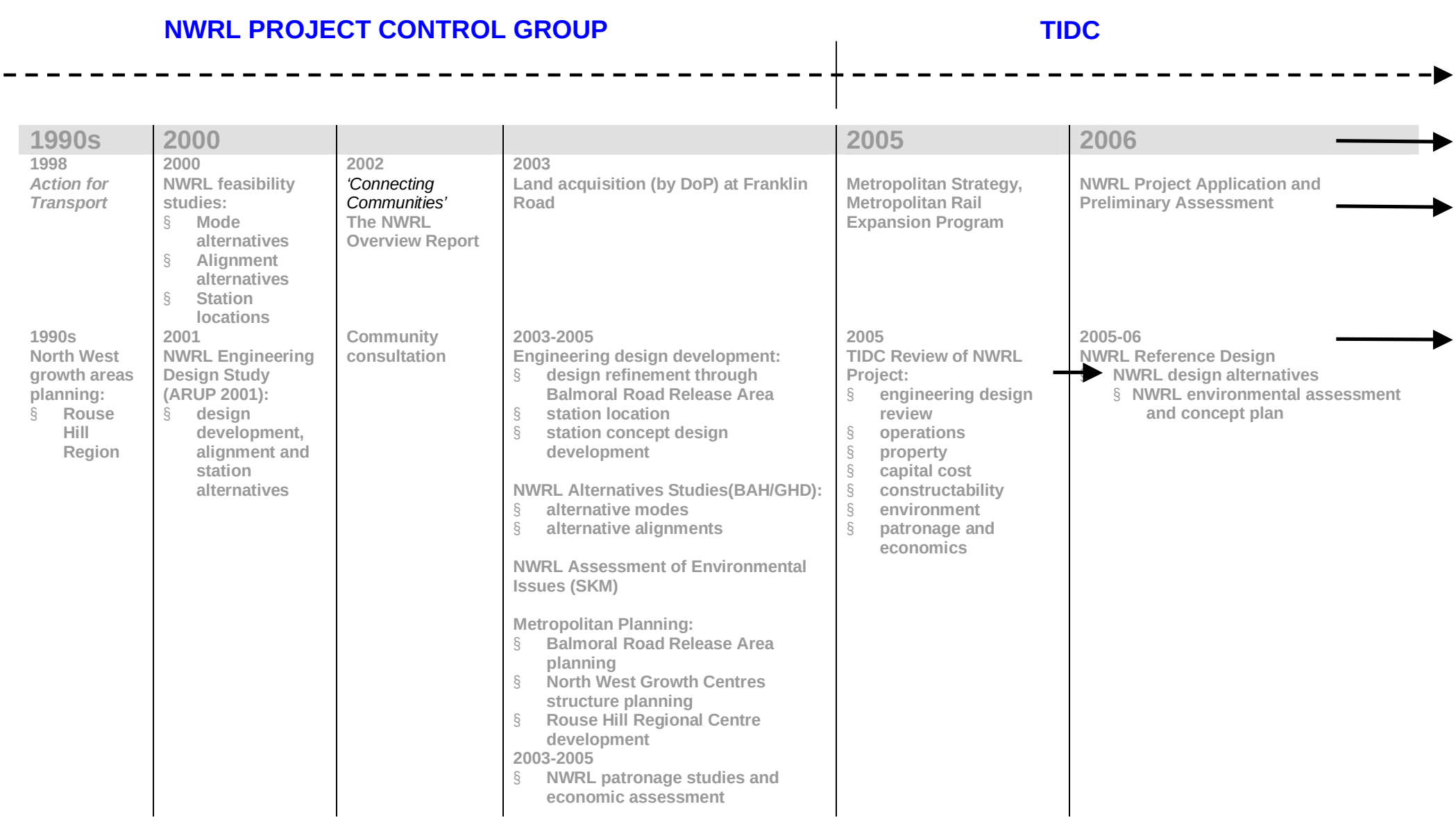

Figure 6.1 North West Rail Link (NWRL) design development history

Table 6.1 North West Rail Link alternatives study evaluation criteria (BAH/GHD, 2005)

Criterion		Detail
1	Connectivity to Castle Hill, Rouse Hill, Norwest Business Park and Box Hill	Connectivity and access benefits within the study area
2	Changes in public transport mode share across the Sydney region	Public transport mode share changes in the 2 hour morning peak period
3	Transit oriented development	The concentration of population and employment around transit stops on the selected route
4	Degree of underground construction	The relative proportion of underground construction for each route
5	Land acquisition impact	Value of land - permanent acquisition for each alternative
6	Risk profile	Measure of the time and cost risk associated with the physical and operational feasibility of each option
7	User benefits	User benefits include travel time savings, transfer, access costs and fare changes
8	Decongestion benefits of all modes	Bus and existing transitway access and diversion benefit, and existing heavy rail crowding benefits
9	Externality costs and benefits	Car, bus and existing transitway externality benefits. Externality costs during operation of all alternatives
10	Resource costs and benefits	Project capital costs; deferment of capital projects in study area; land acquisition costs and opportunity costs; maintenance and operating costs; changes to feeder bus and car parking costs and revenue; increases in rail system and transitway revenue and concession payments; construction disruption costs; and reduction in fuel excise duty

Key features of the evaluation results include:

» One of the heavy rail options (Epping to Rouse Hill via Castle Hill) performed significantly better than the other options;

» The heavy rail options outperformed the light rail and transitway options;

» The strong relative performance of the heavy rail options over other options in the economic appraisal is also reflected in the non-economic appraisal results;

» Heavy rail scores highest for four out of six of the non-economic criteria; and

» The separation between the results in any one mode is more distinct for the economic appraisal results than it is for the non-economic criteria results.

To assess the robustness of the evaluation, sensitivity tests were conducted on all options. Based on the detailed assessment of options the heavy rail option - Epping to Rouse Hill via Castle Hill - was selected as the preferred option. This option is the basis for the project described by this environmental assessment.

The main reasons for selection of this option are that it:

» Has strong connectivity within North West Sydney;

» Facilitates significant transit oriented development along the corridor and relatively strong public transport mode share changes;

» Incorporates the NSW Government's preferred heavy rail conceptual design;

» Is a clear choice as it scores significantly higher in the detailed evaluation than any of the other short listed options;

» Is not sensitive to criterion weights; and

» Is less impacted by any lack of achievement of forecast transit oriented development benefits than other heavy rail choices.

The detailed evaluation results demonstrated the strong performance of the preferred option and the heavy rail options generally on both economic and non-economic criteria.

6.3 Alternative station locations

The proposed alignment includes six stations. During the design development a number of alternative station locations were considered. The initial station and interchange locations (Maunsell, 2000) were identified based on a range of issues including;

» Potential vehicular and pedestrian access points;

» Connectivity to surrounding pedestrian catchments;

» Bus servicing patterns;

» For underground stations - closeness to the surface;

» Patronage potential;

» Engineering feasibility;

» Rail operational constraints regarding station spacing;

» Land use and availability; and

» Potential densification of the station precinct.

The alternative station locations considered during the design development are discussed below.

6.3.1 Thompsons Corner and Koala Park

During early design development, consideration was given to locating a station at Koala Park or Thompsons Corner due to the proximity to major road links and the opportunity to make the station a public transport focus for West Pennant Hills. However, as a result of engineering design constraints (station depth), a station at Thompsons Corner was not considered feasible. A station at Koala Park was ruled out as a result of design development and assessment of patronage opportunities, which resulted in the current Franklin Road station being identified.

6.3.2 Rogans Hill

A station located at Rogans Hill, at the junction of Old Northern Road and Castle Hill Road, was considered to provide accessibility from areas north of Castle Hill; service the nearby Anglican retirement village; and reduce potential demand on the road network surrounding the proposed Franklin Road station. However, due to the required station depths and the constraints of the station location at Castle Hill, a station at Rogans Hill was not considered further.

6.3.3 Samantha Riley Drive

A station located at the northern end of the Balmoral Road Release area, at the intersection of Samantha Riley Drive and Windsor Road, was included within the previous 2002 preferred alignment.

The station at Samantha Riley Drive was positioned to create opportunities for a major park and ride facility at a North West Transitway transit stop. This would reduce commuter car parking pressures within the Transit centre at Burns Road and the Rouse Hill Regional Centre. However, given that the station was positioned less than a kilometre north of Burns Road, the limited patronage benefits, and the impact of future rail operations, it has not been included as part of the project.

Whilst the project does not incorporate a station at Samantha Riley Drive, the design does not preclude a future station at this location.

6.4 Refining the alignment

Important considerations in designing the project were the need to obtain a direct alignment through undulating terrain that is both constructible and minimises potential impacts on developed areas. The eastern part of the study area is characterised by the undulating terrain of the Hornsby Plateau. A surface alignment through the eastern part of the study area would not be feasible and would result in significant adverse impacts on existing land-uses. As a result, a tunnel section has been proposed.

The western part of the study area is largely undeveloped and provides opportunities to incorporate the project into land use planning. Due to the cost implications associated with constructing and operating a new rail line completely in tunnel, surface sections have been proposed in areas that are yet to be completely developed.

The current alignment was developed through a structured route selection process (as described above). This included refining the alignment to produce the existing proposed alignment.

6.4.1 Modifications to the 2002 alignment

Since the Concept Engineering Study (Arup, 2002) and exhibition of the Overview Report in 2002, modifications to the proposed alignment have occurred. These changes have arisen from the outcomes of the specialist studies and their recommendations and the need to address concerns raised by the community, government agencies and individual developers. The key modifications are:

» The bored tunnel alignment between the Beecroft dive structure and Franklin Road Station – in some locations, the route has been re-aligned by up to 250 metres;

» The bored tunnel and surface sections of the proposed alignment between Norwest Business Park and Burns Road Station – approximately 5 km of the route has been re-aligned and consequently the western portal has been re-located further west;

» The stabling facility was moved about 500 metres to the east, adjacent to Windsor Road; and

» The project scope was expanded to include quadruplication of the Northern Line from Epping to Beecroft.

Between the Beecroft dive structure and Franklin Road Station, the proposed alignment was simplified and straightened. In the Balmoral Road Release Area, between Norwest Business Park and Burns Road Station, the proposed alignment was modified to minimise impacts on:

» Cumberland Plain Woodland (an endangered ecological community);

» The northern portion of the Bella Vista estate, by avoiding the requirement for a large cutting through the development;

» Sensitive land uses at the Hillsong Church (including an auditorium and a proposed television and radio studio); and

» Flooding and environmental risks associated with crossing Elizabeth Macarthur Creek in cutting.

Changes to the vertical alignment since the Concept Engineering Study (Arup, 2002) have been largely driven by changes to the horizontal alignment. The vertical alignment is dependent on operating grades, station locations and the existing topography.

6.4.2 Stabling facility

In the project, compared to the 2002 alignment, the stabling facility has been moved about 500 metres to the east, to be adjacent to Windsor Road. The train stabling facility was re-located to be above the assumed probable maximum flood level for Second Ponds Creek; to minimise impacts on Cumberland Plain Woodland; and to not preclude any future expansion of the rail line.

6.4.3 Construction work sites

Construction work sites have not changed substantially compared to the 2002 alignment. However, each site was examined in more detail and rationalised where practicable.

6.5 Alternatives under consideration

As part of the project assessment and development undertaken by TIDC two alternate options were identified and investigated. These include:

» An underground rail connection between Epping and Franklin Road ; and

» An elevated rail alignment between Hill Centre and Rouse Hill.

These two options are described below.

6.5.1 Epping to Franklin Road Tunnel Option

The Epping to Franklin Road tunnel option comprises an underground rail alignment which would connect Epping Station to the new Franklin Road Station (refer Figure 6.2).

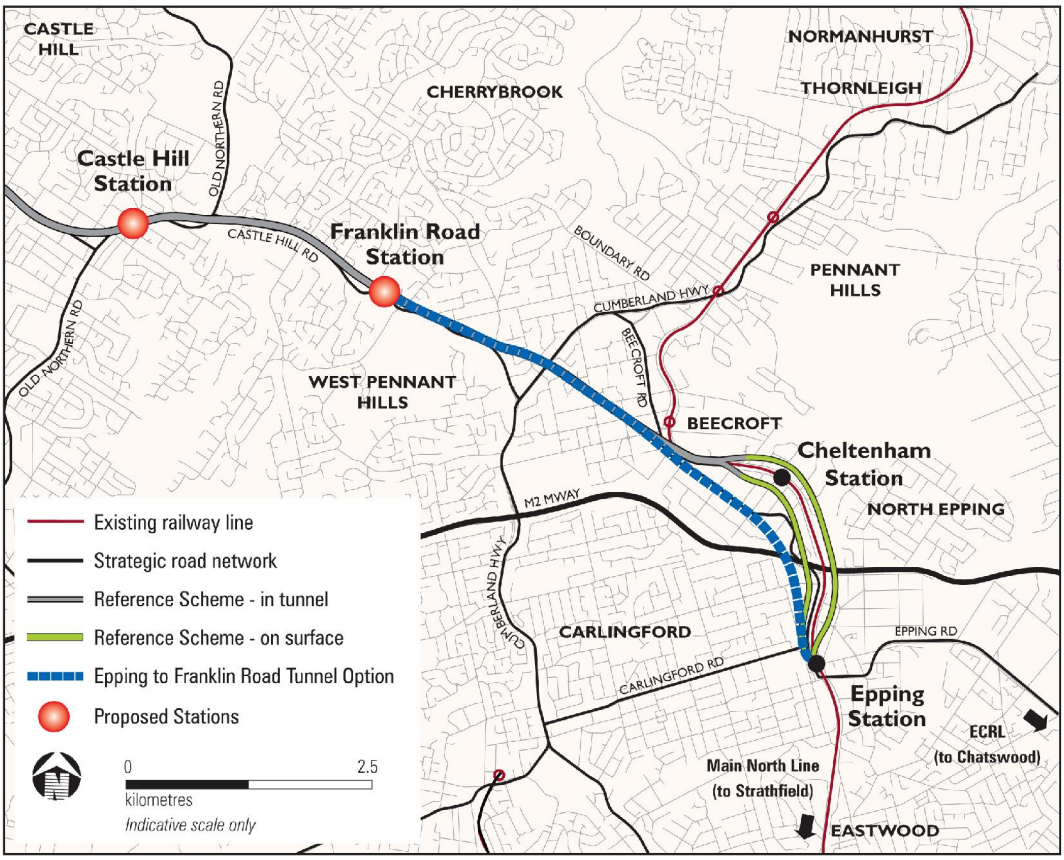

Figure 6.2 Epping to Franklin Road tunnel option

The alternative option in this section is approximately 6 km in length, commencing at the Epping to Chatswood Rail Line stub tunnels at Epping. The alignment would be in bored tunnel and would traverse established residential areas. It would pass beneath Edensor Street, Kandy Avenue, View Place, M2 Motorway, Lyne Road and follow the alignment of Beecroft Road between Cheltenham Road and Welham Street. It would then continue in tunnel in a north-westerly direction to Franklin Road Station (see Figure 6.2). Additional stub tunnels for the future extension of the Epping to Chatswood Rail Line to Parramatta would need to be provided as part of this option.

The tunnels in this section would be up to 50 metres below the ground. The horizontal alignment has been located to minimise encroachment under residential properties with much of the length running under open space and existing roads.

6.5.2 Hills Centre to Rouse Hill Elevated Option

The Hills Centre to Rouse Hill Elevated Option comprises approximately 10 km of rail line on viaduct and two short sections of cut and cover tunnel (refer to Figure 6.3). The viaduct would typically be elevated 6 to 15 metres above ground level to:

» Provide appropriate clearance above existing roads; and

» Maintain the rail line above the floodplain.

A short section of cut and cover tunnel would be constructed in the vicinity of the Castle Hill Showground to facilitate the transition from bored tunnel to the viaduct structure. Hills Centre Station would be constructed immediately to the west of the cut and cover section where the alignment transitions from below ground to above ground.

The rail alignment would continue from Hills Centre Station on viaduct across Cattai Creek and approximately 1 km along the northern side of Salisbury Road using frontages of existing industrial properties.

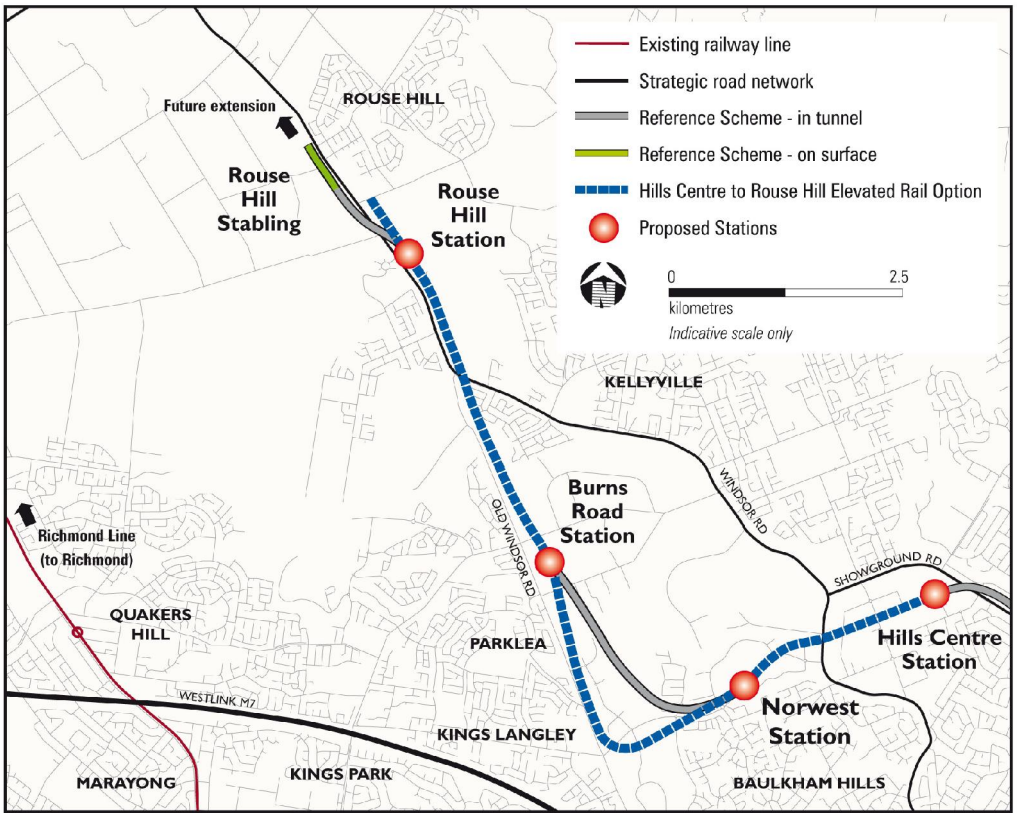

Figure 6.3 Hills Centre to Rouse Hill elevated option

The alternative option would cross under Windsor Road via a short section of cut and cover tunnel and then continue on viaduct for approximately 9 km. The alternative option alignment would cross over Columbia Way before crossing to the median of Norwest Boulevard to Norwest Station and then to Westwood Way. It would then deviate to the southwest of the Bella Vista residential area crossing over Elizabeth Macarthur Drive and Norwest Boulevard, before

proceeding in a northerly direction along the median of Old Windsor Road to the point where the North West Transitway crosses Old Windsor Road. The alignment would cross to the eastern side of the Transitway alignment, which, in-turn, would be on the eastern side of Old Windsor Road. The alignment would continue on viaduct, parallel to the Transitway alignment and on its eastern side. It would cross over Burns Road and Windsor Road and continue to the stabling facility directly south of Commercial Road at Rouse Hill.

An indicative design of the viaduct is shown in Figures 7.12 and 9.4.

Consistent with the project, four stations would be located in this section, as identified in Figure 6.3:

» Hills Centre Station;

» Norwest Station;

» Burns Road Station; and

» Rouse Hill Station.

The latter three stations would be elevated on viaduct for this option. Station locations would be generally in the same locations as the project.

The interim stabling facility would be located partly on viaduct or embankment structure immediately to the south of Commercial Road. The stabling capacity and arrangement would be consistent with the project.

6.5.3 Status of alternatives under consideration

TIDC is continuing to review these options to assess their viability including a preliminary review of construction, rail operation, maintenance and operational issues and environmental impacts. At this early stage of the review process, these alternative options do not form part of the concept plan. In the event that these alternative options are further considered as potential options to the project, they would be subject to detailed environmental assessment and consultation.

6.6 Staged delivery

As part of the project assessment and development undertaken by TIDC, the benefits and implications of staged delivery have been identified and investigated at a preliminary level.

Two stage delivery of the project would include:

1. A first stage that connects with the existing Northern Line between Beecroft and Cheltenham stations to just west of Hills Centre Station, approximately 11 km in length and completed by 2015. This stage would provide three new stations (Franklin Road, Castle Hill and Hills Centre).
2. A second stage from west of Hills Centre Station, terminating at Rouse Hill, approximately 12 km in length and completed by 2017. This stage would provide three new stations (Norwest, Burns Road and Rouse Hill), an all day rail service of four trains per hour, with six to eight trains per hour in peak periods.

Staged delivery is shown in Figure 6.4.

Staged delivery of the project would prioritise key social and economic benefits associated with the provision of public transport. Stage 1 would allow public transport enhancements up to the Hills Centre to be realised by the end of 2015, with cumulative benefits associated with stage 2 to Rouse Hill in 2017.

There would be construction implications of proceeding with the staged delivery of the project, particularly related to spoil handling, noise and traffic. During stage 1, the Hills Centre construction site would be used as the main spoil handling site (refer to description in section 7.5.7).

Temporary stabling would be required within the tunnel sections west of the Hills Centre Station at the commencement of stage 1 operations.

The environmental assessment has focused on the impacts associated with construction of the project in its entirety. While the construction impacts associated with staged delivery would be similar, additional construction planning would be undertaken for stage 1 and stage 2, particularly at the Hills Centre construction site. A description of the further assessments that would be required as part of the staged delivery scenario is discussed in section 11.2.

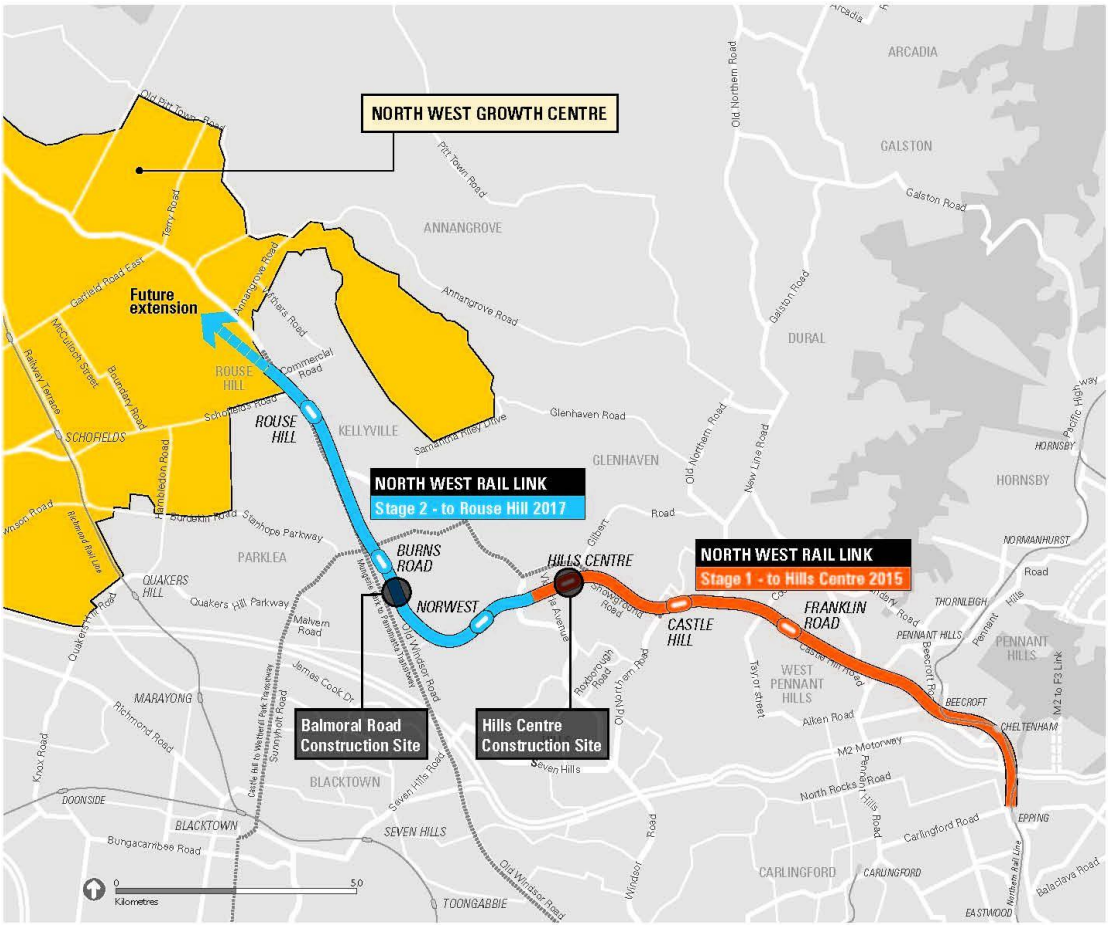

Figure 6.4 Staged delivery