7. Physical description

This Chapter provides a physical description of the proposed SWRL that has been developed for the purposes of Environmental Assessment. It includes engineering and user requirements, urban design principles for the Stations, the proposed SWRL corridor alignment, the preliminary vertical alignment, works proposed at Glenfield Junction, the Station and stabling facility concepts and other associated physical works that make up the SWRL project. Construction and operational requirements are described in Chapter 8. The SWRL Concept Plan in Chapter 20 identifies what TIDC is applying for approval for at this stage.

TIDC is applying for a concept approval for the SWRL project. As such, the project description in this Chapter is open to change during the later stages, particularly during future design work and following the completion of the additional assessments recommended throughout this document.

7.1 Overview

An overview of the proposed SWRL (the project) is provided in Figure 1-2.

In summary, the SWRL project comprises the construction, operation and maintenance of:

- a grade-separated flyover junction over the Main South Line to provide a connection to the East Hills Line north of the Glenfield Station (referred to as Glenfield North Junction)
- approximately 13.1 kilometres of double track within a corridor of approximately 40 metres width over lands to the south and west of the existing Glenfield Junction with the East Hills Line
- modifications to track lay-outs, requiring realignment of approximately two kilometres of track and installation of new cross-overs at Glenfield
- reconfiguration of Glenfield Station, including re-location of the station buildings and concourse to provide for centrally loaded platforms, reconfiguring the eastern platform to an island platform and movement of the platforms 80 metres north (The re-configuration would include a high level concourse with easy access, changes to commuter car parking and other changes to surrounding areas to provide additional facilities such as kiss-and-ride and bus stops.)
- flyovers over the Main South Line and the proposed Southern Sydney Freight Line to the south of Glenfield Station and movement of the existing freight track (which will form part of the Southern Sydney Freight Line) slightly west (referred to as Glenfield South Junction)
- two new railway stations, interchanges and commuter car parks at Edmondson Park and Leppington
- a train stabling facility to the west of the new Leppington Station
- ancillary facilities such as power supply, sectioning huts, signalling structures, access roads, and other infrastructure required for the operation and maintenance of rail services and infrastructure.

The railway would initially comprise two tracks; although the 40 metre corridor would provide sufficient width for potential future quadruplication (the addition of two additional tracks to make a total of four tracks) and the construction of cuttings and embankments, as required. (Quadruplication does not comprise part of the current project and if proposed in the future, would be subject to separate assessment and approval.)

A wider, 60 metre rail corridor would be required to allow for the two proposed new stations at Edmondson Park and Leppington. At the proposed train stabling facility, the corridor would be approximately 200 metres wide over a length of approximately 500 metres. The corridor would also be wider than 40 metres through Glenfield Junction and the reconfigured Glenfield Station (see Figures 7-1a to d). Other railway-related ancillary infrastructure such as substations, sectioning huts, maintenance access roads and other operational facilities would also be constructed within this section of the railway corridor, where practicable.

Options for a potential future extension of the SWRL beyond Leppington are currently being considered by TIDC, but do not form part of the current SWRL project.

The SWRL, as described and assessed in this document, comprises two stages. Stage A involves:

- commencement of early works (Stages 1 to 4) at Glenfield North Junction and Glenfield South Junction (this excludes work at the direct interface with the Glenfield Station upgrade works which are part of Stage B)
- establishment and use of construction work sites (including the establishment of access tracks) at Glenfield and the James Meehan Estate.

Stage A is at fairly well advanced design stage; although some further, relatively minor environmental assessment is required to clarify the impacts of these works.

Stage B comprises the construction and operation of the remaining portions of the SWRL:

- the proposed rail lines and associated infrastructure within a defined 40 metre wide corridor between stations and 60 metres wide at the stations
- Leppington Station, Edmondson Station and the train stabling facility west of Leppington Station
- the Glenfield Station upgrade works
- construction sites and ancillary facilities, including power supply, sectioning huts, signalling structures, access roads, and other infrastructure required for the operation and maintenance of rail services and infrastructure.

Stage B of the SWRL is at a less advanced design stage and further environmental assessment of aspects of this stage is needed.

A detailed description of Stage A and Stage B and the proposed further environmental assessment required is provided in Chapter 20.

7.2 Design and user requirements

7.2.1 Engineering design requirements

Other than the Stage A works at Glenfield, the SWRL has been designed to a concept level only. The *South West Rail Link Project Review Report – Engineering and Infrastructure Technical Report* (Connell Wagner 2006b) notes that the current concept accommodates the following general engineering design requirements:

- adherence with current RailCorp standards for railway design, and other national/international standards, where applicable
- construction of an electrified dual-track railway within a corridor with sufficient width for potential future quadruplication and other railway-related infrastructure
- use of medium-width electric rolling stock (eight-car train sets), with no provision for 'out of gauge' (non-standard gauge) rolling stock or diesel traction operation
- a line speed of up to 125 kilometres per hour
- stabling of 12 eight-car train sets at the train stabling facility at the SWRL opening, with ultimate provision for up to 20 eight-car sets as demand for rolling-stock increases
- assumed future quadruplication of the East Hills Line to Revesby (proposed as a separate project – see Section 2.3.1)
- the ability to use of 10-car train sets (by providing room to extend station platforms at Glenfield, Edmondson Park and Leppington to 210 metres and extension of the stabling facility if required)
- access for vehicles, where practicable, to maintain and inspect the whole alignment
- provision for a potential future extension of the SWRL beyond Leppington.

The train stabling facility concept has been developed in accordance with RailCorp's (2006a) *Design Guidelines for the Upgrade and Construction of New and Existing Train Stabling Yards and Turnback Sidings* (Final Version 1.0, June 2006). The future design work of the stabling area will also be undertaken in accordance with these guidelines.

Further design work for Stage B will be undertaken during the next phase of the project development.

7.2.2 Urban design principles

An urban design analysis of the SWRL project is included in Technical Paper 4 – Urban Design Analysis, included in Volume 2 of this report.

The following urban design principles are proposed to guide the future design work of the station and/or the stabling facility concepts, while still retaining flexibility for the wider town centre and precinct planning that is not the responsibility of TIDC. Each station and the stabling facility must:

- reinforce the role of its local area and urban centre as a principal transport, commercial and community centre within the locality (stations only)
- reinforce the desired scale, character and image of the area and enhance the presentation of the area to visitors and travellers (stations and stabling facility)

- maintain or improve the cross-railway line connections or links to surrounding areas and activities, particularly as station locations would be one of the limited locations where such access across rail lines is afforded (stations only)
- respect the scale, form and economy of existing uses and development and provide appropriate transition to surrounding areas (stations and stabling facility)
- maintain visibility and protect and enhance built or natural features establishing landmarks and memorable gateways for visitors to the area and contributing to image and character generation (stations and stabling facility)
- create a civic presence for the railway station as befits its role as a focus of human activity
- improve existing, or establish new comfortable and inviting, pedestrian environments, including disability access within the railway station. Emphasise the application of 'crime prevention through environmental design' (CPTED) principles (stations and stabling facility)
- give priority access to public transport and other non-car based transport users.

7.3 Alignment and corridor width

The horizontal alignment of the proposed SWRL corridor and a preliminary vertical alignment of the SWRL are shown in Figures 7-1a to d.

The SWRL would connect with the East Hills and the Main South Lines at Glenfield Junction in the vicinity of Glenfield Station, which is proposed to be reconfigured as part of Stage B. More details of the works at Glenfield Junction and Glenfield Station are provided in Sections 7.4 and 7.5.

Approximately 600 metres south of the Glenfield Station, the proposed corridor alignment swings west from the existing Main South Line rail corridor and proceeds on embankment, approximately seven metres high, through lands known as the James Meehan Estate and south of Hurlstone Agricultural High School. At the western extent of this area, the land rises steeply and the proposed corridor alignment passes from embankment into cutting (around 14 metres deep), enabling it to pass under Quarter Sessions Road and the Hume Highway/South-western Freeway.

West of the Hume Highway, the proposed corridor alignment enters the Edmondson Park area, passing over Campbelltown Road into the former Ingleburn Military Camp. Edmondson Park Station would be located adjacent to the northern extent of the former military camp. The SWRL and Edmondson Park Station would be in an (approximate) seven metre deep cutting through this area, which is designed to facilitate the Station's integration with the future Edmondson Park town centre. The depth of the cutting through this area is subject to further assessment of flooding issues, as discussed in Chapter 13.

The proposed corridor alignment then heads to the north-west and north, up an (approximate) 2.5 % incline, remaining in a cutting of up to 10 metres. The alignment then travels downslope at an (approximate) 1.4 % grade, crossing over Cabramatta Creek. In this area, the alignment would head in a northerly direction, parallel to the edge of the Edmondson Park release area.

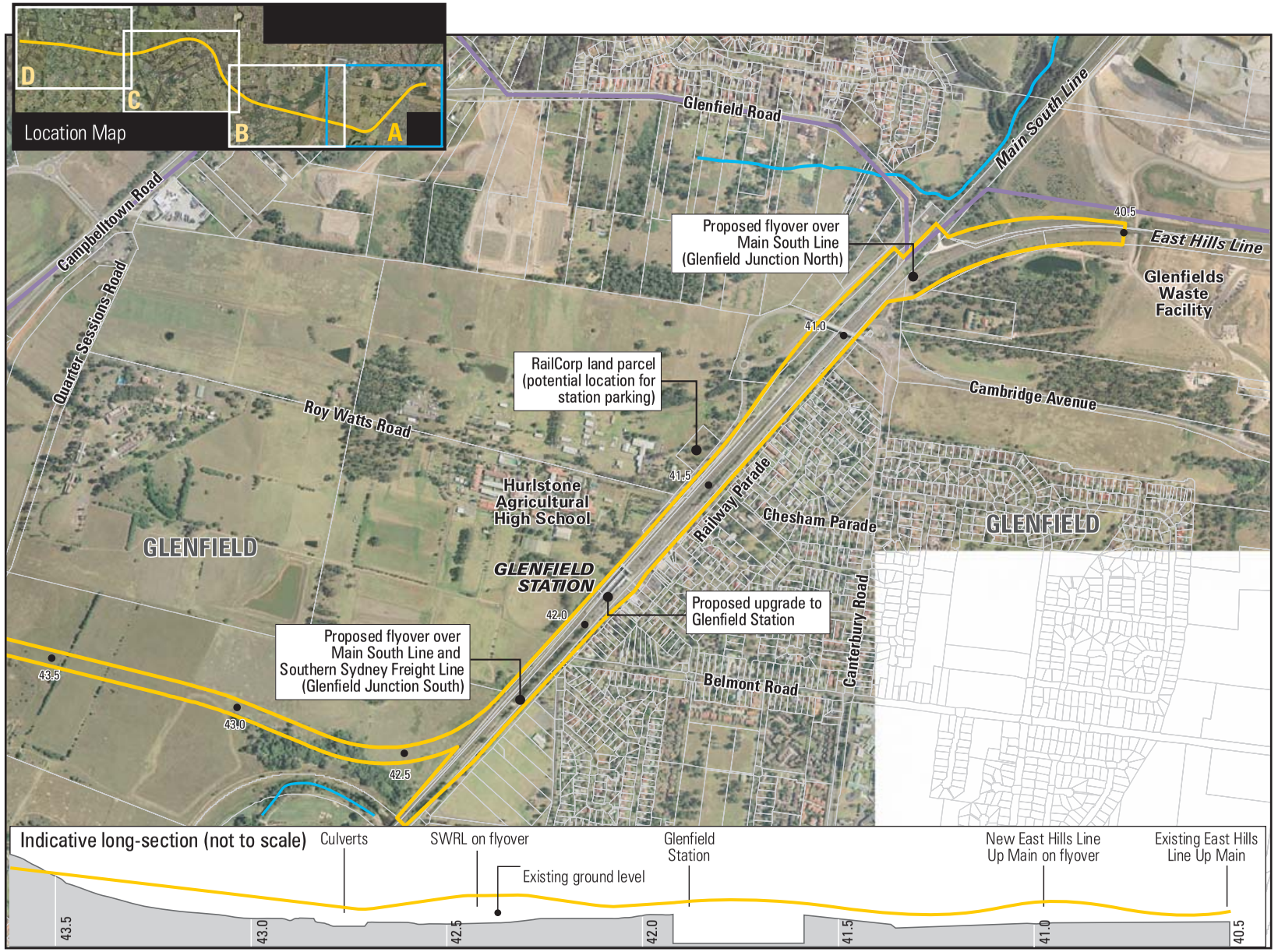


Figure 7-1a Horizontal and indicative vertical alignment (Glenfield)

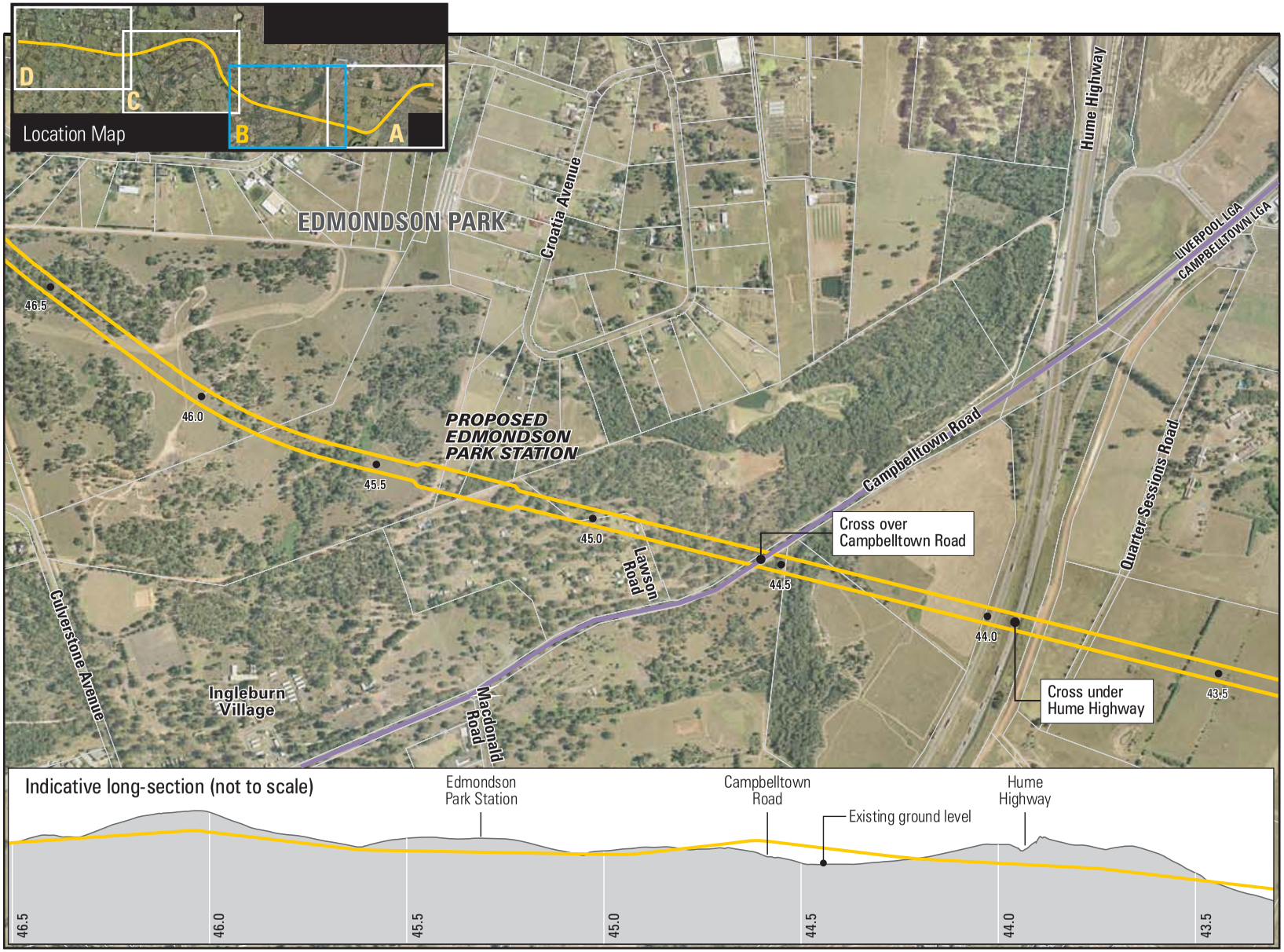


Figure 7-1b Horizontal and indicative vertical alignment (Edmondson Park east)

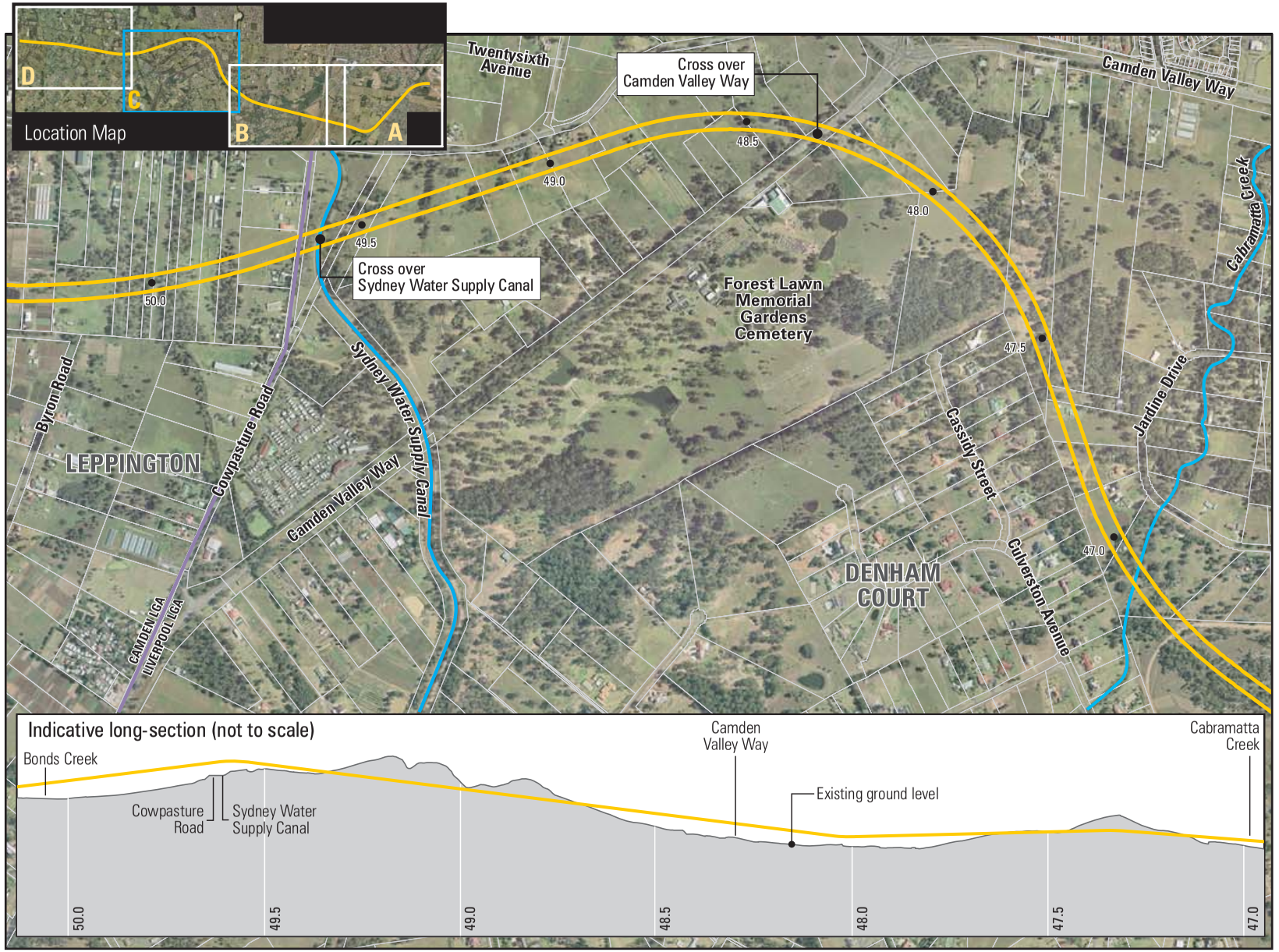


Figure 7-1c Horizontal and indicative vertical alignment (Edmondson Park west to Leppington east)

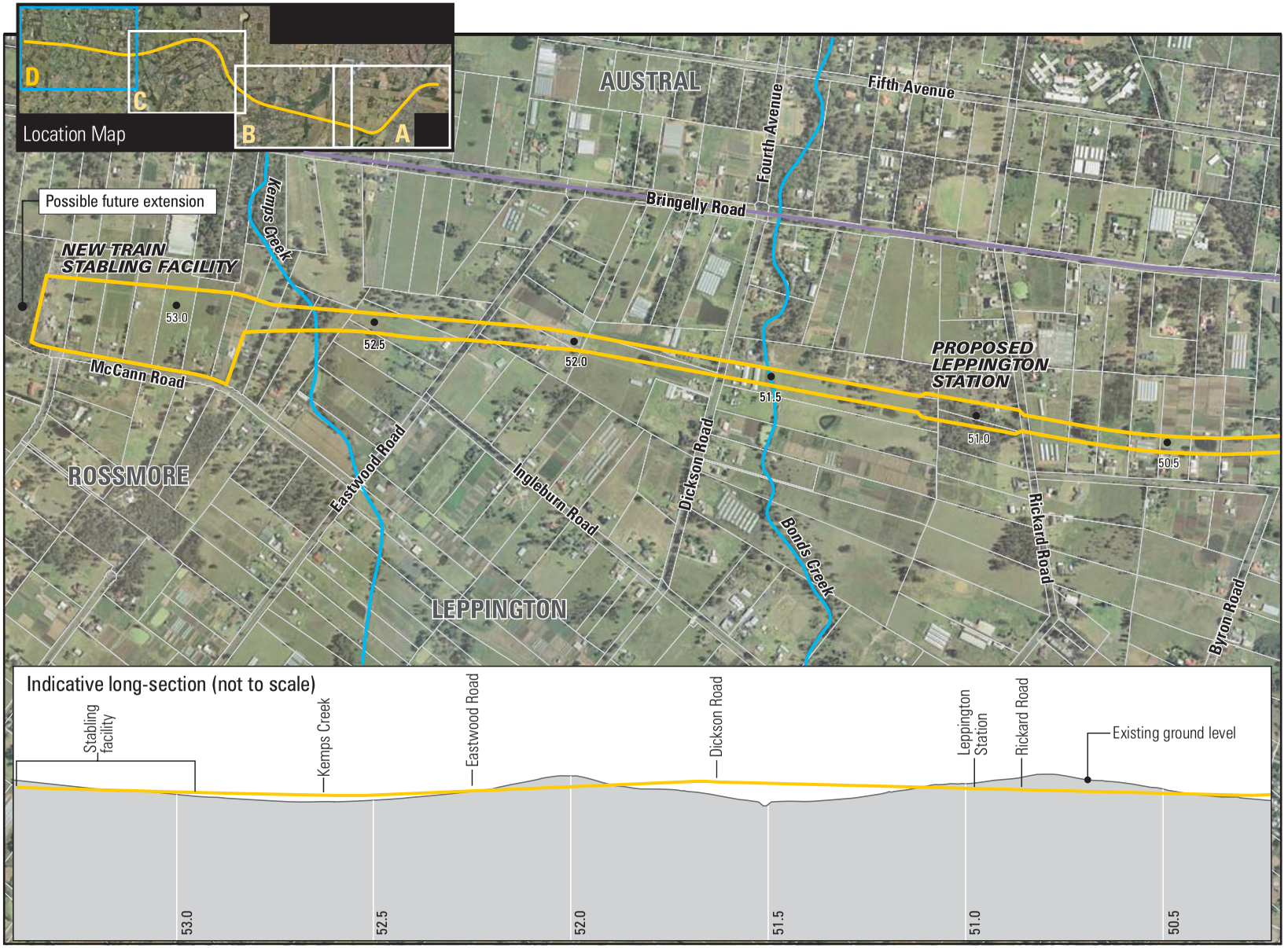


Figure 7-1d Horizontal and indicative vertical alignment (Leppington to Rossmore)

The proposed corridor alignment then passes through a short stretch of cutting as it crosses to the north of the rural-residential suburb of Denham Court. From there, it would proceed on embankment to the north of the Forest Lawn Memorial Gardens Cemetery.

The corridor alignment would then enter the southernmost precinct of the Western Sydney Parklands site, crossing over Camden Valley Way and rising at an approximate 2.5 % grade between Camden Valley Way and Cowpasture Road, in a cutting with a maximum depth of about 11 metres. Bridge structures would be used to cross Cowpasture Road and the Sydney Water Supply Canal. West of the Sydney Water Supply Canal, the SWRL would be on embankment, up to 10 metres high. The gradient of this section would fall at a grade of approximately 2.5 %.

The new proposed Leppington Station would be located in a cutting, immediately west of Rickard Road and east of Bonds Creek. West of this point, the corridor alignment would run generally parallel, but approximately 400 metres to the south of Bringelly Road, before joining with the proposed train stabling facility.

The proposed train stabling facility would be partly in cutting and partly on embankment, approximately 2.5 kilometres to the west of Leppington Station. Further details of the stabling facility are provided in Section 7.6.

7.4 Glenfield Junction grade separation

Glenfield North Junction is the junction of the Main South and East Hills Lines, which is located approximately 750 metres north of Glenfield Station. A new junction (Glenfield South Junction) is proposed as part of the SWRL to the south of the existing Glenfield Station to link the SWRL into the existing rail network. The existing and proposed track configuration at the Glenfield Junctions is shown in Figures 7-2a and b.

7.4.1 Glenfield North Junction

A single-track, grade-separated reinforced concrete flyover is proposed at Glenfield North Junction to carry the ‘Up’ East Hills Line over the Main South Line. The flyover structure also needs to pass under the Glenfield Road/Cambridge Avenue overpass of the Main South Line. The ‘Down’ East Hills Line would be re-aligned on the eastern side of the existing railway, to the east of the existing Main South Line. A crossover would also be constructed to the south of the flyover, to connect the Up East Hills Line with the Up South Main Line. The flyover would be built wide enough to allow for two tracks, to make provision for future developments on the network.

Construction of the approach ramp to the flyover would require relocation of part of a rising main from a sewage pumping station that currently runs under the proposed track alignment.

7.4.2 Glenfield South Junction

South of Glenfield Station (at Glenfield South Junction), two single-track grade-separated concrete flyovers would be constructed to carry the SWRL tracks over the proposed Southern Sydney Freight Line and the Main South Line to connect with the existing network.

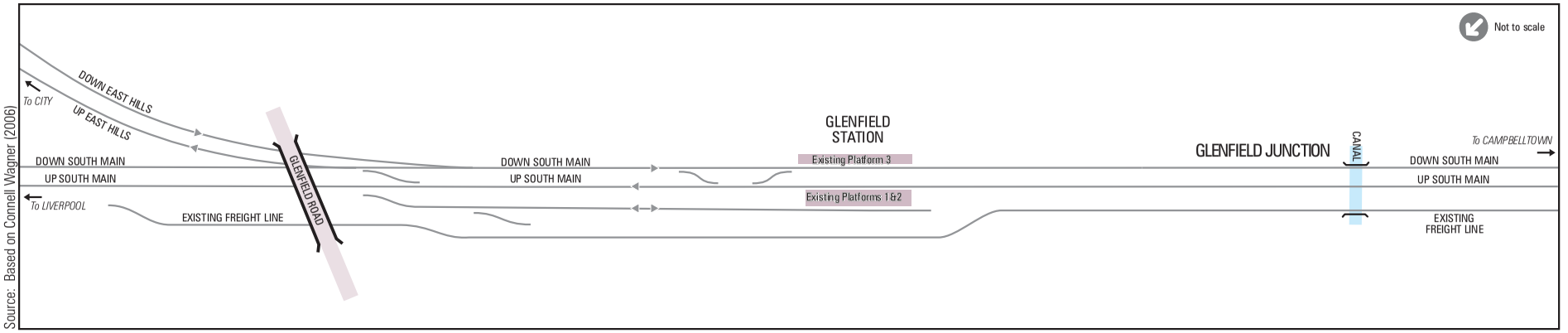


Figure 7-2a Existing configuration at Glenfield Junction

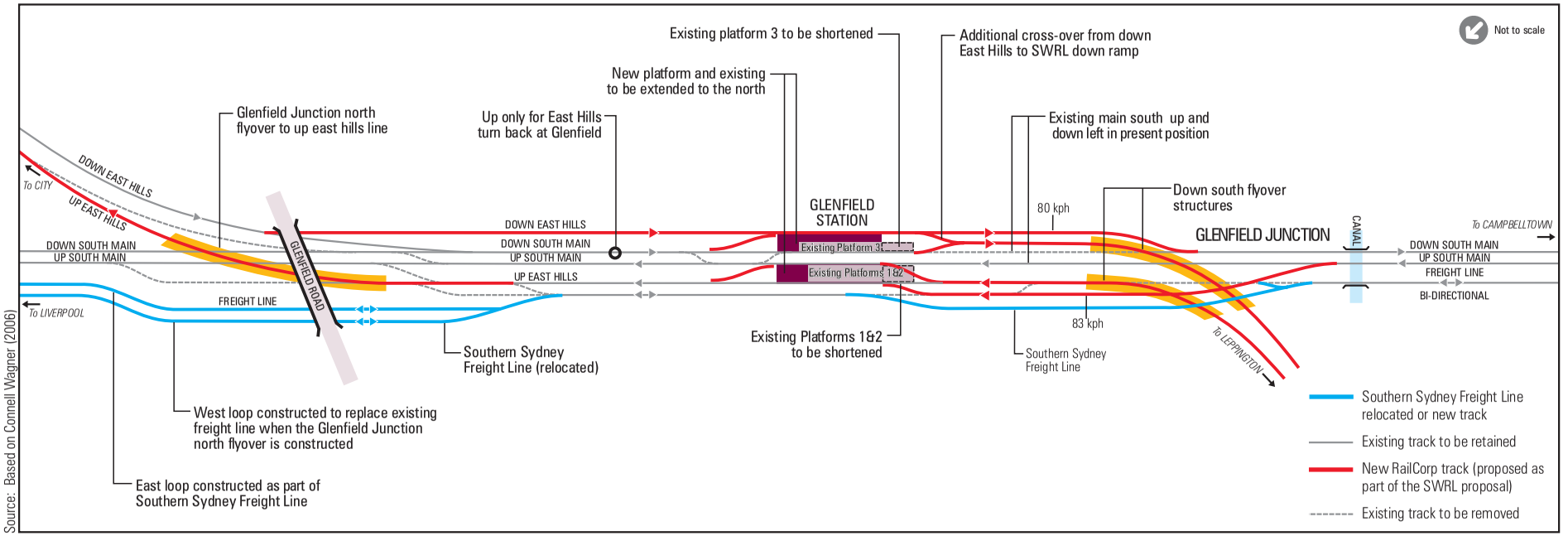


Figure 7-2b Proposed configuration at Glenfield Junction

The preferred track arrangement for connection of the SWRL to the network south of Glenfield is a six track arrangement, as shown in Figure 7-2b. This arrangement provides a continuation of the 'Down' Main South through and south of Glenfield, using Glenfield Station Platform No. 3. SWRL trains heading south of Glenfield would access the two new flyovers via new turnouts.

The flyovers also require the relocation of the existing Southern Sydney Freight Line track at this location, to a parallel alignment to the west of its present location. This is to ensure that the rail corridor can be widened to accommodate the additional tracks required for the flyover ramps.

7.5 Stations

7.5.1 Overview

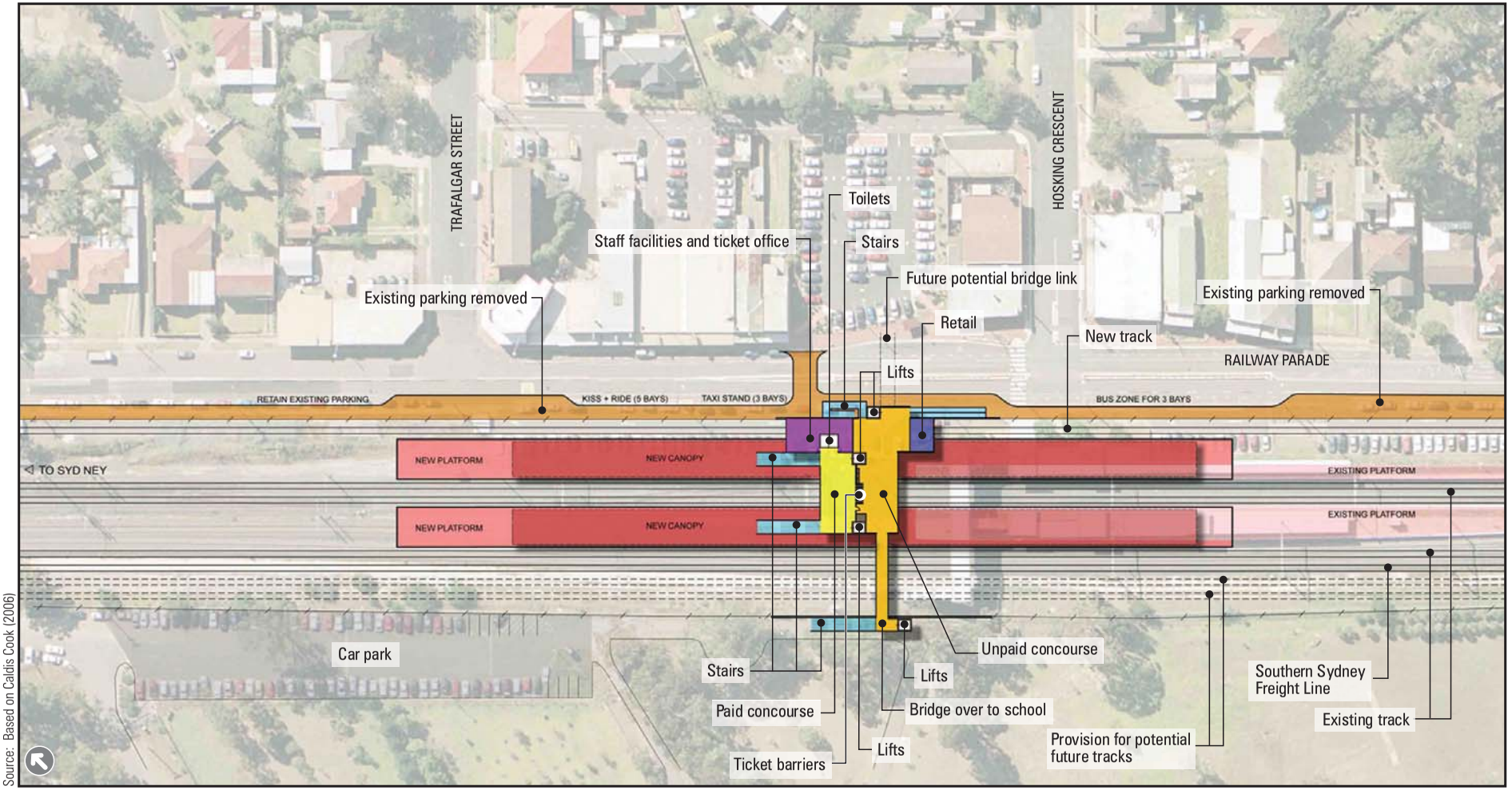
Concept level designs of the proposed upgrade to Glenfield Station, and the new Leppington and Edmondson Park Stations have been prepared for the purpose of environmental assessment — see Figures 7-3, 7-4 and 7-5a and b. More detailed station architectural designs will be prepared during the next phase of the design process, and will incorporate the urban design principles detailed in Sections 7.2.2 and Technical Paper 4 (Urban Design Analysis). Where possible, the station designs will be informed by town centre planning around the Edmondson Park and Leppington Stations; although precinct and town centre planning for Leppington is not planned to progress until the longer term. Edmondson Park town centre locality planning is being undertaken through a masterplanning process by the Growth Centres Commission, Liverpool/Campbelltown Council and/or Landcom.

At this stage, detailed requirements for commuter parking, road access alterations and other mode of access interchange arrangements at these Stations cannot be determined, as these need to be integrated with and considered in the context of the wider precinct planning. However, the descriptions below identify the approximate number of parking spaces that would be provided at the time of opening of the stations, based on predicted patronage demand at the time of opening. This will be further considered during the next phase of design. The likely mode of access requirements are also identified below and discussed further in Chapter 11.

7.5.2 Glenfield Station reconfiguration

A substantial reconfiguration of Glenfield Station would be required to accommodate the SWRL, including the additional running tracks through the Station and crossovers and flyovers to the north and south. The proposed Station concept is shown in Figure 7-3 and described below based on the *South West Rail Link Project Review Report – Station Concept Design* (Caldis Cook 2006).

Glenfield Station currently comprises a single island platform, with a turnback provided on the western side. This mainly services the Up Main South Line, and a single face platform that serves the Down Main South Line.



Source: Based on Caldis Cook (2006)

Figure 7-3 Indicative Glenfield Station concept

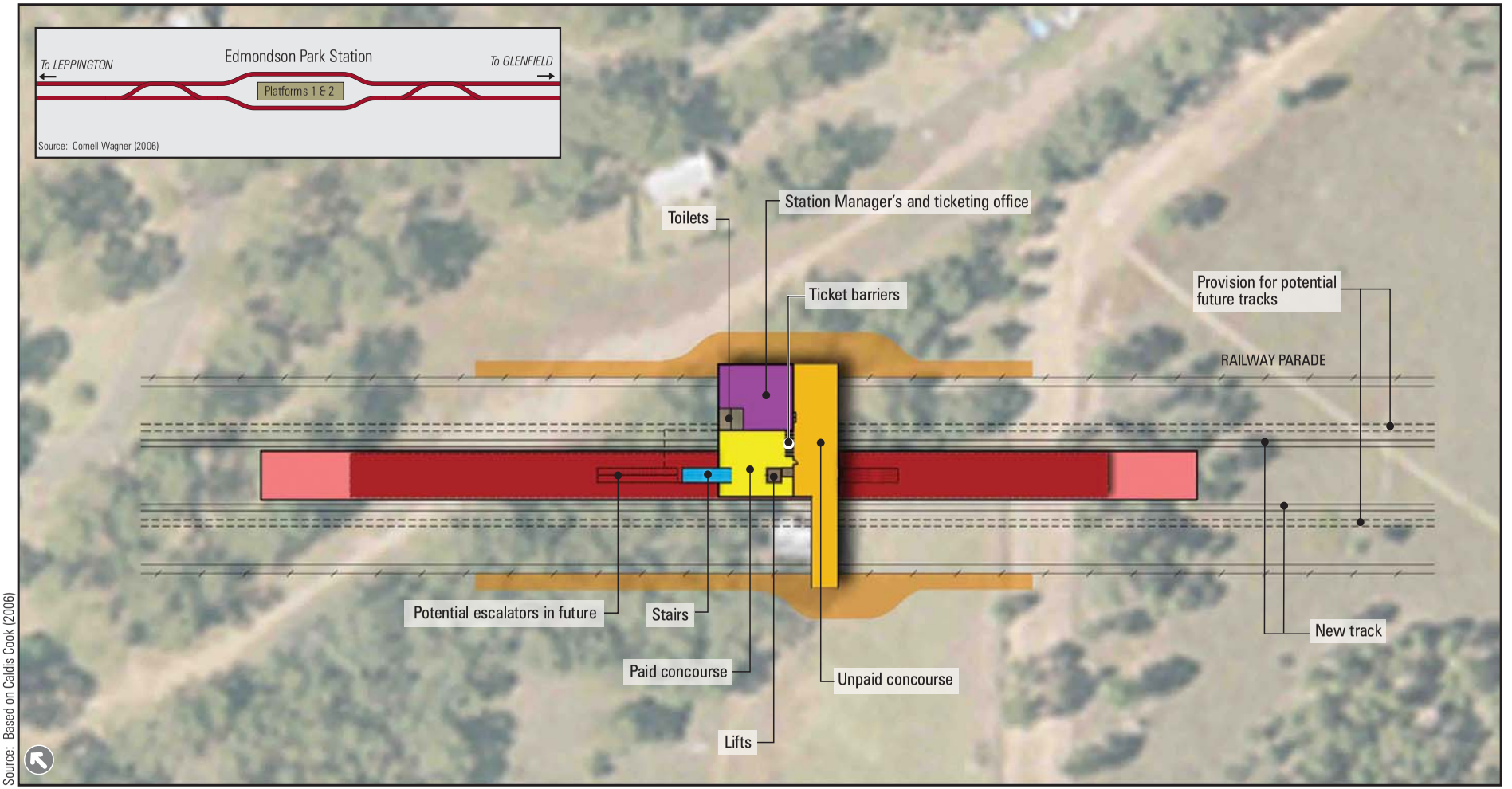


Figure 7-4 Indicative Edmondson Park Station concept

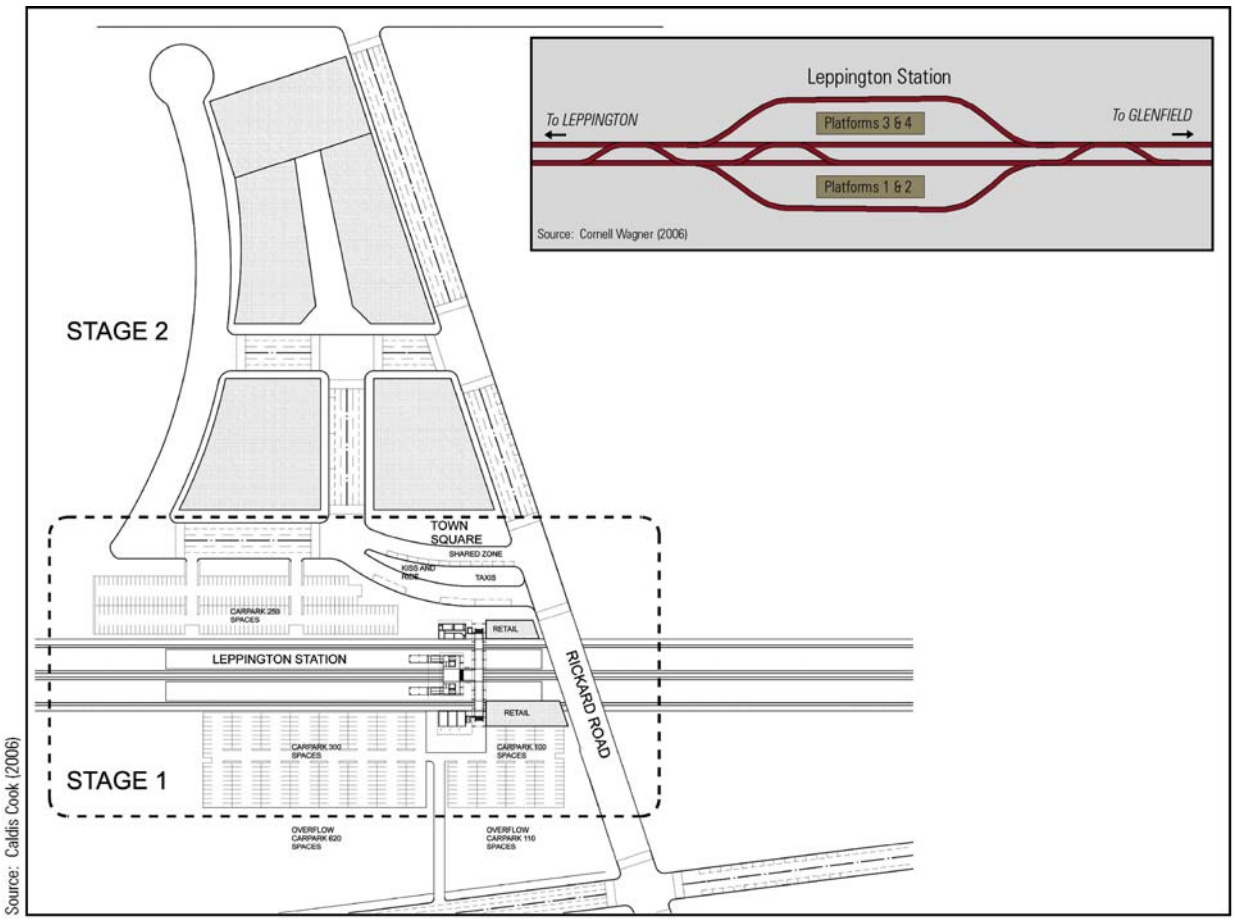


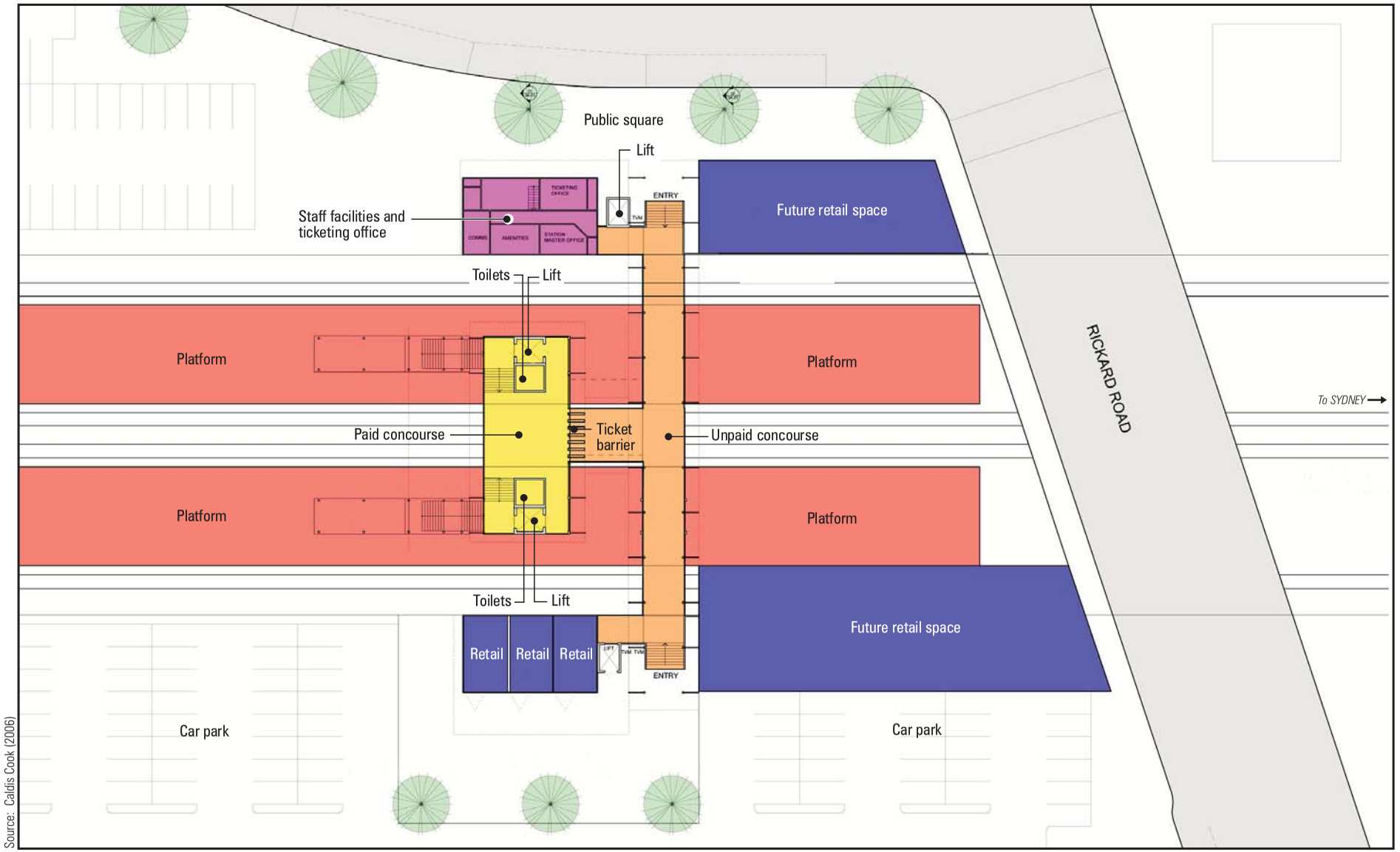
Figure 7-5a Indicative Leppington Station Locality Plan (Stages 1 and 2)

The Station is proposed to be reconfigured to accommodate two island platforms by the addition of a new platform face on the east side of the Station. The existing tracks for freight transport (on the western side) would be relocated further to the west. Repositioning of the platforms is also proposed by:

- shortening the existing platforms by approximately 80 metres at the southern end
- extending the platforms by approximately 80 metres at the northern end.

An easy access upgrade and other modifications would also be required, including a new pedestrian overbridge and reconstruction of the Station concourse approximately 50 metres northwards towards the East Hills flyover to provide a central point of access. The new overhead station concourse would include elevated ticketing, staff amenities, offices and customer amenities.

Access from Railway Parade to the concourse could be via escalators, stairs and a lift. The reconfiguration of the Station would result in the loss of approximately 120 existing kerbside commuter parking spaces along the eastern side of the rail corridor, at Railway Parade. These are proposed to be replaced (at a minimum). The location of the replacement car park is yet to be confirmed, but a likely location is on the western side of the rail corridor, on land recently purchased by RailCorp (see Figure 7-1a). To the south of the Railway Parade station entrance, the Station concept allows for construction of a bus zone with three bus bays, while to the north, a taxi stand (three bays) and a kiss-and-ride facility (five bays) could be accommodated.



Source: Caldis Cook (2006)

Figure 7-5b Indicative Leppington Station concept detail

As patronage through the Station increases and Glenfield Station becomes of greater importance in the CityRail network, additional ticket barriers, staff amenities and facilities would be required. These facilities have been planned for within the proposed station upgrade.

The Station concept also allows for a potential future footbridge linking the eastern side of Railway Parade.

7.5.3 New stations at Edmondson Park and Leppington

The proposed Edmondson Park and Leppington Stations would be designed to facilitate integration with the future town centres, including the adjoining retail/commercial activities planned within the respective town centres. The Stations would seek to provide an efficient interface between the transport facilities and these premises. Both Stations would include paid and unpaid concourse areas, pedestrian overbridges/connection to adjoining facilities, and facilities for transport interchange between bus and rail modes. As the area is currently unsewered, temporary on-site sewerage facilities at Leppington Station, at least, would need to be considered during the future design work. Edmondson Park Station would be connected to the mains sewer as part of development.

Figure 7-4 shows the proposed Edmondson Park Station concept and Figures 7-5a and b shows the proposed Leppington Station concept.

Edmondson Park Station

The Edmondson Park Station concept is based on an island platform configuration with an overhead concourse, and the SWRL tracks in an approximate seven metre deep cutting. The depth of this cutting is subject to further flooding analysis during future design work, as discussed in Chapter 13. This arrangement would enable local/transport interchange access to be maintained above the Station, without the need for lifts or stairs. This would make interchange with nearby bus, taxi and kiss-and-ride facilities more convenient. The Station would be an open facility with a 180 metre long platform. A lift would be provided from the concourse down to the platform.

The Station would have accessibility, staff and customer facilities suitable for the anticipated patronage within the first 10–15 years after opening. As patronage increases, the Station facilities have been designed to grow, with increased vertical circulation and a larger concourse area.

The Station is planned to be serviced directly by an extension of the existing Liverpool to Parramatta strategic bus corridor. However, park-and-ride facilities would also be needed to cater for local demand. Approximately 250 parking spaces would be provided.

Leppington Station

The proposed station location is immediately to the west of Rickard Road, which is envisaged to form a major north–south road link. The Station would be in a cutting at this location, perpendicular to Rickard Road.

The proposed Station concept comprises twin island platforms served from an overhead concourse spanning the rail corridor. The Station overhead concourse area is proposed to be located slightly to the west of Rickard Road (set back 40 to 50 metres) to permit potential future commercial infill development over the rail corridor. This means that the Station concourse would be slightly elevated from the surrounding area (north and south), which would require a low rise flight of stairs and lift to access the concourse.

The Station would be designed to grow as patronage increases. The initial proposed concept is for a concourse with stairs and lift access to the street and platforms. The stairs would arrive close to the eastern point of the platform. This location allows for escalators to be added and the paid concourse to be extended towards the west, as patronage increases. The new escalators and (potentially) additional stairs would arrive at platform level in the middle third of the platform.

There is likely to be a requirement for only five or six ticket barriers initially, but there would be sufficient width between the lift shafts to increase the number of barriers. The initial gap would be separated by a glazed barrier.

The proposed rail line would form a boundary to the new Leppington town centre. It is anticipated that most patronage would approach the station from the north side, resulting in a sensible positioning of the ticket office on the north side. This building (at grade, not elevated), would be linked to the footbridge for easier staff access. Automatic ticket vending machines would be positioned at other entrances to augment the ticket office. Passenger toilets would be located on the paid area and the locked door would be operated by staff in the ticket office. The north side would connect with the bus interchange and the proposed retail precinct.

As the new Station would be in close proximity to newly developing areas and relatively remote from existing developed areas, it would be an attractive park-and-ride location for commuters; in the short term, as development and public transport networks become established. It is likely that many residents that currently park at other stations would shift to Leppington when park-and-ride supply is made available. Approximately 1,000 park-and-ride spaces are proposed to be provided at the Station on opening. Any long-term provision of park-and-ride facilities would be carefully planned as part of the overall planning for the town centre, to ensure it does not impede development of the town centre and affect amenity of the area. The location for the initial park-and-ride facilities could be later developed as the town centre grows.

Rickard Road is proposed by the Metropolitan Strategy as a regional public transport boulevard linking Campbelltown to Liverpool via Leppington. A series of bus routes are proposed to be operated as ‘strategic corridors’, with Leppington as the main focal point. Thus, the bus interchange located alongside Leppington Station would be of regional importance. The initial bus interchange would be located off-street, north of the Station, with easy access from Rickard Road. The proposed town centre road layout would provide an easy and direct route for buses from all directions to the interchange. The initial design is flexible enough to be expanded along the length of the station or within the town centre designed as required.

7.6 Train stabling facility

The train stabling facility is proposed to cover an area of approximately 500 metres long by 200 metres wide to the west of Leppington Station (in the suburb of Rossmore), in a mix of cutting and embankment. The facility is designed to accommodate up to 20 eight-car train sets on opening. This allows for projected growth. The facility would be capable of expanding to accommodate 10-car train sets in the future. An indicative concept for the facility is provided in Figure 7-6.

The location of part of the facility in a slight cutting would assist in providing a natural noise and visual barrier to the stabling facility. Noise and visual attenuation measures at this location are discussed in Chapters 12 and 16.

The SWRL project would terminate at this stabling facility; although options for potential future extension beyond Leppington have been considered in the concept design. A future extension of the SWRL does not form part of the Concept Plan for the SWRL (see Section 7.7).

Additional facilities in the yard would include cleaning/light maintenance facilities, ablutions, administration offices, staff car parking, and train washing facilities. The facility would be lit by floodlights and fenced for security. Access would be provided from McCann Road and around the yard to provide access to remote carriages. Road rail vehicle access (for hi-rail vehicles) would also be provided.

Suitable environmental controls, such as the provision of bunds, would be provided to avoid interference with and run-off of contaminants into the Creek. Controls for waste from the facility, including wastewater, are discussed further in Chapters 19 (Other environmental issues) and 21 (Draft Statement of Commitments).

Train crews would have to walk to and from trains stabled at the sidings at the commencement of each shift or on completion of the operations for each train. The access track walkways for train crews would be designed to meet occupational health and safety requirements for safe access (e.g. warning lights, trip-free walking surfaces, adequate lighting, the provision of safe places, etc). Staff amenities would be provided to meet RailCorp occupational health and safety obligations and standard requirements.

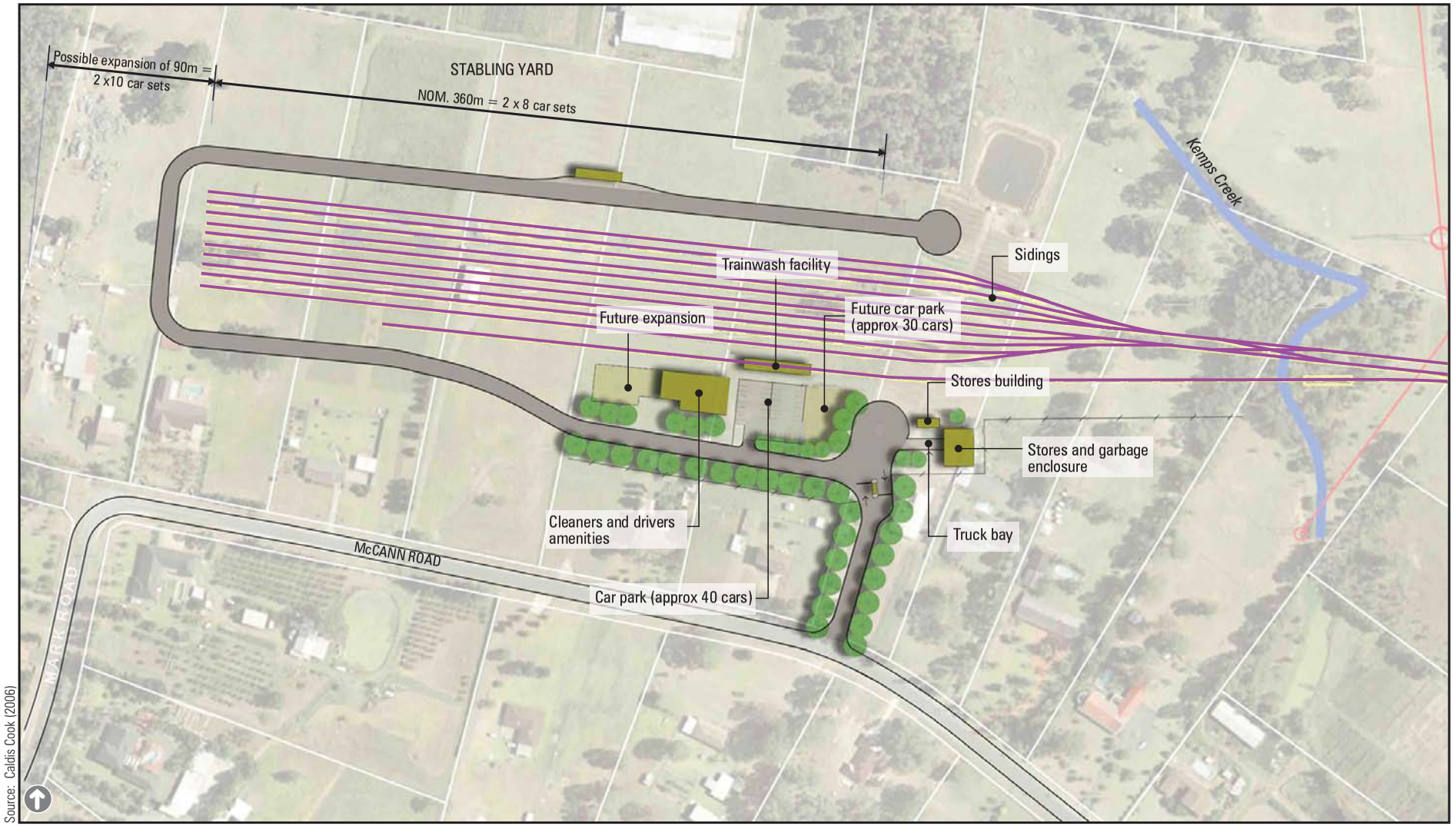
The amenities building would comprise a meal room and appropriate amenities for staff (male and female). The stabling facility is proposed to become a Train Crew Sign-On Depot, meaning that the following additional facilities would be required:

- an inspectors office with room for desk, furniture and computer system
- a sign-on location with suitable area for notice boards, safety and other documentation to be issued
- locker rooms with toilets, male and female
- appropriate security arrangements for all facilities (including CCTV coverage)
- car parking.

The majority of residential properties in the area use septic tanks. In the short term, the stabling mess facility is also likely to have a suitably sized on-site sewerage system.

7.7 Potential future extension

The design and location of the proposed SWRL, including the train stabling facility, does not preclude the potential future extension of the SWRL beyond Leppington. The precise location of the extension and any future terminus would be determined by operational needs and the patterns of future development. Any future extension is not part of the current SWRL project and would be subject to a separate environmental assessment and approvals process.



Source: Caldis Cook (2006)

Figure 7-6 Indicative train stabling facility concept

7.8 Railway infrastructure

Rail track

The SWRL tracks would be designed in accordance with current standards, with tracks laid on concrete sleepers and conventional stone ballast.

Bridges and structures

As well as the Glenfield flyover and Station structures described above, the SWRL project requires the construction of new road and rail bridges, culverts, retaining walls and, potentially, noise walls.

Rail overbridges are proposed at Quarter Sessions Road and the access road to Macquarie Links Drive shown in Figure 7.1b, allowing the SWRL to pass under these roads. A major cut-and-cover underpass structure is proposed at the Hume Highway, allowing the SWRL to pass under this major highway. Rail underbridges are proposed at Campbelltown Road, Camden Valley Way, Cowpasture Road and the Sydney Water Supply Canal, allowing the SWRL to pass over these facilities.

The design of these bridges and the precise location and design of any culverts, retaining walls and noise walls will be determined during the next phase of the design process.

Power supply and overhead wiring

The SWRL would operate on a conventional 1,500 volt DC overhead traction power supply system, with standard cantilever masts. A traction power study will be undertaken to assess the ability of the existing supply system to accommodate the additional power supply loads. At least one additional substation may be required along the proposed alignment. Suitable dual electrical power supplies would also be required at the new Edmondson Park and Leppington Stations.

Signalling

The signalling system would comprise conventional colour light (LED) signals with train stops and suitable power supplies. The existing signalling system at Glenfield would need to be reconfigured to accommodate the new SWRL tracks.

Services

Suitable protection measures or diversions would be implemented to protect existing utility services along the SWRL route, including:

- numerous fibre optic telecommunications cables, water mains and a copper line (a type of communications cable) adjacent to the Down Main South Line at Glenfield Junction
- a sewer rising main next to the Up Main South Line north of Glenfield Station
- gas, water, telecommunications and figure optic cables in Railway Parade and along the proposed corridor alignment
- bridges over the Sydney Water Supply Canal that incorporates the Central Trunk 5 water main
- numerous overhead power distribution cables that cross the route

- services relating to the existing railway infrastructure at Glenfield Junction, including overhead wiring (traction power), signalling, telecommunications and track drainage.

A full services survey would be completed as part of future design work and the necessary diversion and protection measures would be implemented in consultation with the appropriate service providers. During future design work, consideration would be given to the need to accommodate service corridors for the wider South West Growth Centre development.

7.9 Drainage and hydrology

As discussed above, various culverts and bridges would be required as part of the SWRL project to facilitate drainage and minimise flooding impacts of the project. Within the section of the alignment on embankment west of Glenfield South Junction, provision would be provided for a stormwater opening to allow floodwaters to enter/leave the potential detention basin potentially proposed by Campbelltown City Council on the northern side of the embankment.

Fourteen watercourse and stormwater crossings are proposed along the SWRL corridor. The design details at these crossings are yet to be confirmed. As a minimum, reinforced concrete box (RCBC) culverts would be provided. The crossing locations are shown on Figure 5-7.

7.10 Landscape and urban design

A Landscape and Urban Design Plan would be prepared and incorporated into the SWRL project as the design develops. This Plan would incorporate, but would not be limited to:

- the urban design principles detailed in Section 7.2.2
- the visual mitigation recommendations detailed in Chapter 16 (Visual) and 21 (Draft Statement of Commitments)
- other recommendations in Technical Paper 4 – Urban Design Analysis.

The Landscape and Urban Design Plan and further design of the station and stabling facility concepts would also need to be integrated with any future precinct planning undertaken in the areas surrounding the stations. TIDC would liaise with the Growth Centres Commission, the Department of Planning, local councils and other land owners (like LandCom) involved in the precinct planning, to ensure this integration occurs.