6.12 Norwest Station

Norwest Station would be an underground station, located within the Norwest Business Park close to the Norwest Marketown Shopping Centre, commercial and residential developments, and within close proximity to the Hillsong Church.

The proposed station is located in an area which has experienced strong growth and has significant opportunity for employment and residential intensification (NSW Government, 2010, Metropolitan Plan for Sydney). The station has been located to improve access to Norwest Business Park and has the potential to be a catalyst for future growth of the area.

Norwest is a major employment area characterised by large commercial buildings within a modern landscaped setting. The station would service the existing business centre and would introduce a strong pedestrian oriented environment serving future employment and residential catchments.

The station architecture consists of a street edge pavilion that would be integrated into the scale and built form of the surrounding business park development.

The station entrance would be located at the intersection of Norwest Boulevard and Brookhollow Avenue with at grade access via new signalised pedestrian crossings to the town centre and employment area to the north. As shown in **Figure 6.23** to **Figure 6.26**, the underground station concourse and island platform would be accessible from the street level.

Norwest is highly accessible by road with direct access to the M7 Motorway and the major regional roads of Windsor Road and Old Windsor Road perpendicular to the main spine of Norwest Boulevard. As an established arterial road, Norwest Boulevard provides good existing links to the station. The precinct design does not provide any additional park and ride opportunities, but is primarily focussed on enabling transport transitions from bus, pedestrian and kiss and ride connections.

Provision for an underground connection to the north-eastern side of Norwest Boulevard, would be safeguarded.

To facilitate access to the station, sections of surrounding roads and footpaths would be modified and upgraded as needed, including on parts of Norwest Boulevard and Brookhollow Aveune.

At the intersection of Norwest Boulevard and Brookhollow Avenue the existing roundabout would be replaced by a signalised intersection and pedestrian access.

Weather protected bus stops and waiting areas would be located on either side of Norwest Boulevard. Taxi and kiss and ride stops / waiting areas also with weather protection would be located along Brookhollow Avenue.

The area of land to the north east of the station entrance would be landscaped, including planting along Norwest Boulevard. Station skylights may be integrated within this landscaped area.

The station is described in **Table 6.5** and illustrated in **Figure 6.23** to **Figure 6.26**.

Table 6.5 Description of Norwest Station

Feature	Description
Centre type	Specialised Centre
Station type	Specialised Centre
Customers	Employment and residential
Location	▪ The proposed Norwest Station is located within the "Norwest Business Park", a major employment centre 30.5 km north west of the Sydney CBD ▪ The proposed station is located adjacent to Norwest Boulevard and within The Hills Shire ▪ A large area of recent residential development lies to the south of the station
Platform depth	Approximately 20 m below street level
Concourse depth	Approximately 8 – 13 m below street level
Station entrances	Located off Norwest Boulevard. At the corner of Norwest Boulevard and Brookhollow Avenue
Day 1 Elements	▪ Way-finding signage and transport information ▪ Station utilities /services facilities ▪ Public space/plaza areas adjacent to station entry points ▪ Retail space ▪ Local bus interchange, comprising of four bus stands, located on both sides of Norwest Boulevard ▪ Nine Taxi spaces and nine kiss-and-ride spaces located on Brookhollow Avenue ▪ Bicycle parking and storage facility for 30 bicycles ▪ Station entrance at the intersection of Norwest Boulevard and Brookhollow Avenue with an at grade access via new signalised pedestrian crossing ▪ Two service buildings would be located south east of Norwest Boulevard along the eastern site boundary ▪ Two service access points adjacent to the service buildings, accessed via Norwest Boulevard and Brookhollow Avenue ▪ Provision of two rail facility service access roads: - Off Brookhollow Avenue - Off Norwest Boulevard ▪ Removal of roundabout and provision of new signalised intersection at Norwest Boulevard and Brookhollow Avenue in consultation with RMS ▪ Pedestrian and bicycle upgrades as needed along Norwest Boulevard and Brookhollow Avenue ▪ Future development site

Figure 6.23 Norwest Station - Indicative layout

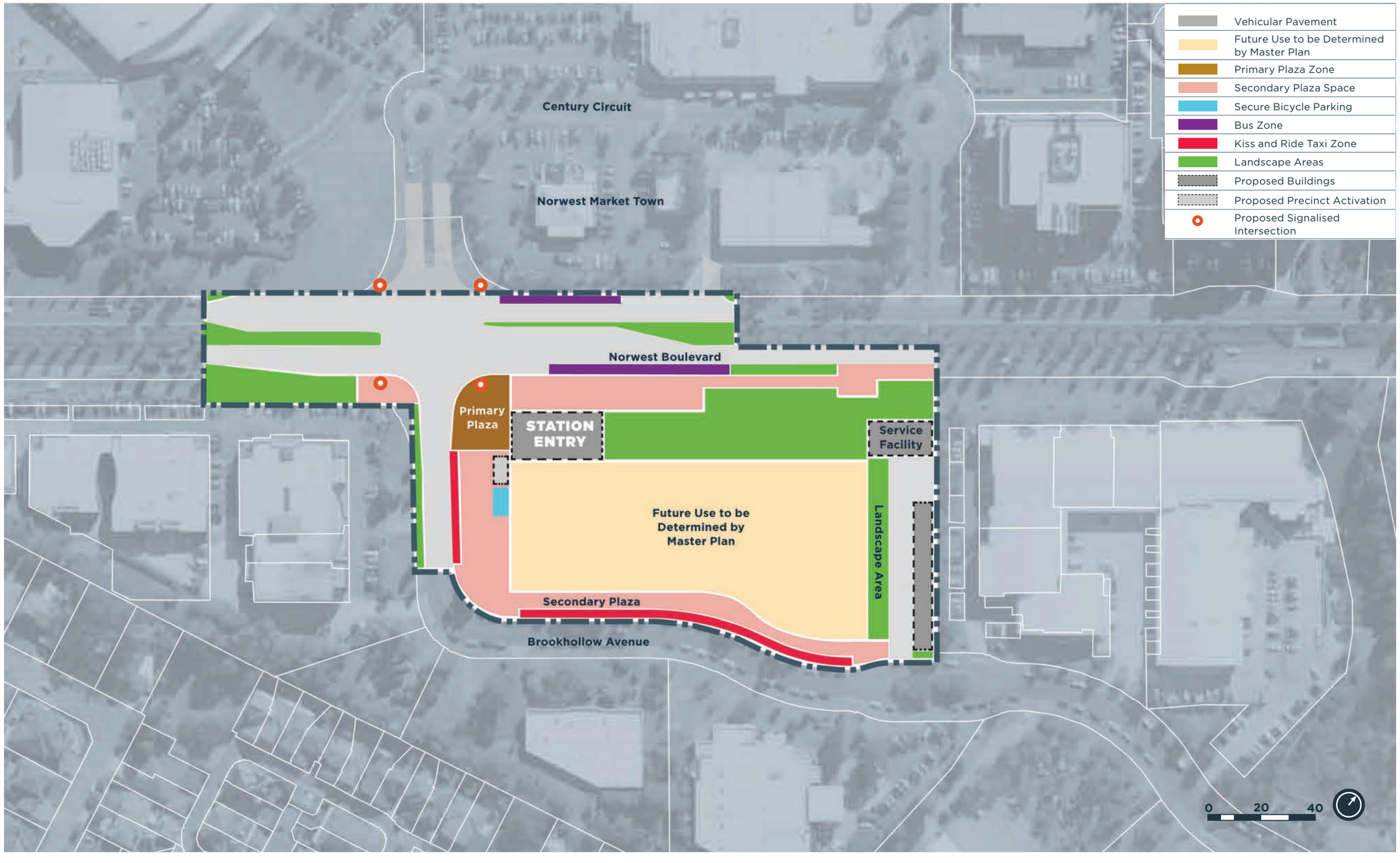


Figure 6.24 Norwest Station - Indicative vehicle and pedestrian movements

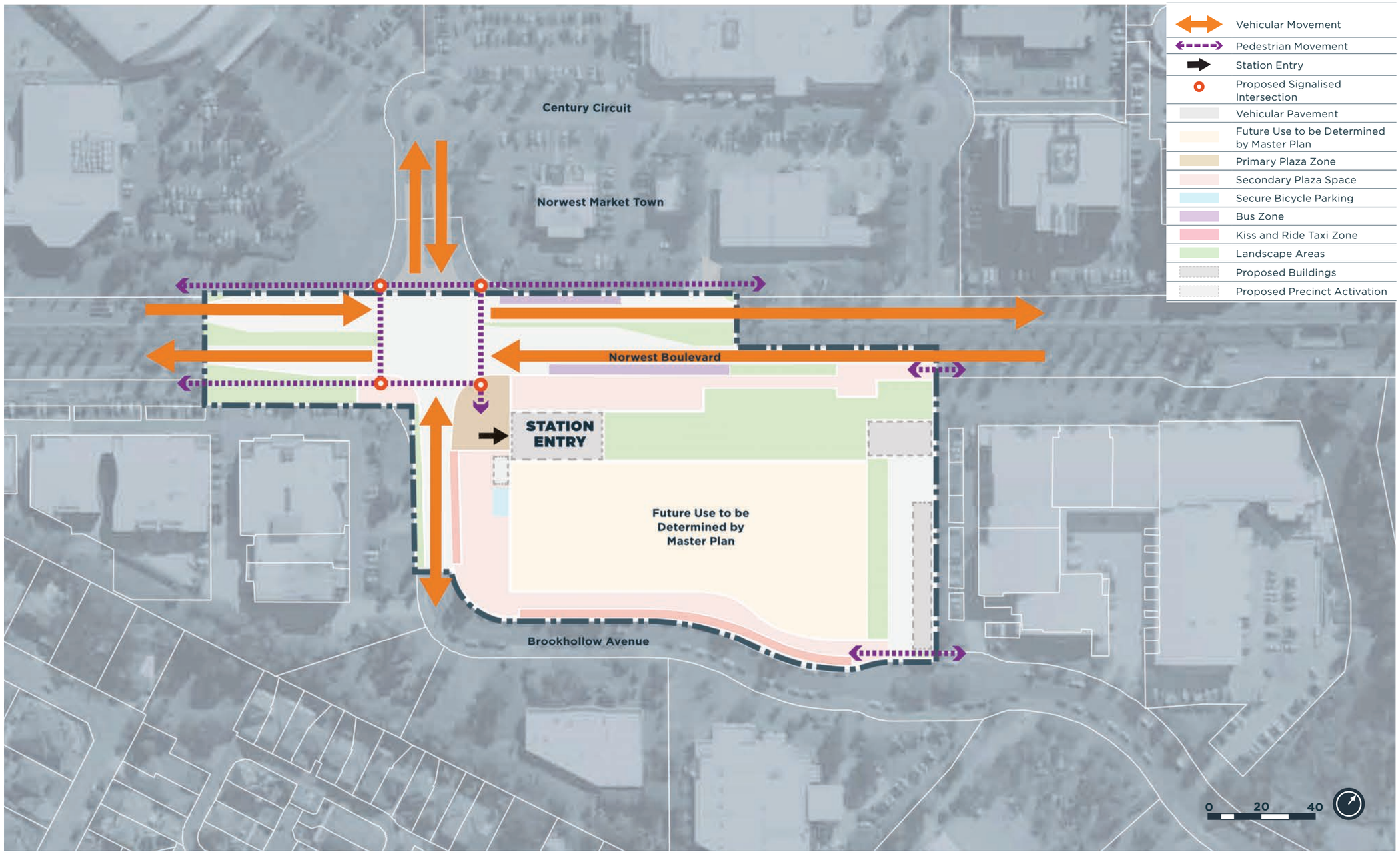


Figure 6.25 Indicative cross section of Norwest Station at Day 1 of operations

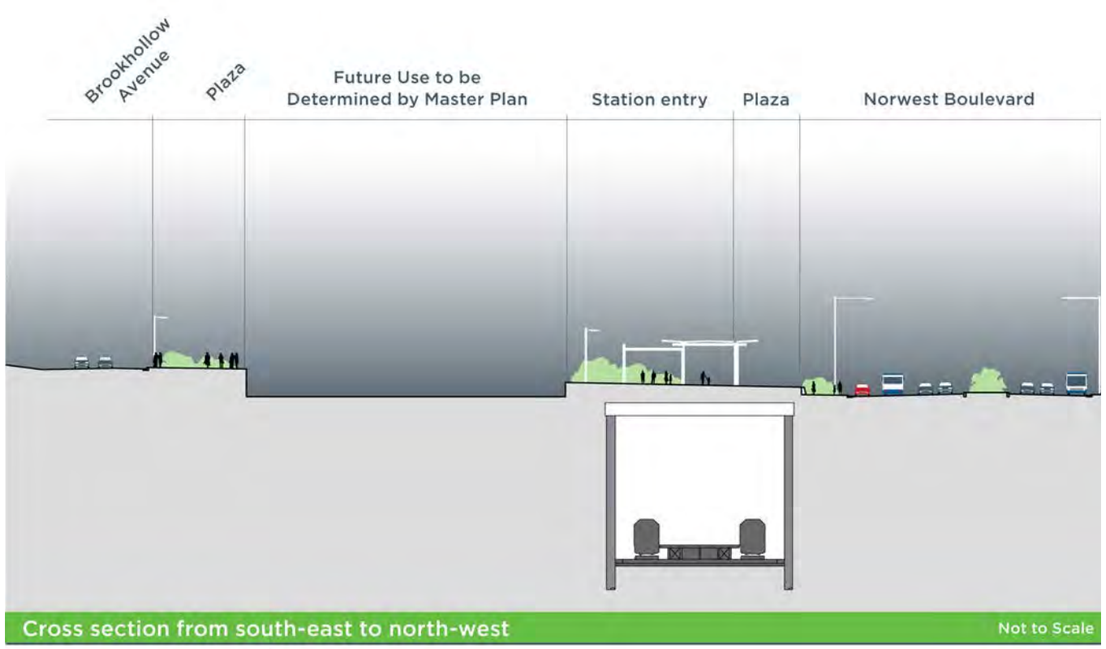


Figure 6.26 Artist's Impression of Norwest Station at Day 1 of operations, looking east towards the station entrance from the intersection of Norwest Boulevard and Brookhollow Avenue

6.13 Bella Vista Station

Bella Vista Station precinct is located at a critical linking point between the existing edge of Norwest Business Park and the southern edge of a future growth corridor that runs between Elizabeth Macarthur Creek and Old Windsor Road. The station has the potential to be a key landmark within this new commercial / mixed use centre. Pedestrian access is provided primarily from the new precinct road with a range of local connections.

The station has been designed as a park and ride station and would improve public transport access to the Norwest Business Park.

The station entry plaza addresses the new extended Lexington Drive and its intersection with Celebration Drive. There is an opportunity to provide a second entrance at Bella Vista to improve the future pedestrian catchment to the north. This may require slight realignment of the station to improve the relationship with the proposed local street network.

The station shown in **Figure 6.27** to **Figure 6.30** would be in a cutting that is about 1,200 m long. At its deepest point the cutting would be 15 m deep, retained on both sides, and wide enough for a twin track railway with a separate maintenance access road along the eastern edge. As the station is located in open cut, it benefits from natural light and ventilation. The rail alignment north of Bella Vista transitions from a cutting to an elevated structure.

The station entry and concourse would be at street level and have been designed to provide access to the emerging town centre of Bella Vista and the localised walk-up residential catchment. Access to and parking at McDonalds would be reconfigured. A significant number of station users will arrive by private car, with cars accommodated in a series of on grade and multi storey car parks located further along the new extended Lexington Drive. Some 800 commuter car parking spaces would be provided in the multi-deck and on grade park and ride facilities adjacent to the station.

The newly extended Lexington Drive to Balmoral Road would provide the primary street address for local bus routes and kiss and ride users with weather protected bus, taxi and kiss and ride facilities along its length.

A service building would be located adjacent to Old Windsor Road, west of the proposed carpark and would include a traction and station substation.

The station is described in **Table 6.6** and illustrated in **Figure 6.27** to **Figure 6.30**.

Table 6.6 Description of Bella Vista Station

Feature	Description
Centre type	Specialised Centre
Station type	Future Town Centre
Customers	Employment and residential
Location	▪ Bella Vista is a suburb in the Norwest Business Park and is located 33 km north west of the Sydney CBD ▪ The proposed station location is north of Celebration Drive, a key access road and east of Old Windsor Road and lies within The Hills Shire ▪ A large area of residential development is located to the east of the station with a business park to the south ▪ It has gently undulating topography, wide valleys and open views ▪ The station is located in a business park which has been designed for predominately vehicular access ▪ The proposed station is located on the corner of Old Windsor Road and Celebration Drive
Platform depth	Approximately 6 m entrance to platform
Concourse location	Street level
Station entrances	Located at the prominent southern end of the precinct, creating a public plaza. Provision for a second entrance at the northern end of the precinct.
Day 1 Elements	▪ Way-finding signage and transport information ▪ Station utilities /services facilities ▪ Public space/plaza areas adjacent to station entry points ▪ Retail space ▪ Bus (six spaces), Taxi (four spaces) and kiss and ride (16 spaces) located along the new extended Lexington Drive Boulevard ▪ Local bus access provided from the existing T-way ▪ Bicycle parking and storage facility for 30 bicycles ▪ Park and ride facility with capacity for approximately 800 cars in a combination of two level and on grade car parks ▪ Access to and parking at McDonalds would be reconfigured ▪ Removal of existing roundabout at the junction of Celebration Drive and Lexington Drive ▪ Service access road off new boulevard (new extended Lexington Drive) ▪ Signalisation of the existing intersection with Lexington Drive and Celebration Drive ▪ Pedestrian crossings on the Lexington Drive extension ▪ A pedestrian bridge across Old Windsor Road ▪ Widening of Celebration Drive to provide four lanes between Lexington Avenue and Old Windsor Road ▪ Extension of Celebration Drive north to link with proposed northern link road and then west back to Old Windsor Road ▪ Footpath upgrades as needed along Celebration Drive ▪ Service building located adjacent to Old Windsor Road, west of the proposed carpark ▪ Three service access points located adjacent to the service building, the station entrance and the northernmost on grade park and ride facility. These would be accessed via the service road off Balmoral Road, the new link road and the Lexington Drive Extension respectively ▪ Future development sites

Figure 6.27 Bella Vista Station - Indicative layout

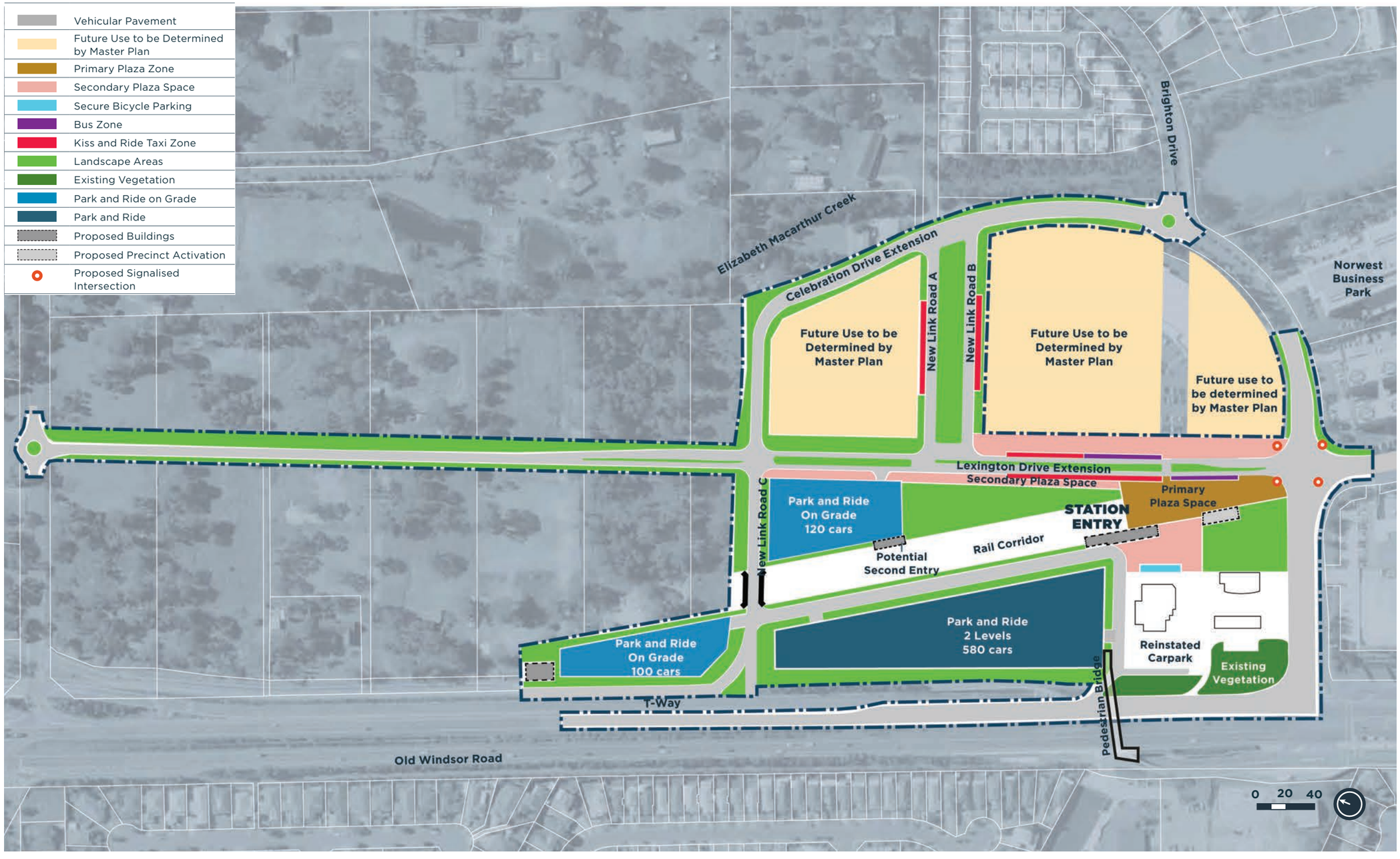


Figure 6.28 Bella Vista Station - Indicative vehicle and pedestrian movements

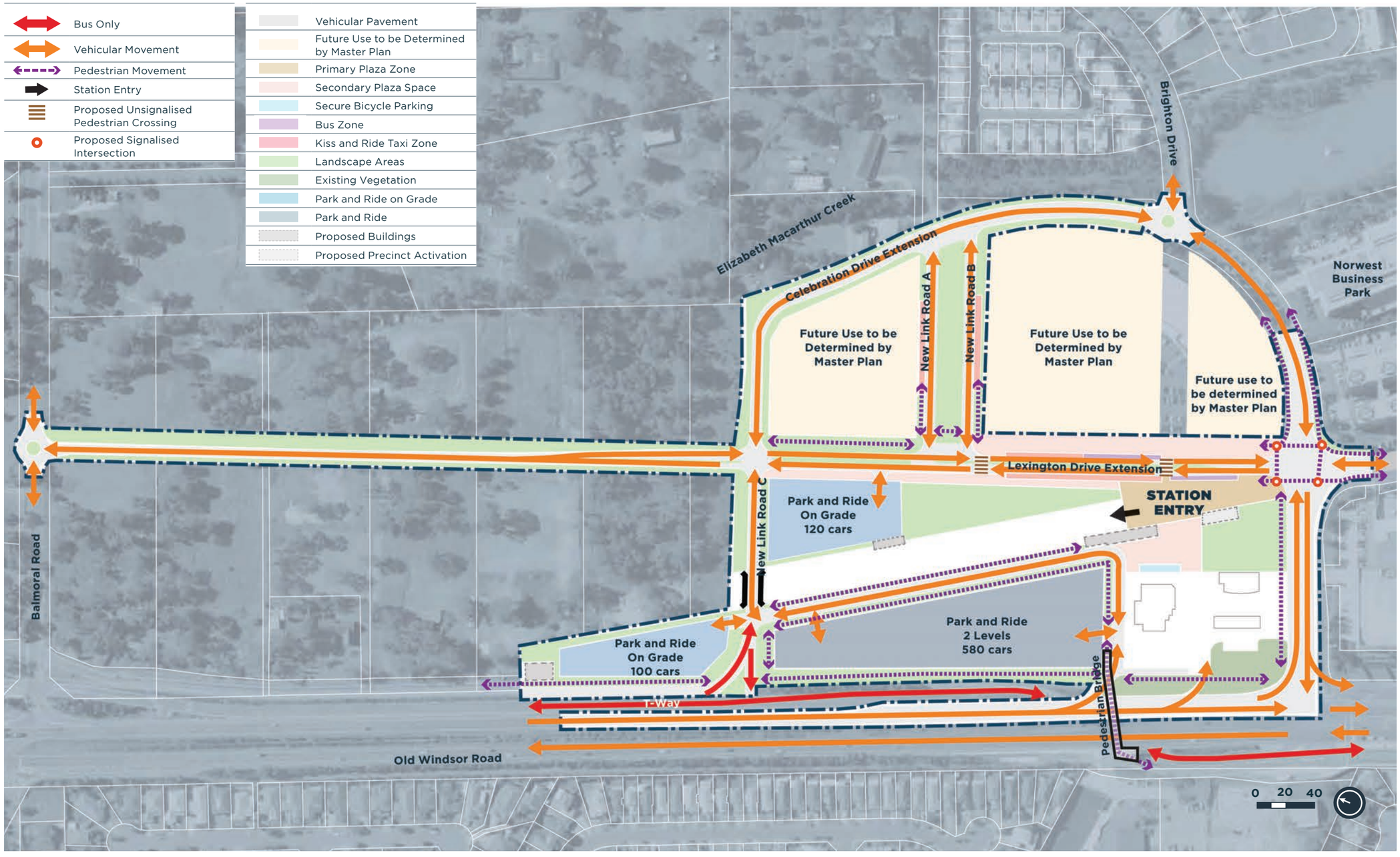


Figure 6.29 Indicative cross section of Bella Vista Station at Day 1 of operations

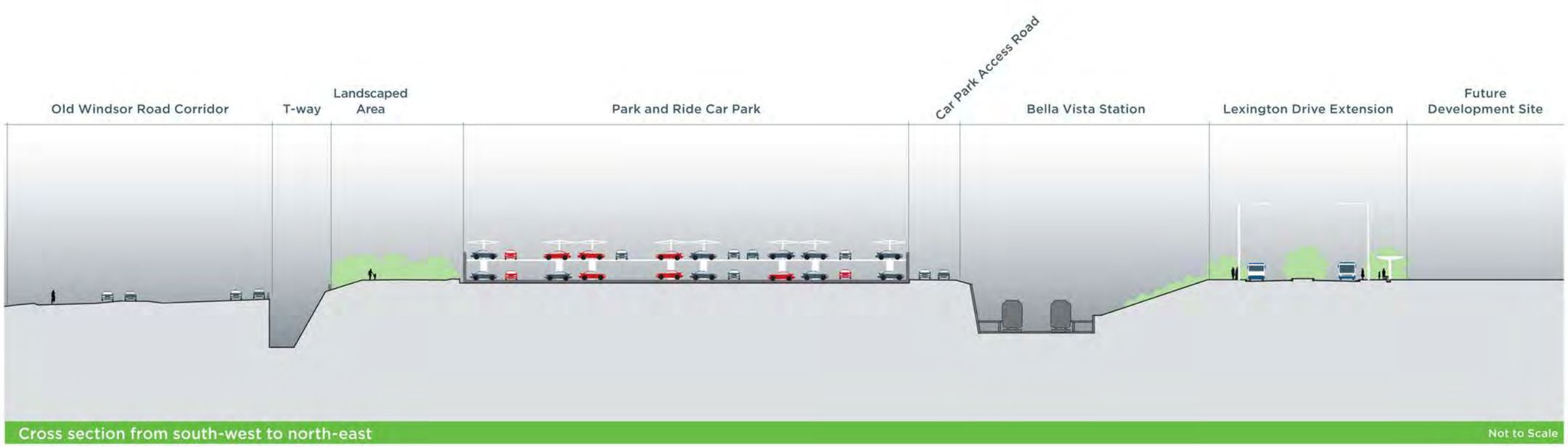


Figure 6.30 Artist's Impression of Bella Vista Station at Day 1 of operations, looking towards the station entrance

6.14 Kellyville Station

The Kellyville Station precinct is located at the junction of Samantha Riley Drive and Old Windsor Road to the east of the existing T-way bus stops and car park and would provide rail access and a public transport interchange for the existing residents of Kellyville, Beaumont Hills and Stanhope Gardens. With future major development potential to the east and in the Balmoral Land Release area, the precinct would serve a growing and evolving local community.

The station would be a significant destination on day one for park and ride users of the rail network and T-Way system, with extensive parking facilities adjacent to the station. Some 1,200 car parking spaces would be located close to the station. A two level park and ride facility would be located to the east of the station entry, and two on grade facilities would be located beneath the rail viaduct north and south of Samantha Riley Drive. An additional 160 car parking spaces would be provided to replace affected T-way parking.

The rail would be located on an elevated viaduct through this precinct and the elevated station alignment offers the opportunity to design a simple transport interchange facility that maximises circulation and connectivity between transport modes at ground level.

Platforms on each side of the track (side platforms) would be elevated (approximately 13 m above street level) and would be accessed from the ground level station entry and concourse. The station entry addresses a new boulevard connector parallel to Old Windsor Road which would provide direct access to Samantha Riley Drive and would allow unimpeded, interchange to the existing T- Way to the west and the car park and potential future development to the east.

To provide shading for passengers a proportion of the platform area would be covered by a canopy. To provide protection from wind and rain additional weather protection has also been integrated within the platform. The station passenger areas (entry, concourse and platform) would be naturally ventilated and daylit.

To facilitate access to the station new roads would be constructed and sections of surrounding roads and footpaths would be modified and upgraded as needed. In addition, a pedestrian bridge would be constructed over Old Windsor Road and the T-way at the intersection with Samantha Riley Drive and Newbury Avenue.

As shown in **Figure 6.31** to **Figure 6.34**, weather protected taxi and kiss and ride stops and waiting areas would be provided along the new precinct access roads.

The station adjoins an existing T-way providing opportunity for interchange between transport modes. The T-way would be retained for T-way and local bus services with weather protected facilities.

The station is described in **Table 6.7** and illustrated in **Figure 6.31** to **Figure 6.34**.

Table 6.7 Description of Kellyville Station

Feature	Description
Centre type	Future small village
Station type	Suburban village
Customers	Residential
Location	▪ The proposed Kellyville Station is located east of Old Windsor Road, south of Samantha Riley Drive, and just north of a large area of proposed greenfield development. The station is 34 km north west of the Sydney CBD ▪ The proposed station is located close to Old Windsor Road and within The Hills Shire ▪ The gently undulating topography, wide valleys and open views ▪ The proposed station would service existing residential and future residential areas ▪ The proposed station is adjacent to the Riley T-way Station on the south-eastern corner of Old Windsor Road and Samantha Riley Drive
Platform height	Approximately 13 m from entrance to platform
Concourse locations	Street level
Station entrances	Located in prominent northern end of precinct, creating a public forecourt
Day 1 Elements	▪ Way-finding signage and transport information ▪ Station utilities / services facilities ▪ Public space / plaza areas adjacent to station entry points ▪ Bus (provision for four future spaces), taxi (four spaces) and kiss and ride (10 spaces) located along the new precinct access roads ▪ Bicycle parking and storage facility for 45 bicycles ▪ Park and ride facility with capacity for approximately 1,360 cars, comprising 1,200 park and ride spaces plus 160 additional spaces for the T-way ▪ New precinct access roads ▪ Access to the station entrances for emergency, delivery and maintenance vehicles ▪ Samantha Riley Drive widened to accommodate additional turning lanes ▪ Existing roundabout on Samantha Riley Drive removed ▪ Existing T-way retained ▪ New signalised intersections at Samantha Riley Drive and road access to railway station ▪ Footpath upgrades as needed ▪ New pedestrian bridge across Old Windsor Road and T-way ▪ Pedestrian crossings across the new precinct boulevard and station access roads ▪ Service building located adjacent to station entry building (under the viaduct) which would include a station substation ▪ Service access point located adjacent to the service building, accessed via the new precinct access road ▪ Future development sites

Figure 6.31 Kellyville Station - Indicative layout

Figure 6.32 Kellyville Station - Indicative vehicle and pedestrian movements

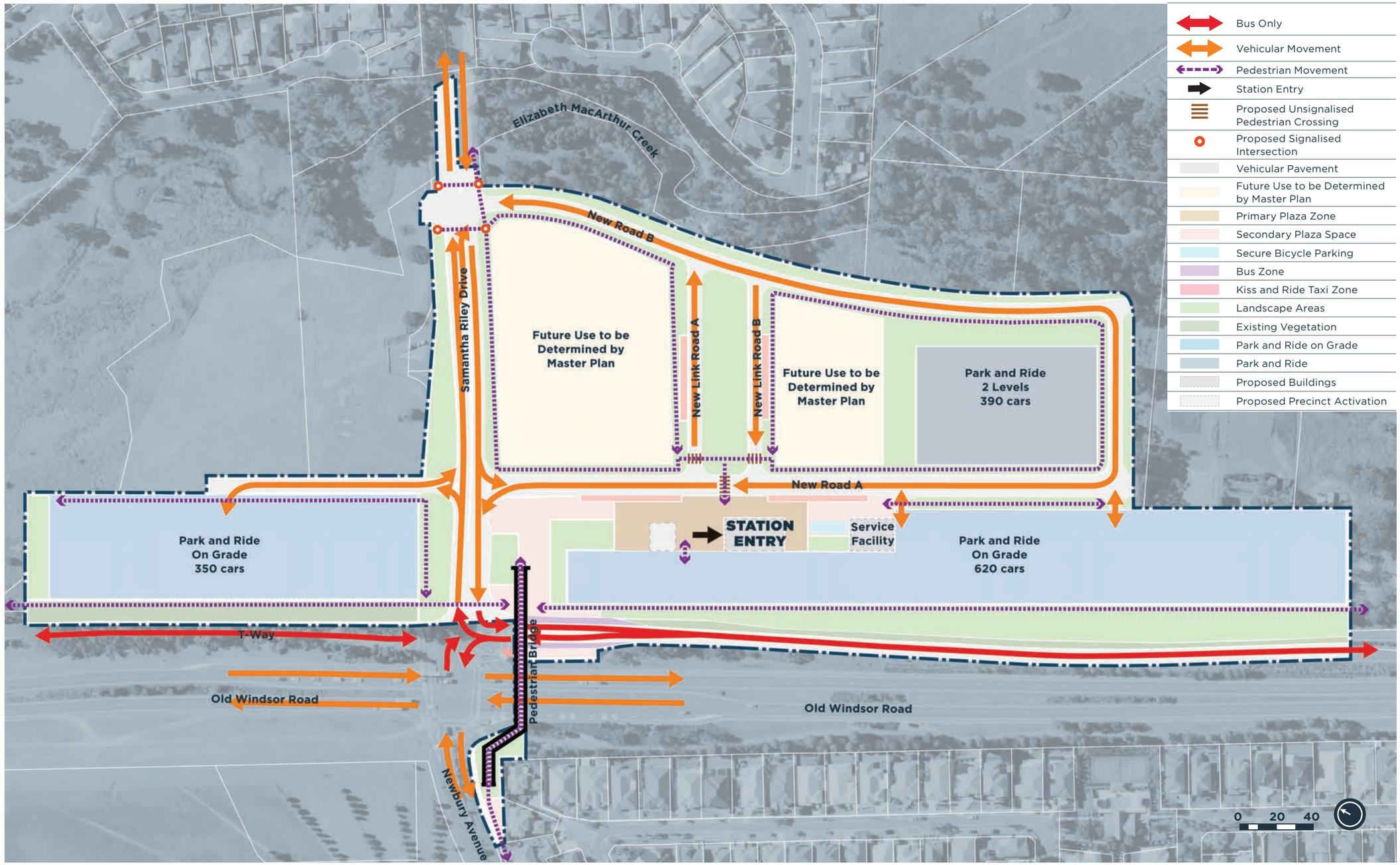


Figure 6.33 Indicative cross section of Kellyville Station at Day 1 of operations

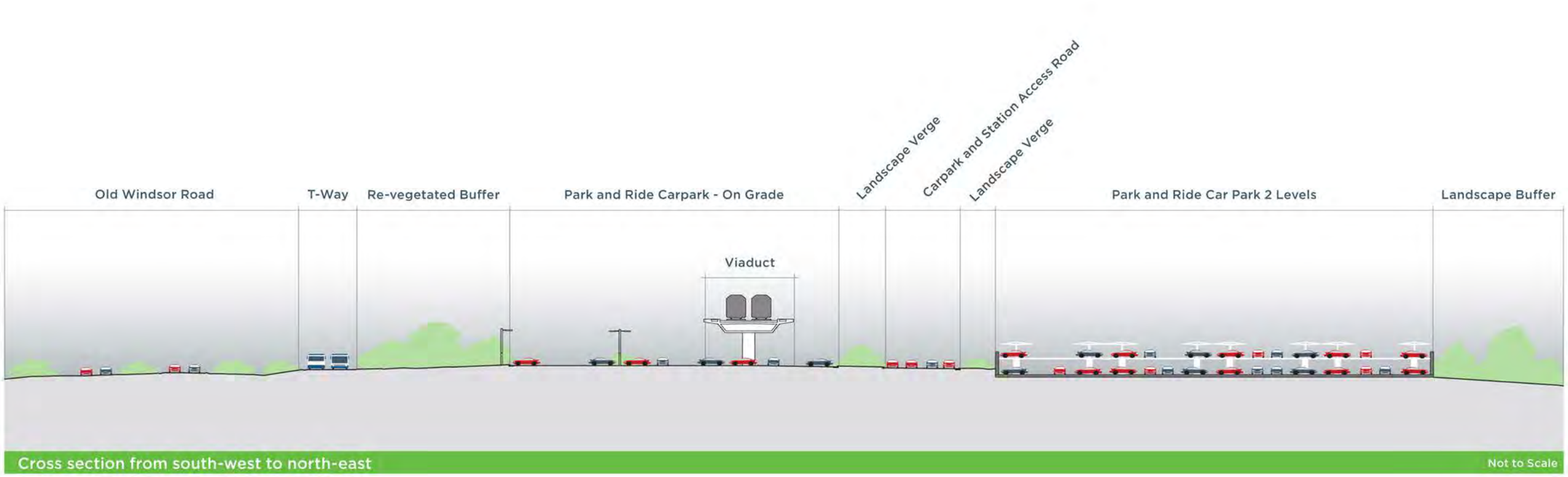


Figure 6.34 Artist's Impression of Kellyville Station at Day 1 of operations, looking west towards the station access from the new access roads

6.15 Rouse Hill Station

Rouse Hill Station provides a structured and integrated transport function to the Rouse Hill town centre retail and commercial core. The area around the station has significant potential for change and Rouse Hill has a long term employment target of 12,000 jobs by 2036 (NSW Government, 2010, Metropolitan Plan for Sydney).

The station would be located adjacent to the existing western town centre entry forecourt.

The rail would be located on an elevated viaduct through this precinct and the elevated station alignment offers the opportunity to design a transport interchange facility that maximises circulation and connectivity between transport modes at ground level.

As shown in **Figure 6.35** to **Figure 6.38**, the station entry would address a combined interchange plaza that would provide legible circulation between each transport type and the town centre.

The station side platforms would be elevated (approximately 12m above street level) and a canopy would provide weather protection for passengers. The station passenger areas would be naturally ventilated.

Sections of surrounding roads and footpaths would be modified and upgraded as needed to facilitate access to the station.

As the station would be a major public transport interchange facility, the existing T-way would be modified to accommodate the station transport interchange. The weather protected bus stops would be located between the station and Windsor Road.

The station is described in **Table 6.8** and illustrated in **Figure 6.35** to **Figure 6.38**.

Table 6.8 Description of Rouse Hill Station

Feature	Description
Centre type	Major centre
Station type	Mixed use centre
Customers	Employment and residential
Location	▪ The Rouse Hill Town Centre is 37 km north west of the Sydney CBD and located within The Hills Shire ▪ The proposed station is above the existing T-way, in between Windsor Road and Tempus Street, directly to the west of Rouse Hill Town Centre ▪ Area 20, within the north west growth sector, is located to the north and future development is also expected to the north east. Recent residential development lies to the south of the station
Platform height	Approximately 12 m from entrance to platform
Concourse location	Street level
Station entrances	The station entry plaza would be located on Tempus Street
Day 1 elements	▪ Way-finding signage and transport information ▪ Station utilities /services facilities ▪ Public space/plaza areas adjacent to station entry points ▪ Bus interchange on both sides of the T-way (12 bus stands) ▪ T-way bus movement and road layout reconfigured ▪ Taxi (six spaces) and kiss and ride (25 spaces) zones located along Tempus Street ▪ Reconfiguration of the bus interchange ▪ Bicycle parking and storage facility for 40 bicycles ▪ Modifications to Windsor Road to facilitate the viaduct crossing ▪ Reinstatement of to the existing signalised intersections with Rouse Hill Drive and White Hart Drive ▪ Service access off Tempus Street and modified T-way ▪ Footpath upgrades as needed along Tempus Street and Windsor Road ▪ Service building south east of the station entry which includes a station substation and section hut ▪ Service access point located adjacent to the station entry, which would be accessed via the T-way ▪ Bus layover areas adjacent to Windsor Road between Rouse Hill Drive and Commercial Road, and south of White Hart Drive beneath the rail viaduct ▪ Pedestrian crossings on Tempus Street, Main Street and the T-way

Figure 6.35 Rouse Hill Station - Indicative layout

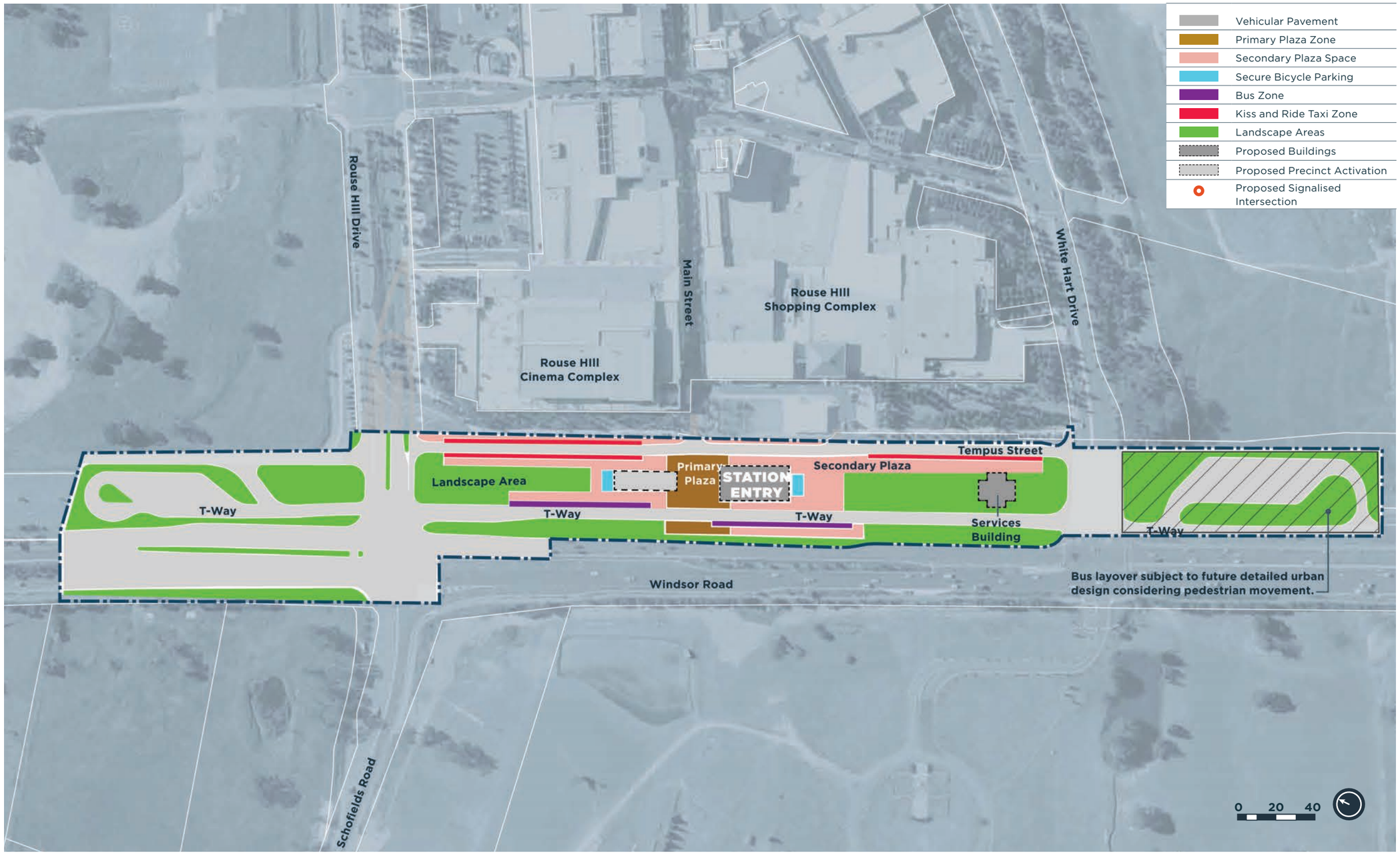


Figure 6.36 Rouse Hill Station - Indicative vehicle and pedestrian movements

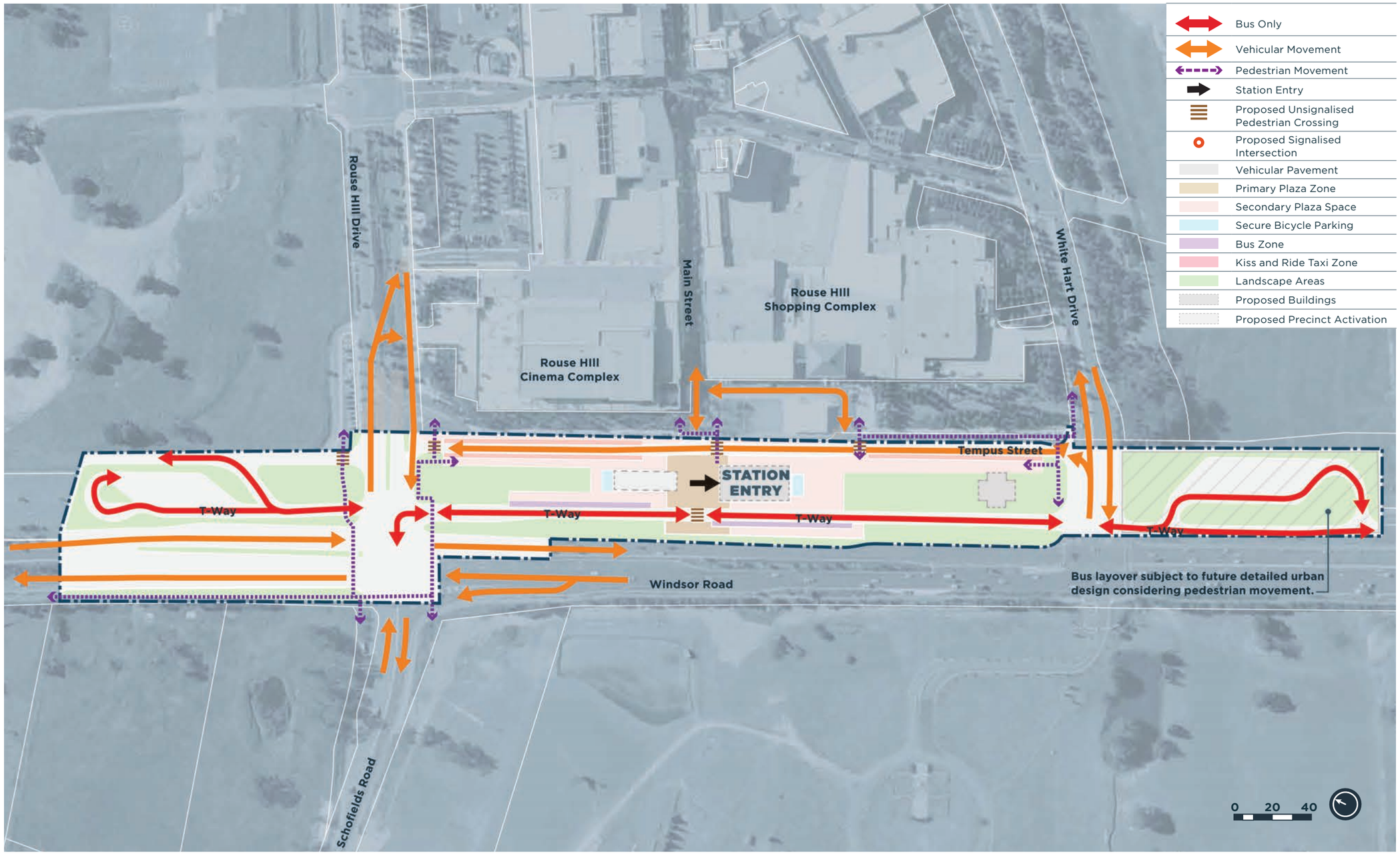


Figure 6.37 Indicative cross section of Rouse Hill Station at Day 1 of operations

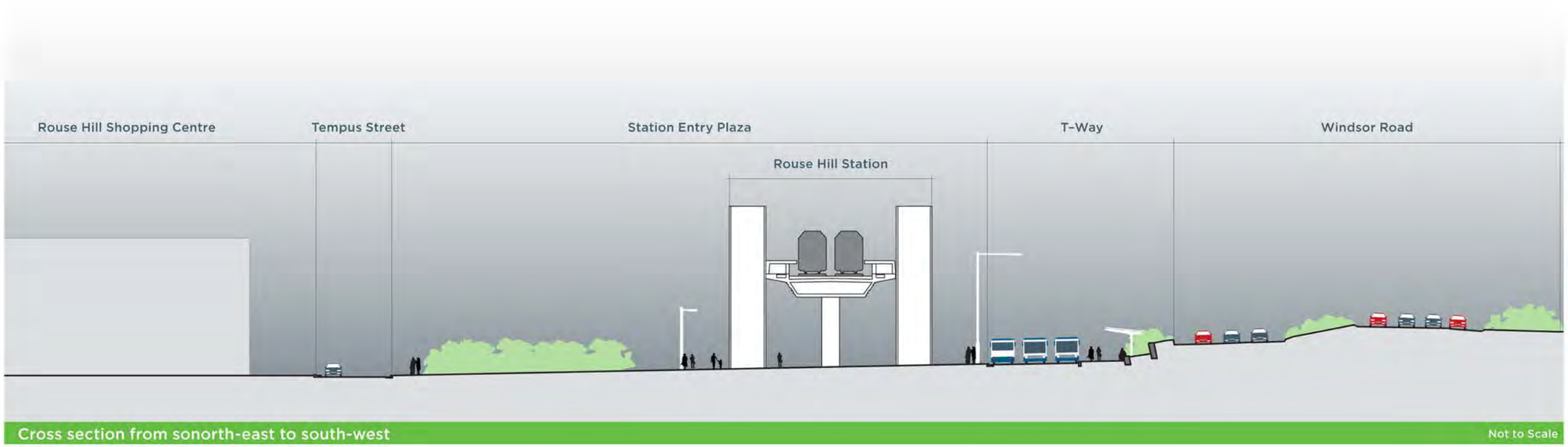


Figure 6.38 Artist's Impression of Rouse Hill Station at Day 1 of operations, looking east towards the station entrance from the T-way

6.16 Cudgegong Road Station

The Cudgegong Road Station precinct would form the transport hub of a new village centre in a rapidly growing area of North West Sydney. The station would serve the existing residents within The Ponds, the Area 20 precinct and future neighbourhoods in the North West Growth Centre. The station would be located to the west of Cudgegong Road and east of Tallawong Road in an open cut arrangement with the station precinct road framework being established for day one operation. The station entry would be located on the northern side of the station, establishing a public forecourt address for the future village centre as shown in **Figure 6.39** to **Figure 6.42**.

The station would be a significant park and ride destination serving the residential expansion areas surrounding the precinct. Park and ride facilities for 1,000 cars would be provided in close proximity to the station with a strong emphasis placed on pedestrian connectivity. A dedicated pedestrian bridge across the rail corridor would provide direct connections and would align with the proposed street pattern of the future village.

The station entrance, concourse and services buildings would be at street level.

Two new precinct access roads (north spine road and south spine road) would be constructed to provide access to the main station entry point and car park areas. These new roads would run between Tallawong Road and Cudgegong Road.

The weather protected kiss and ride, bus and taxi stops/waiting areas would be located along north spine road.

A pedestrian bridge would be constructed off south spine road to provide direct pedestrian access across the rail alignment to the station entry plaza. Pedestrian crossings would be provided on the north and south spine roads.

To facilitate access to the station, sections of Cudgegong and Tallawong Roads would be modified and upgraded as needed. New signalised intersections would be provided where south spine road intersects Cudgegong Road and Tallawong Road.

Cudgegong Road would also be reconfigured / realigned, including provision of a bridge section over the rail alignment.

The park and ride facility would be located south of the new precinct access road (south spine road) and between Tallawong Road and Cudgegong Road. Around 1,000 car parking spaces would be provided in this facility.

The station design includes safeguarding for a future additional island platform to enable turnback of additional trains and/or the extension of the rail alignment.

The station is described in **Table 6.9** and illustrated in **Figure 6.39** to **Figure 6.42**.

Table 6.9 Description of Cudgegong Road Station

Feature	Description
Centre type	Small Village
Station type	Village Centre
Customers	Predominantly residential
Location	▪ The proposed Cudgegong Road Station is located within the North West Growth Sector adjoining the gazetted Area 20 master plan area and the Riverstone East development precinct, 48 km from the Sydney CBD ▪ The proposed station is located between Cudgegong and Tallawong Roads within Blacktown City ▪ Large development areas are adjacent to the proposed station including; Area 20, Alex Avenue, Riverstone East, Schofields and Second Ponds Creek areas ▪ It is located within an area of gently undulating topography
Platform depth	Approximately 6 m entrance to platform
Concourse location	Street level
Station entrances	Located on the northern side of precinct, creating a public forecourt
Day 1 elements	▪ Way-finding signage and transport information ▪ Station utilities /services facilities ▪ Station entrance off north spine road ▪ Public space/plaza areas adjacent to station entry points ▪ Bus (six spaces), Taxi (nine spaces) and kiss and ride (15 spaces) interchanges located adjacent to the station entry on the north spine road ▪ Bicycle parking and storage facility for 45 bicycles ▪ Park and ride facility with capacity for approximately 1,000 cars (at grade) ▪ Two new precinct access roads (north spine road and south spine road) between Tallawong Road and Cudgegong Road ▪ Construction of an overbridge midway between Tallawong Road and Cudgegong Road linking the northern and southern spine roads ▪ Access to the station entrances for emergency, delivery and maintenance vehicles ▪ Pedestrian crossings on the north and south spine roads ▪ Service access road off north spine and south spine roads ▪ New signalised intersections at intersections of: - Cudgegong Road and (south spine road - Tallawong Road and south spine road ▪ Pedestrian bridge across rail alignment linking the southern spine road to the station entrance ▪ Areas around station safeguarded for potential future development ▪ Service building, located west of the station entry ▪ Two access points located adjacent to the service building and the station entry ▪ Future development sites

Figure 6.39 Cudgegong Road Station - Indicative layout

Figure 6.40 Cudgegong Road Station - Indicative vehicle and pedestrian movements

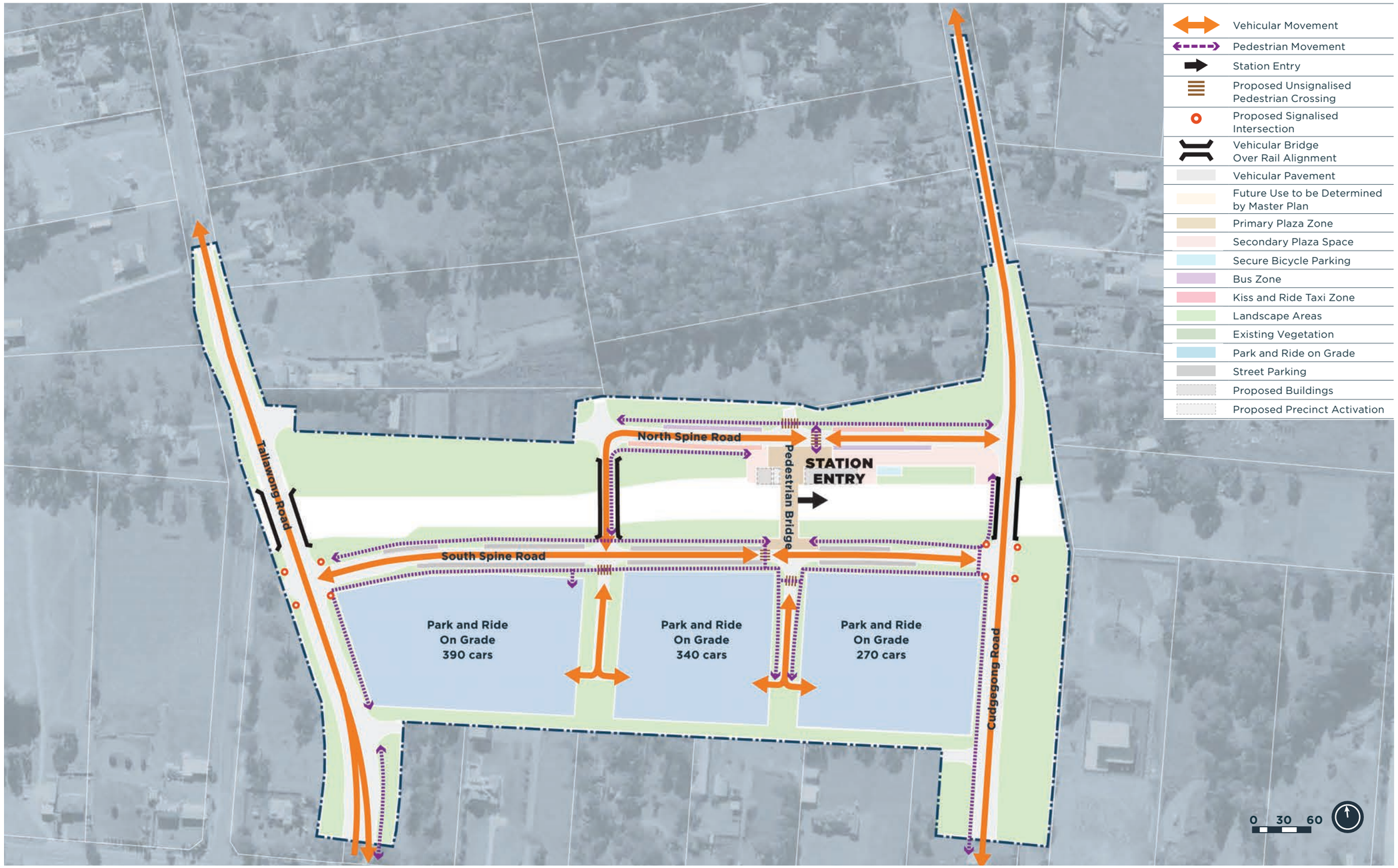


Figure 6.41 Indicative cross section of Cudgegong Road Station at Day 1 of operations

Figure 6.42 Artist's Impression of Cudgegong Road Station at Day 1 of operations, looking south towards the station entrance from the north spine road

6.17 Stabling and Maintenance Activities at Tallawong Road

As shown in **Figure 6.43**, the stabling and maintenance activities would be carried out at a site off Tallawong Road. The site is located north of Schofields Road and west of Tallawong Road, within the North West Growth Centre, an area of land which has been identified for future urban development.

As part of a broader Sydney rail strategy known as Sydney's Rail Future, the NWRL will operate with dedicated single deck rapid transit trains. The stabling facility would need to cater for future patronage growth with NWRL being designed for an ultimate capacity of up to 20 trains per hour (in the peak direction every three minutes).

To ensure that it does not unduly constrain nor inhibit the reliable operation of the broader future rail network (including a second harbour crossing which has been identified as part of Sydney's Rail Future) the infrastructure for NWRL must consider future configurations and options. In this regard, the future operational and land requirements for the rapid transit network require validation during further development and implementation of the NSW Long Term Transport Master Plan and ongoing consultation with relevant stakeholders.

The site would be designed to integrate with the future surrounding land uses and incorporate sustainability measures in line with TfNSW Sustainable Design Guidelines.

The design of the site would address the operational requirements for stabling and maintenance activities, including any operational processes required for departing trains as well as requirements for cleaning and maintenance.

The design of the stabling and maintenance facility would be in keeping with its locality and further anticipated land uses.

The site would include the following infrastructure and services:

- Internal access roads.
- Train stabling area.
- Train wash.
- Wheel lathe within a building.
- Maintenance building.
- Infrastructure maintenance facilities.
- Administration buildings including operational control centre.
- Staff car park.
- Landscaping.
- Lighting and CCTV.
- Fencing.
- A bulk power sub-station and transformer facilities with secure access.

The site would also accommodate the needs of emergency services.

Since residential development is planned for the areas surrounding the site (including the Riverstone East Precinct to the north and Alex Avenue Precinct to the south of the facility), a key design principle has been to minimise visual and acoustic impacts. Screening would be provided to minimise visual impacts, noise and light spill from the site. No train horn testing would be carried out at the site and where possible trees would be retained along the site boundaries.

Water sensitive urban design principles such as waste water collection and re-use (including building and train wash) and rainwater harvesting have been incorporated into the site design. For example, rainwater would be harvested from the roof of the train maintenance building for reuse onsite.

6.17.1 Train Stabling

Trains would need to be stored in the stabling facility outside peak periods and between the last service and the first service commencing the following day. Trains would normally be shut down once they have been stabled and the interior cleaned. They would need to be powered up one hour prior to their scheduled departure time. The stabling would operate 24 hours per day, seven days per week.

The stabling facility would assist in maintaining operational reliability by allowing train services to commence on time from Cudgegong Road Station. Stabling the trains required to operate the NWRL at or near the end of the line, eliminates the need for extended sections of out-of-service or empty train operations.

The stabling facility requires a large flat area for its operation. The facility will be configured to accommodate up to 20 stabled trains. Track and crossovers will connect the eastern end of the yard with the main running lines near Cudgegong Road Station.

Daily internal cleaning of the trains would take place when trains return to the site after the morning and evening peak periods and also at the end of each day. The water used for spot cleaning would be collected and treated onsite for reuse. A rainwater harvesting tank would be installed onsite to enable collection, storage and use of rainwater at the facility.

6.17.2 Train Maintenance

The following activities would be performed in the train maintenance building:

- Train washing.
- Rolling stock inspections and repairs.
- Major train maintenance.
- Wheel maintenance.

To minimise noise impacts, the train maintenance activities would be undertaken in an acoustic enclosure where practical.

The exterior of the trains would be washed in an automated train wash a minimum of twice per week. Up to 95% of the wash water used in the automated train wash would be recycled. The residual 5% of wash water would be discharged to sewer.

The tread of train wheels becomes worn during operation. The train wheels would be periodically machined using either an underfloor wheel lathe or milling machine.

Figure 6.43 Indicative plan of Tallawong Stabling Facility at Day 1 of operations

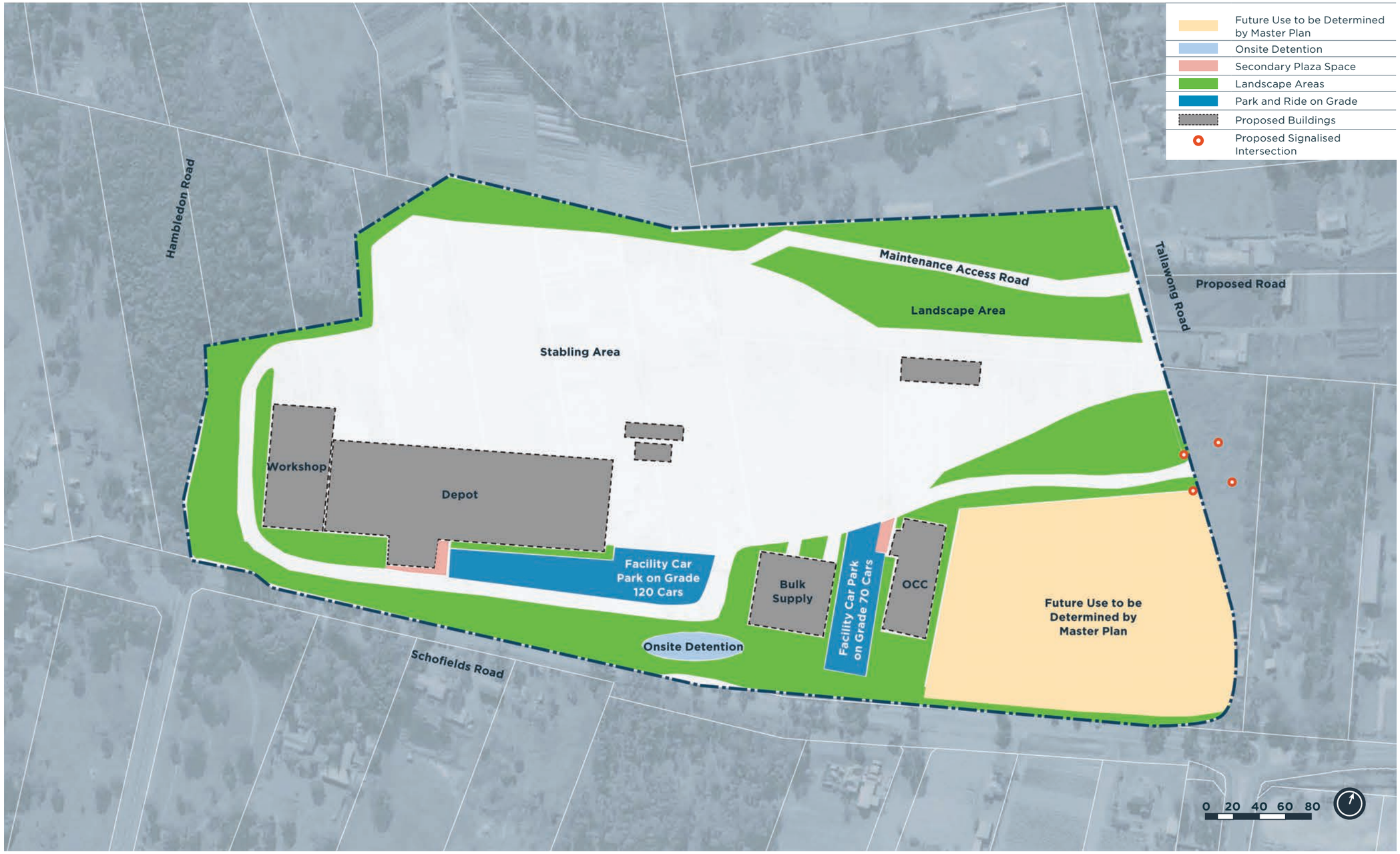
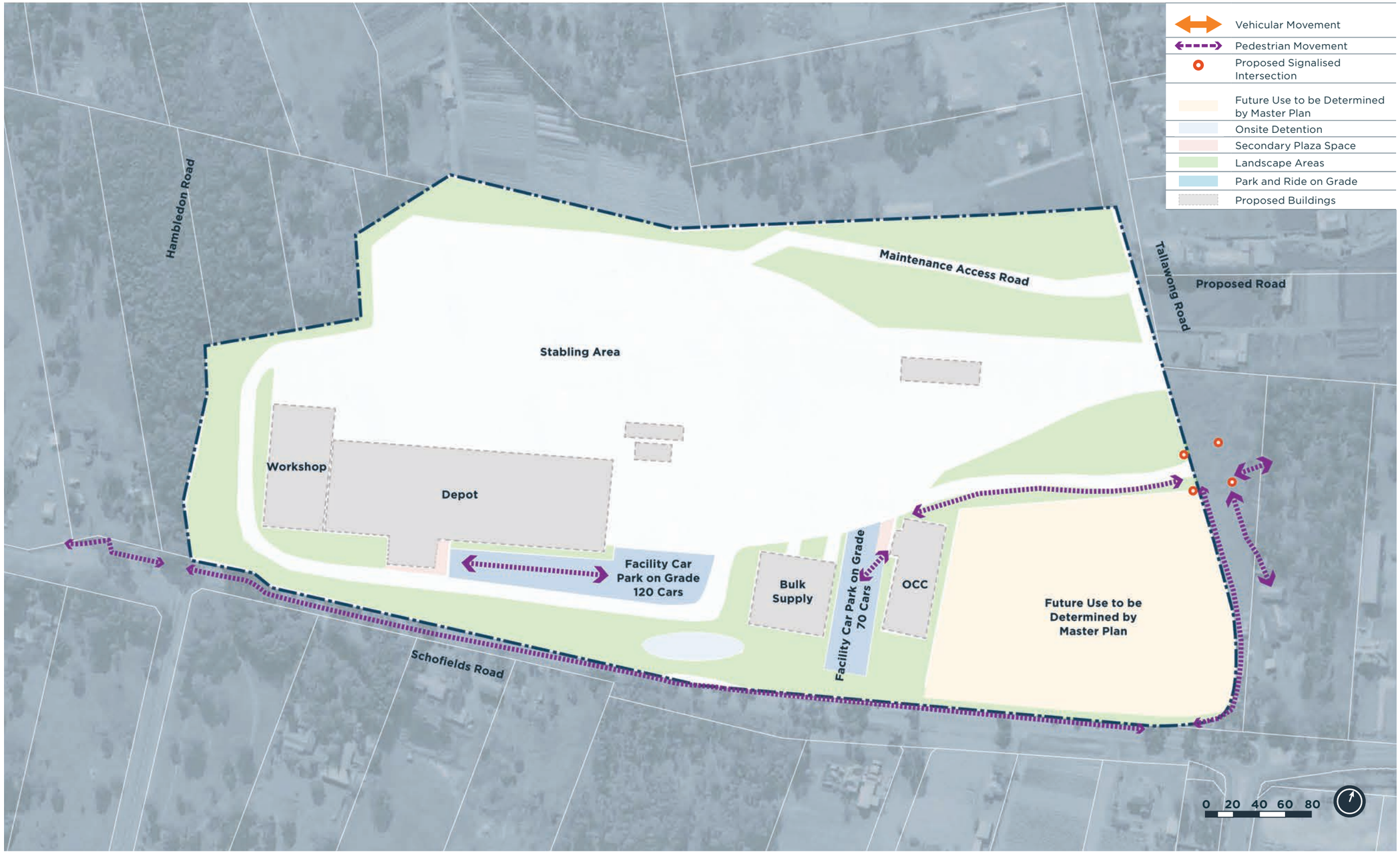


Figure 6.44 Tallawong Stabling Facility - Indicative layout



PART D - RAIL INFRASTRUCTURE AND SYSTEMS

6.18 Introduction

The following sections provide a description of the proposed NWRL infrastructure and systems including the tunnels, the skytrain and surface tracks, the service facilities and the rail infrastructure and systems.

6.19 Tunnels

The twin underground rail tunnels extend from Epping Station for 15.5 km to a tunnel portal immediately north of Celebration Drive, in the Norwest Business Park near Bella Vista Station. The underground section would include the stations at Cherrybrook, Castle Hill, Showground and Norwest.

The tunnels would have a circular cross section and a clear internal lined diameter of approximately 6.0 m. The tunnels would be lined with pre-cast concrete segments to ensure the long term life of the tunnels and to minimise groundwater ingress.

In addition to space for the trains and tracks, the tunnels would provide space for various equipment including rail signalling, controls and communication, overhead traction power, fire systems and emergency access walkway. These aspects of the tunnel are the subject of this EIS. For ease of understanding, a cross section of the twin tunnels is provided below in **Figure 6.44** illustrating the elements of the tunnels addressed in EIS1 as well as those which are the focus of EIS 2.

Typically the two tunnel track centrelines would be approximately 12.3 m apart, allowing for a 9 m wide platform at each island platform station. However, tunnel spacing may vary depending on construction methodology, geotechnical and other constraints. To facilitate emergency access/exit between the twin tunnels cross passages would be provided at maximum intervals of 240 m.

The tunnels would have a maximum vertical grade of 4.1% and have been designed with an appropriate curvature to accommodate a maximum operating speed of 100 km per hour.

The vertical gradient of the tunnels is influenced by the topography, geological constraints, presence of watercourses and the alignment has been designed to provide sufficient clearance to existing and proposed building basement levels (for example below Castle Hill town centre). The tunnel crown (top of the tunnel) would be located at its shallowest point approximately three metres below ground surface and at its deepest point approximately 70 metres below ground surface. On average the tunnels would be more typically in the 20-25 m depth range and tunnel depth would tend to be at its shallowest at station locations and at the northern tunnel portal. Refer to **Figure 6.13**, **Figure 6.17**, **Figure 6.21** and **Figure 6.25** for cross sections of the NWRL stations located within the tunnels.

6.20 Skytrain and surface tracks

The NWRL would emerge from a tunnel portal to the north of Celebration Drive in the Norwest Business Park and continues in a cutting. Bella Vista Station would be located in the cutting.

From Bella Vista Station, approximately 0.5 km of the above ground section of the NWRL alignment would be located in a cutting and then on an earthwork embankment. **Figure 6.29** provides an indicative cross section of the cutting and embankment between the tunnel portal near Bella Vista Station and the skytrain.

A cross over cavern would be provided at the transition from open cutting to embankment.

From the embankment structure, the rail track would become the elevated rail viaduct known as the skytrain. The skytrain would continue for about 4.2 km, passing above flood prone land, before coming to the surface within the Area 20 Precinct, prior to arriving at Cudgegong Road Station.

Two stations, Kellyville and Rouse Hill, would be located within the skytrain section of the project. **Figure 6.46** provides an artist's impression of the skytrain arriving at Rouse Hill Station.

Figure 6.45 Cross section of the tunnels illustrating the elements of EIS1 and EIS2

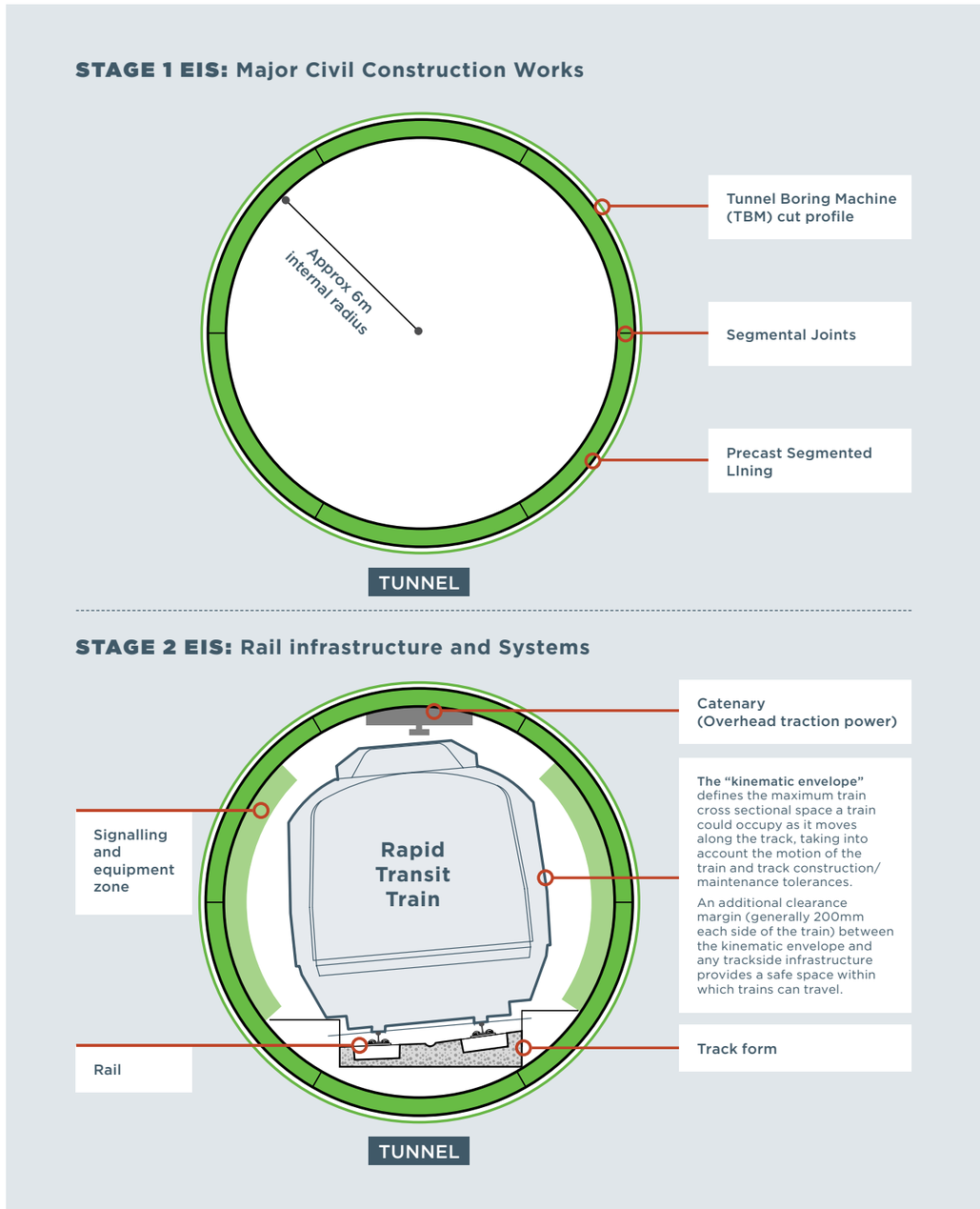


Figure 6.46 Artist's impression: NWRL skytrain arriving at Rouse Hill Station

The skytrain would run between Kellyville to beyond Rouse Hill and have a width of approximately 11 to 14 m incorporating two railway lines plus signalling, overhead wiring, acoustic treatment and maintenance walkways for rail workers.

The skytrain would likely be constructed from cast in-situ concrete piers (or footings) with concrete box section girders between the piers. The skytrain would have typical spans (the length of the viaduct between piers) of between 36 m and 48 m. Longer spans may be provided where The skytrain passes over key infrastructure or watercourses. There may also be a requirement for shorter spans in certain sections in order to avoid piers being located within the footprint of existing infrastructure.

The skytrain would be used only by passenger trains – it is not proposed to use the skytrain structure for purposes such as cycleways or pedestrian walkways.

Figure 6.5 A-J (and Appendix C shows the route of the skytrain and surface tracks, including the vertical alignment.

The skytrain would be an important design element in the visual environment and must therefore meet high quality design principles. Design principles establish the focus for future detailed design, which would be reviewed by a Design Review Panel.

Design principles for the skytrain include:

i. The skytrain must contribute to a high quality experience for customers by, for example, providing for views from the train.
ii. The skytrain must be an elegant architecturally and structurally engineered designed solution that represents value for money.
iii. The proportions of the skytrain (such as the width/depth ratios, edge design, column supports and underside treatments) must be well considered when viewed visually at human scale.
iv. All of the rail infrastructure elements of the skytrain (such as services, catenary, acoustic sound walls, downpipes, lighting) must be integrated into the design holistically, and be able to be maintained.
v. The skytrain must be minimised in width and, in particular, minimised as far as practicable in the depth/thickness of the structure.
vi. The support for the skytrain (i.e. column layout, spacing and design) must respond and/or facilitate the uses below (such as local access, active and passive public spaces, landscaping and car parking).
vii. Materials and finishes must be robust and easily maintainable considering graffiti protection and the effects of dust and rain.
viii. The skytrain must incorporate feasible and reasonable noise mitigation (addressing both airborne and structural noise).
ix. The skytrain must incorporate sustainability initiatives (such as water collection from the viaduct and energy harvesting), minimise the use of resources and materials and have a low carbon footprint.

To meet the principles described above, an indicative cross section of the skytrain structure is shown in **Figure 6.47**. The construction of the skytrain has been assessed as part of EIS1. The indicative design, rail services, fittings and fixtures, track bed, rail track and any acoustic treatment required are the subject of this EIS.

Figure 6.47 Indicative cross section of the preferred skytrain structure. Note central support for overhead wiring. A trapezoidal soffit concept is shown on a single pier.

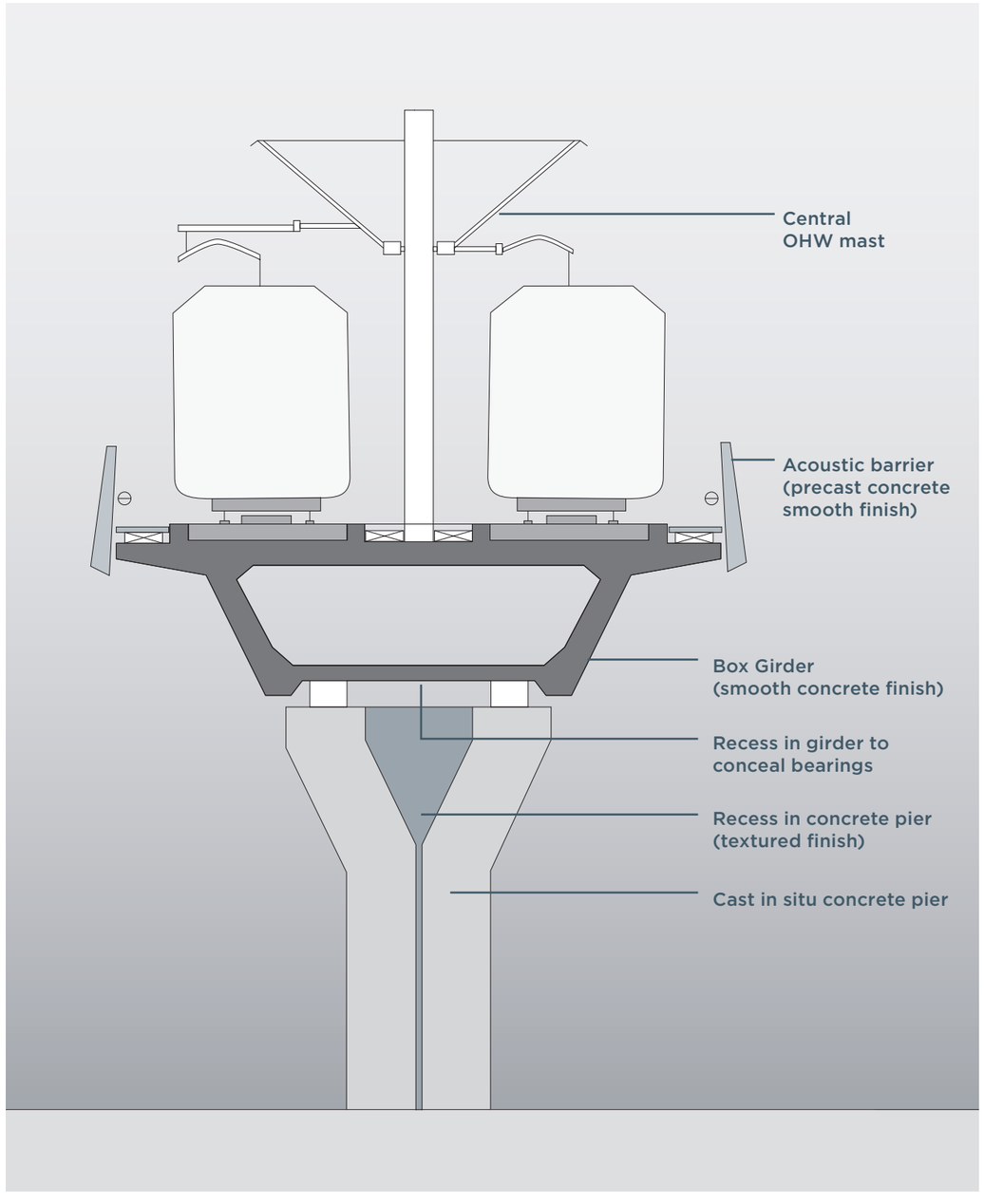
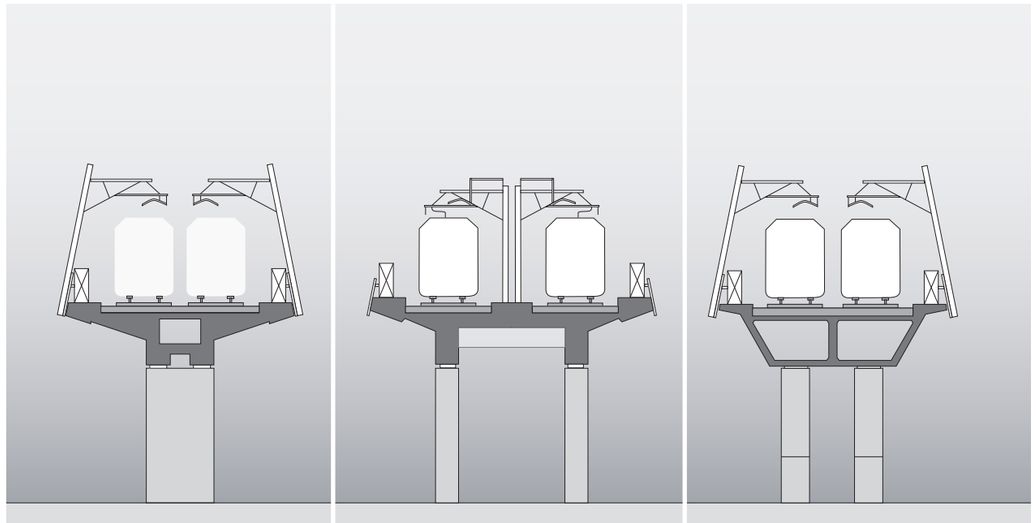


Figure 6.48 Indicative cross section of alternate skytrain structures. Note overhead wiring supported from side of viaduct. A curved soffit concept is shown on a single pier.



In addition to the preferred structure described above, a number of variations would be possible that would still address the design principles identified above. Indicative cross sections for these options are presented above in **Figure 6.47**. It is possible that other materials including steel could be used provided they meet the principles described above. Opportunities exist for parts of the skytrain to be designed as individual elements to create urban markers.

At this stage, the exact design of the skytrain structure has not been confirmed. Feedback from stakeholders and the community on the indicative designs presented above would influence the ongoing planning and design work required, including detailed design by a future contractor.

The skytrain and other parts of the surface alignment would include bridge structures where the alignment crosses key infrastructure or watercourses. These are identified in **Table 6.10** and also Appendix C (long section).

Table 6.10 Proposed bridge structures

Location	Approximate span	Type
Balmoral Road, Kellyville	40 m	Road bridge over rail line
Memorial Avenue, Kellyville	40 m	Rail bridge over road as part of the skytrain structure
Samantha Riley Drive, Kellyville	40 m	
Windsor Road, Kellyville	40 m	
Sanctuary Drive, Rouse Hill	40 m	
White Hart Drive, Rouse Hill	40 m	
Windsor Road, Rouse Hill	40 m	
Second Ponds Creek	10 spans of 39 m	Rail bridge over watercourse
Cudgegong Road, Rouse Hill*	39 m	Road bridge over rail line
Tallawong Road, Rouse Hill*	29 m	Road bridge over rail line

*Bridge construction assessed in EIS1

6.21 Services Facilities

Services facilities would be located at Epping and Cheltenham. Service facilities provide support services such as power and fresh air ventilation which are required for the safe operation of the railway. The Cheltenham Services Facility also provides emergency access and egress to and from the rail tunnels.

6.21.1 Epping Services Facility

The Epping Services Facility site would be within a property located on Beecroft Road (Lot 21DP700406, 244 Beecroft Road) north of Carlingford Road and south of Devlins Creek, approximately 3,400 m2in area. The property located to the west of Beecroft Road is adjacent to residential and commercial uses. Details of the facility are shown in **Figure 6.49** to **Figure 6.50**.

Access to the facility is from Beecroft Road; however the facility will not be accessible to the public with security fencing.

The Epping Services Facility would include a traction power substation, a ventilation and equipment building (within one facility) and onsite stormwater detention. The facility would require maintenance access via Beecroft Road and would also be used for rail personnel (not heavy equipment) to access the tunnel during track/tunnel maintenance periods. A suspended slab constructed within the services facility compound would allow for safe turning movements for maintenance vehicles. The remainder of the acquired site would provide a potential development site that will contribute to the Epping Town Centre future mixed town centre core.

Figure 6.49 Epping Services Facility - Indicative layout

Figure 6.50 Artists Impression of Epping Services Facility

6.21.2 Cheltenham Services Facility

The Cheltenham Services Facility would be located adjacent to Cheltenham Oval between Castle Howard Road and the M2 Motorway as shown in the following **Figure 6.51** to **Figure 6.52**.

The Cheltenham Oval is in a bushland setting and is accessed from Castle Howard Road. The adjacent services facility is required for the safe operation of the railway beneath and would include emergency access and egress, plant rooms, a sectioning hut (for railway systems operation), access for maintenance personnel and onsite stormwater detention facilities. It does not include tunnel ventilation equipment or traction power substation. The vehicular entrance to both the facility and Cheltenham Oval would be upgraded which would result in removal of the existing traffic island, four trees and a Council building.

The rail tunnels have been slightly re-aligned to be located directly below the service facility to provide a more efficient emergency access / egress arrangement. This would also reduce construction impacts (which were assessed in EIS 1) because less excavated material (spoil) would be excavated.

Following construction of the facility, items that had been displaced would be able to be re-established, such as the netball training courts and, if required, the sports amenities building (see below). There would also be opportunities to create a positive legacy for the local community and facilitate improvements to the sporting and recreational area.

It is proposed to upgrade the existing sports amenities building, and effectively conceal the rail service facility, as shown in **Figure 6.51** to **Figure 6.52**.

Subject to consultation with the local community, other users of the area and the Hornsby Shire Council, a more detailed design of this option would be progressed.

User groups have expressed a desire for a new, more modern amenities building to replace the current one. The new amenities building would be incorporated into the services facility building, effectively masking the services facility itself. This option would also allow for up to three new netball courts to be created in a similar configuration as the current courts and reinstatement of the public parking area.

An alternative option would be for the services facility to be designed and built as a separate building and located generally behind the existing sporting amenities building. This would allow the existing building to remain (both during construction and operation). However, this option would result in less space being available for future netball courts and/or public parking. This alternative option is therefore not preferred.

It is important to note that any disruption of the existing sporting facilities during construction would be minimised wherever practicable and would be offset through the provision of temporary facilities of an equivalent standard. This would be planned in consultation with residents, Hornsby Council and local user groups. Refer to Chapter 7 for more information on construction activities.

The areas of bushland cleared as a result of major civil construction works (assessed in EIS 1) would be rehabilitated following completion of the services facility, including reinstatement of the bush trail where it may have been disrupted due to construction.

Figure 6.51 Cheltenham Services Facility - Indicative layout

Figure 6.52 Artist's impression of Cheltenham Services Facility on day 1 of operations looking west from Castle Howard Road

6.22 Rail infrastructure and systems

6.22.1 Trackform (tunnel, above ground and stabling area)

Trackform refers to the track system consisting of the rail and its supports.

The trackform in the underground section would consist of a fixed concrete slab trackbed and would likely comprise:

- A continuously welded rail.
- A resilient booted-sleeper design. This involves providing a rubber 'boot' around the sides and bottom of the sleeper where the track is fastened, to reduce the transfer of noise and vibration into the surrounding ground and building structures above the tunnels.
- Higher attenuation trackform may be provided, where reasonable and feasible, to further mitigate ground-borne noise, where the tunnels are bored close to particularly sensitive receptors, such as residential buildings, medical facilities or places of worship . Noise and vibration issues are addressed in further detail in Chapter 10.

6.22.2 Rail signalling and control systems

Advanced Signalling Technology

The signalling system would support the safe operation of the rapid transit system.

Under normal operations, the NWRL and all of the rapid transit rail lines would use advanced signalling technology, including Automatic Train Protection (ATP) and Automatic Train Regulation (ATR) / timetabling. The ATP system would keep each train within a safe braking distance of the train ahead.

The advanced signalling technology operating system would control the train stopping at stations, ensure trains stop at the correct location, control speed between stations, ensure that only the doors on the correct side can be opened at each station, and initiate door closing. The train lines would allow for bi-directional operation in special circumstances (trains can run along either track). When combined with intermediate crossovers this provides functionality to respond to a range of incidents to support service continuity where practical. All operating and control systems would be integrated with rail systems to provide consistent performance including high levels of safety.

Integrated Information Control System

An integrated information control system would allow communication with passengers or any staff member via audio and visual links at the station or on a train. The various systems that would be used include:

- Radio communications systems for operator and emergency services.
- Passenger mobile telephone and other modern telecommunication methods.
- Passenger information display and public address.
- Closed-circuit television system and video broadcasting system.
- Digital voice video recording system.
- Telephone system and personnel wireless terminal.
- Emergency warning information system.

6.22.3 Traction power supply, sub-stations and overhead wiring

The ongoing design work has identified the need for new traction substations at Epping West, Cherrybrook, Castle Hill, Showground, Norwest and Tallawong stabling and maintenance facility. A sectioning hut would be required at the Cheltenham Services Facility and at Rouse Hill. In addition, an off precinct traction substation would be required at Bella Vista. The NWRL electrical distribution network would provide:

- 1500 Volts Direct Current (V DC) overhead wire traction power to the rolling stock via a 33kV reticulation system.
- Low voltage power for electrical services at stations and the Stabling Facility, signalling and communications systems via an 11kV reticulation system.

The 1500V DC overhead wire system configuration would be based on a fixed tension wiring for the tunnel section with variable weight tensioned wiring for the open route sections.

The 33kV and 11kV reticulation systems would be independent of the external energy authority and would be designed with suitable redundancy to continue rail operations under fault conditions. The 33kV feeder system and 11kV network would be internal to the rail corridor and would connect the NWRL traction substations with the existing high voltage network.

PART E - OPERATIONS

6.23 Introduction

The following sections provide a description of the proposed NWRL operations including the train types, service frequencies, stabling and train maintenance, safety and security measures and future operations.

6.24 Project Operations

6.24.1 Rapid Transit Rail Network

The NWRL would provide frequent rail services seven days a week with operating hours throughout the day from early morning until late at night.

Operating hours would be determined as part of the development of the service schedules for the NWRL.

- The principles for timing of passenger services would be based on providing opportunities for customers to get to jobs in the Sydney CBD by 6am and with extended operating hours on Friday and Saturday night. The timetable will recognise integration with other public transport services.

The NWRL would connect directly with the existing ECRL providing access to the existing rail stations located at Epping, Macquarie University, Macquarie Park, North Ryde and Chatswood.

The trip from Cudgegong Road to Chatswood is expected to take approximately 37 minutes on a rapid transit train, including dwell time at stations.

The indicative service frequency of the NWRL would be:

- **Weekday peak:** train every 5 minutes (12 trains per hour).
- **Weekday off-peak:** train every 10 minutes (6 trains per hour).
- **Weekends:** train every 10 minutes (6 trains per hour).

Due to the high frequency of NWRL services, customers would be able to turn up at any NWRL station and catch the next train, eliminating the need for timetables.

At Chatswood customers would be able to cross the platform to change onto the existing rail network. Train services would be organised to ensure passengers only need to wait a few minutes to switch from a NWRL train to another train into the city in peak periods. It is expected that there would be a train every three minutes from Chatswood to the city during peak times. Regular services to / from the city in the off peak would be provided. The North Shore service levels would be increased, up to 20 trains per hour during the peak.

Allowing for dwell time at stations and changing trains at Chatswood, a journey from the North West (Cudgegong Road Station) to the Sydney CBD is expected to take just under one hour in the peak. Customers would also be able to interchange at Epping Station onto Northern Line services. Frequent rail services to the city via Strathfield would be provided during peak times with regular services during the off peak period.

6.24.2 Future operations

As part of a broader Sydney rail strategy, the NWRL has been designed with sufficient capacity to meet future rail travel needs of the population. Train frequencies would be increased over time to meet future patronage growth with NWRL being designed for an ultimate capacity of up to 20 trains per hour (every 3 minutes).

The infrastructure for NWRL would be developed and configured to ensure that it does not unduly constrain the development of a range of timetable options and frequencies, nor inhibit the reliable timetabling and operation of the whole rail network.

The NWRL would be designed to operate under normal conditions as well as occasions where it may need to respond to degraded operations or emergency situations.

Rail maintenance vehicles would also be able to use the system, and the design would address access for maintenance. While this may not be a frequent activity, access is often required late at night when no passenger services are operating.

6.24.3 Train Types

All trains operating on the NWRL would be new, modern single deck rapid transit trains.

These new generation trains would deliver a fast, safe and reliable journey for customers with high performance standards and good customer amenity features.

Each train would have eight carriages and be capable of transporting up to 1,300 people.

The rapid transit trains would have the following features:

- Three doors per side per carriage, allowing fast boarding and alighting.
- A mixture of seating arrangements.
- Wheelchair spaces provided within carriages.
- Priority seating provided for mobility impaired, the elderly and parents with prams.
- Level access between platform and train.
- An air-conditioned environment.
- Capable of being driven from both train ends.
- A modern passenger information system and train control systems.

Single deck trains allow passengers to get on and off more efficiently than double deck trains, and the modern signalling technology optimises train running and maximises rail line capacity utilisation.

In order to operate the NWRL between Cudgegong Road and Chatswood with a train every 5 minutes (12 trains per hour), would require approximately 20 trains.

Figure 6.53 and **Figure 6.54** provide an Artist's impression of the new modern single deck rapid transit trains.

Figure 6.53 Artist's Impression: A single deck, high frequency train

Figure 6.54 Artist's Impression: Interior of a single deck train

6.24.4 Daily Operations – Typical Weekday

Early Morning

Trains would be prepared in the stabling yard at Tallawong Road during the 30 minutes prior to their scheduled departure. The trains would be powered up and the lighting, ventilation and air-conditioning systems activated. Time would be allowed for the air-conditioning system to bring the internal train temperature to the desired level.

Concurrently, the on-board control systems would commence a series of self checks to ensure that all systems are operating correctly. All auxiliary equipment would operate for up to 30 minutes before departure. This equipment includes air-conditioning, air compressors and static inverters. Train digital voice announcement systems may be tested by broadcasting white noise through internal speakers adjacent to the train doors. The duration of this test would generally be for a few seconds, i.e., long enough to verify that the system is functioning.

Brake systems would also be tested. The brake testing results in compressed air being exhausted from the brake pipe.

Once these activities have been completed, and at the scheduled times, trains would be progressively deployed from the stabling yard to Cudgegong Road Station to commence services.

It should be noted that no horn testing would be undertaken as part of preparing the train.

Morning Peak

Service frequencies would progressively increase to 12 trains per hour (every five minutes) for the morning peak period.

Weekday off peak

Service frequencies would be reduced to approximately 6 trains per hour (every 10 minutes) during the weekday off peak. During this period selected trains not required for service would be returned to the Tallawong Stabling Facility until the afternoon peak period. Cleaning and minor maintenance of these trains could be undertaken during this period before the afternoon peak. Some trains may also undergo major maintenance in the train maintenance facility during this time.

Afternoon Peak

Trains stabled during the middle of the day would be brought back into service to bring the frequency back up to 12 trains per hour (every five minutes) for the afternoon peak period. All trains available for service would be operating during this period.

Evening

Trains would be gradually taken out of service as the frequency is reduced to 6 trains per hour in the evening period. Trains would be progressively returned to the stabling yard in the lead up to the end of service.

Once in the stabling area the trains would be internally cleaned and any minor maintenance work would be performed. During the cleaning period, some auxiliary systems would need to remain on to support lighting and air conditioning for cleaning crews.

Upon completion of the cleaning and minor maintenance activities, the trains would be powered off and put into stabled mode until the commencement of service the following day.

Service level

Indicative travel times to Macquarie Park, the Lower North Shore and City destinations from selected NWRL stations are shown in **Table 6.11** below

Table 6.11 Indicative NWRL Travel times to Key Destinations

Station	Indicative Travel time to			
	Macquarie Park	Chatswood	North Sydney	Wynyard
Cudgegong Road	28	37	51	57
Rouse Hill	26	35	49	55
Kellyville	24	33	47	53
Showground	17	26	40	46
Castle Hill	15	24	38	44
Cherrybrook	12	21	35	41

Source: Transport for NSW

6.24.5 Infrastructure maintenance activities

Rail maintenance vehicles (including diesel powered rail vehicles) would access the NWRL. While this may not be a frequent activity, access is often required late at night following the cessation of services.

The design of NWRL will be developed to minimise the need for weekend closedowns.

6.24.6 Fire and life safety

Key features of fire and life safety to be implemented during operation and maintenance have been considered for customers, staff and neighbours of the NWRL would include:

- Meet performance requirements of the International Fire Engineering Guidelines and Australian standards such as the Building Code of Australia.
- Emergency access/egress shafts at the Cheltenham Services Facility.
- One train per tunnel ventilation segment where possible. Two is a maximum to retain a simple egress strategy.
- End detrainment (provision of an evacuation route for passengers in an emergency or vehicle breakdown) with egress along the trackway on the skytrain and other surface areas.
- Side detrainment (passenger evacuation) with egress along the walkway in the tunnels.
- Evacuation in the opposite direction to which the train is travelling as smoke moves in the direction of train travel.
- Cross passages to provide a means of escape and fire fighting access via the non-incident tunnel. Proposed cross passages spaced a maximum of 240 m apart.
- A primary escape route from the tunnel via the stations (through the end of platform fire stairs).
- Longitudinal smoke control to prevent back layering of smoke, and to dilute smoke downstream of a fire. The default direction for smoke ventilation is the direction that the train was travelling.
- Construction of crossover smoke control design and tunnel physical features to mitigate smoke spread into the non-incident tunnels.
- A four-hour structural fire rating in the tunnel.
- Emergency lighting and signage in the tunnel, with CCTV and public address speakers at cross passages and crossovers.
- Automatic fire detection in the plant areas, cross passages and other risk areas. Sprinkler (or pre-action sprinklers) in the risk rooms and high value plant rooms. Gas suppression in communication rooms and other areas where protection of equipment is a key requirement.
- Hydrants throughout the tunnel.
- Fire stairs in stations.
- Provision for assisted evacuation for the mobility impaired.

6.24.7 Safety and security

From the outset of the design process, safety during operation and maintenance has been considered for customers, staff and neighbours.

Public spaces in the stations have been designed to minimise obstructions and projections, providing clear routes for passengers with poor vision and eliminating blind spots where people can hide. Concourses are at ground level (open cut and elevated stations) or immediately below ground level (underground stations). This minimises uncontrolled (outside gateline) space in each station. In addition, the following safety in design items are proposed for adoption as part of the design:

- Ticket gate included in design and used as operational control where extraordinary demand is placed on a station, combined with degraded operations (events or similar), to avoid overcrowding on platforms.
- Separation between platform end and maintenance walkway in the tunnel to be adopted where practical on underground stations to discourage access. Fixed barriers would be attached to platform ends to further discourage trespass.
- Retail concessions located on unpaid side of ticket gate only and to use materials consistent in performance for stations (non-combustible).
- No areas in station where devices may be left unattended where they cannot be readily seen / observed.
- Tunnel lighting located on the inside of the tunnel face so as not to encourage trespass into tunnels.
- Lighting outside in landscaped and plaza areas and street entrances.

6.24.8 Operational staff

Up to 200-300 full-time equivalent jobs would be required in order to operate and maintain the NWRL, including the operation and maintenance of rolling stock, stations and tracks. This is subject to future operator requirements.

PART F - END STATE

6.25 Introduction

The following sections provide a description of the proposed end state for the NWRL including the station precinct master planning and development approach, design principles for each station precinct and the interim land use strategies.

6.26 Station Precinct master planning and development

The planning approach being adopted for the NWRL recognises that development around the stations would occur over time, but that measures must be taken now to provide a robust framework within which this development can occur. This is reflected in the immediate station precincts as described earlier in this chapter. A station precinct planning process, parallel and separate to the NWRL planning approval process, is currently underway involving a collaborative approach with Councils and DP&I.

The Department of Planning and Infrastructure and Transport for NSW have jointly established a Precinct Planning Working Group with Blacktown, The Hills and Hornsby Councils. The primary objective of the working group is for state and local government to work collaboratively to develop and implement station precinct planning frameworks to maximise the land use opportunities associated with the NWRL.

The outcomes of the precinct planning working group will be used to facilitate community and stakeholder discussion about the desired future character of station precincts. This will ultimately inform future planning controls and infrastructure requirements to support growth scenarios along the NWRL corridor. Ongoing consultations are occurring with DP&I (Strategies & Land Release and Plan Making and Urban Renewal) as part of the detailed station planning. This work is considered essential to ensure that detailed access, land use integration and coordination issues are resolved.

The proposed NWRL station and precinct designs have been developed through an iterative process aimed at maximising opportunities to integrate with existing and future land use, and have taken into account early feedback from the working group and councils.

Key land use integration elements of the project design include:

- Locating stations within existing centres or locations with the potential for creating new transit oriented neighbourhoods.
- Ensuring that station access infrastructure is set within a robust street pattern that is adaptable to future urban development needs.
- Optimising station precinct and car park layouts to provide opportunities for active uses near stations, which helps to improve precinct safety and surveillance and allows day-to-day needs to be met locally, reducing the need for additional vehicle trips.
- Ensuring that the design and location of transport infrastructure and service facilities maintains the potential for future development of residual lands.

The aim is to ensure that the precinct planning would enable future transit-oriented developments associated with the north west to achieve:

A mix of uses-employment, retail and community services located within a five minute (400 m) walkable catchment – to reduce the need for trips to meet daily needs.

Precincts that promote connectivity and access to the stations, interchange facilities, key activities and uses.

A population density within walking distance of each station (generally 800 m) to support a range of activities and uses.

The working group would also promote use of public transport through parking policies and cycling strategies that aim to reduce car use and where possible facilitate well-designed development.

As well as addressing the demand for better transport access, the NWRL would provide a catalyst for the further development of North West Sydney. It provides the opportunity to implement a fully integrated approach to transport and land use planning that connects people and the communities in which they live, work, learn and play.

Station precincts would comprise commercial and / or retail activities, open space and public domain improvements. Within the immediate station precinct there would be the potential for development to occur after construction has finished. At these locations the station precincts have been designed to allow future development by other parties. These future developments are not directly related to the project and separate planning approvals under relevant local / State legislation would be required. The NWRL Project would be designed and constructed to accommodate potential future development (by providing a robust street pattern, local access arrangements and an integrated design approach, including structural support, servicing and access).

6.26.1 Interim land use strategies

Residual (or surplus) land would remain following the completion of major civil construction works and construction associated with stations, rail infrastructure and systems. In some cases, residual land would provide the opportunity for future development to occur as identified in relevant indicative station precinct plans.

TfNSW would manage land not required as part of the NWRL station infrastructure or precinct on sites that have the potential for any residual development.

Interim land uses, such as retail or commercial, may be encouraged to provide active street frontages pending more substantial development occurring. Some sites may have the potential for active community uses or art programs, (such as an 'artist in residence' scheme). Interim land uses would not include temporary commuter car parking. Any interim uses would occur in consultation with local councils and be subject to local planning controls.

Further details on the station planning process and potential land use impacts are described in the Land Use Chapter 14.