

Train operations

Introduction

For the first time, customers on the Sydney rail network won't need a timetable – they will be able to just turn up and go with North West Rail Link services.

In peak times there will be a train every five minutes – or 12 an hour.

Over time, as demand increases, service frequency could increase up to 20 trains an hour – or one every three minutes.

The North West Rail Link will provide frequent rapid transit rail services seven days a week.

It will operate throughout the day from early morning until late at night.

The trip from Cudgegong Road to Chatswood will take about 37 minutes. The complete journey from Cudgegong Road to Wynyard will take just under an hour.

From day one of operations, service frequency will be:

- Weekday peak: train every five 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).

Indicative 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 |

At Chatswood, customers will simply cross the platform to change on to the existing rail network.

There will be a train at least every three minutes from Chatswood to the city during peak times with North Shore trains increased to 20 trains per hour or more during the peak.

Regular services to and from the city in the off peak will also be provided.

As part of Sydney's Rail Future, the North West Rail Link has been designed with sufficient capacity to meet future rail travel needs.

By the time that the North West Rail Link is operating, stages one and two of Sydney's Rail Future will be in place – including platform re-design; timetable overhauls; improved rail operations; automatic train operations and track infrastructure enhancements.

Train frequencies on the North West Rail Link will be increased over time to meet patronage and network growth up to an ultimate capacity of up to 20 trains per hour, or one every three minutes.

Timetables will integrate with other public transport.

The project will connect directly with the existing Epping to Chatswood line providing improved access and higher frequency rail services to Epping, Macquarie University, Macquarie Park, North Ryde and Chatswood stations.

Customers can also interchange at Epping Station on to Northern Line services. Frequent rail services to the city via Strathfield will be provided during peak times with regular services during the off peak period.

The trains

All trains on the North West Rail Link will be new, modern single deck rapid transit trains.

These new generation trains will deliver a fast, safe and reliable journey.

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

The rapid transit trains will feature:

- Three doors per side per carriage – fast to get on and off;

- Air-conditioning;
- A mixture of seating arrangements;
- Grab handles for standing passengers;
- Wheelchair spaces;
- Priority seating areas for the mobility impaired, the elderly and parents and carers with prams;
- Level access between platform and train;
- Modern passenger information systems; and
- Advanced train control and safety systems.

Single deck trains allow people to get on and off more quickly than double deck trains.

Modern operating systems and signalling technology ensure we can optimise train running times and maximises rail line capacity.



Artist's Impression, rapid transit train



Artist's Impression: Interior of a single deck train

Typical daily operations

Early morning

Trains will be prepared in the stabling yard at Tallawong Road before their scheduled departure.

Trains will be powered up and the lighting, ventilation and air-conditioning systems activated. Time will be allowed for the air-conditioning to bring the internal train temperature to the desired level.

At the same time, on-board control systems will start a series of self checks to ensure all safety and operations systems are working correctly. All equipment including air-conditioning, air compressors and static inverters will operate for up to 30 minutes before departure, and train digital voice announcement systems will be tested.

Brakes will also be tested by compressed air being exhausted from the brake system. No horn testing will be undertaken as part of preparing the train.

Once these activities are complete, trains will progressively depart as per their schedules from the stabling yard to commence service.

Service frequencies would progressively increase to 12 trains per hour – one every five minutes – for the morning peak.

Weekday off peak

Service frequency will be about six trains per hour (every 10 minutes) during the weekday off peak.

During the off-peak period some trains will return to the Tallawong stabling facility until the afternoon.

Cleaning and minor maintenance of these trains could be undertaken during this period and some trains may also undergo major maintenance during this time.

Afternoon peak

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

Evening

Service frequency will be six trains per hour in the evening and trains will progressively return to the stabling yard.

Once in the stabling area, trains will be cleaned inside daily and any minor maintenance work carried out. During the cleaning period, some systems like lighting and air conditioning would remain on for the safety of cleaning crews.

After cleaning and minor maintenance, trains will be powered off and stabled until the next day.

Fire and life safety

Safety is the highest priority for the North West Rail Link.

Key features of fire and life safety systems and procedures during operation include:

- The fire and life safety systems will meet the performance requirements of the International Fire Engineering Guidelines and Australian standards such as the Building Code of Australia;
- Emergency access and egress shafts at Cheltenham Services Facility;
- Protocol of one train to operate per tunnel ventilation segment, where possible;
- On the skytrain section and surface areas, passengers will get off the trains in an emergency or breakdown from the front or back of the train and walk along the track;
- In the tunnels, passengers will get off the trains in an emergency or breakdown from the side and use walkways in the tunnels;
- Evacuation is in the opposite direction to which the train is travelling;
- There will be cross passages between the tunnels spaced a maximum of 240 metres apart, which can be used as a means of escape and for fire fighting access via the non-incident tunnel;
- The stations will be a primary escape route from the tunnels with fire stairs at the end of platforms;
- Smoke control systems will be designed to direct and dilute smoke in the direction the train was travelling while customers will be evacuated in the other direction;
- Ventilation systems in the tunnels will be designed to stop smoke spreading into the non-incident tunnel;
- Tunnels will be designed with a four-hour structural fire resistance rating;
- Emergency lighting and signs in the tunnel, with CCTV and public address speakers at cross passages and crossovers;
- Automatic fire detection in equipment areas, cross passages and other areas. Sprinklers (or pre-action sprinklers) in equipment 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; and
- Provision for helping to evacuate the mobility impaired.

Traffic

A core objective of the North West Rail Link is to reduce road congestion across Sydney's North West.

The project is forecast to reduce car trips by 14 million a year in 2021 – increasing to 20 million a year by 2036.

The North West Rail Link will provide a viable and readily accessible alternative to cars for people travelling to a wide range of areas including Epping, Macquarie Park, Chatswood, the lower North Shore, North Sydney and the Sydney CBD; as well as centres including Castle Hill, showground, Norwest, Bella Vista and Rouse Hill.

This section provides an overview of likely traffic-related topics relating to train operations on the North West Rail Link.

Understanding the current transport system

Traffic studies

All new North West Rail Link stations are close to major roads, and are in suburban or major retail areas.

Traffic capacity of roads around them is mostly governed by the capacity of the roads themselves and their major intersections.

The performance of key intersections was computer-modelled to assess effects of changing demand on the road network.

Methods included:

- Traffic count data was collected for key intersections during peak periods.
- This data was supplemented by seven day counts along selected roads.
- The results of traffic counts were used to assess the expected future performance of key road intersections.

The studies also noted planned upgrades to the major road network in the North West over the next 10 years, both by local councils and the NSW Government.

Detailed traffic analysis, including modelling of intersection performance, is included in the full Environmental Impact Statement 2 report and supporting technical papers.

The studies indicate that the North West Rail Link itself will not be a traffic generator.

Buses

Buses are currently the main public transport for the North West area, and a comprehensive network of services operate local or cross-regional services to other parts of Sydney.

These include buses to the Sydney CBD, North Sydney and Macquarie Park and M2 express buses.

There are also connecting bus runs to regional centres and railway stations such as Parramatta, Hornsby, Blacktown, Riverstone, Seven Hills, Epping, Beecroft and Pennant Hills.

Hillsbus and Busways, under a contract with Transport for NSW, provide bus services in Sydney's North West as follows:

- Hillsbus covers suburbs around Cherrybrook, Castle Hill, Showground, Norwest, Bella Vista, Kellyville and Rouse Hill Stations.
- Busways covers residential areas including Stanhope Gardens, Glenwood, Kellyville Ridge and Schofields Road. Busways also provides links from these areas to Blacktown, Riverstone, Castle Hill and Macquarie Park.
- Significant numbers of buses operate from the Hills District to the Sydney CBD. Main routes are the 610 and M61 between Castle Hill and the Sydney CBD that run at high frequency during the peak. Buses also run until early morning on most days and for 24 hours on Friday and Saturday nights.

Growth in buses

Many people currently park their cars and catch Hills-City buses around Baulkham Hills Intersection, Barclay Road and Oakes Road bus stations.

About 40 city bus services operate through Baulkham Hills Intersection between 7am and 8am on weekdays. Hillsbus is experiencing significant growth on buses from the Kellyville and Rouse Hill area via the North West T-way to the M2 Motorway and beyond to the city.

Passenger numbers on T-way services to and from Parramatta are continuing to increase.

The two major bus interchanges at Castle Hill and Rouse Hill experience significant bus layover. At Castle Hill the majority of buses wait in Old Castle Hill Road north of the Crane Road – Castle Street intersection. There is also some shorter layover in the 'Bus Only' section of Old Northern Road. The Old Castle Hill Road layover has space for up to eight buses, with a further two to three buses in Old Northern Road.

The Rouse Hill bus layover area was built as part of the Rouse Hill Transport Interchange for the T-way. The bus layover is between the bus interchange and Windsor Road and there are driver facilities in the interchange. The bus layover has space for about eight buses.

North-West T-way

The T-way opened in 2007 and provides a priority bus link from the North West to Parramatta and Blacktown.

The T-way includes:

- Parramatta and Rouse Hill – 14km of bus only roads and 3km of bus lanes.
- Blacktown and Parklea – 7km of bus only road.

Both T-ways intersect at Burns interchange at Parklea. There are 30 bus stations along the T-way, with seven along the North West Rail Link corridor:

- Celebration;
- Balmoral;
- Burns;
- Riley;
- Merriville;
- Sanctuary; and
- Rouse Hill.

Busways and Hillsbus run T-way services. Hillsbus routes that travel along the project corridor include T63, T64, T65, T66, 602, 607X and 617X. Busways routes include T71, T75 and 740.

Bus frequencies are:

- Weekday – every 3-4 minutes during peak and 7-8 minutes off peak; and
- Weekend and public holidays – every 10 minutes.

Cycling

There is a limited network of on-road and off-road cycleways near the stations at present, with only Showground, Bella Vista, Kellyville and Rouse Hill having cycle paths or lanes close-by.

Hills Shire Council completed a Bike Plan Review in 2009 that identified an extensive proposed off road cycleway network including routes that could be linked to the new stations.

There are also opportunities for cycle routes in Blacktown City to connect with Rouse Hill, Kellyville and Bella Vista stations.

Pedestrians

Existing and upgraded footpaths, pedestrian crossings, pedestrian refuges and kerb ramps will facilitate safe pedestrian movement to and from stations.

Safe and easy access to stations from the surrounding areas will encourage people to walk to the stations where possible.

Pedestrian facilities will be part of station design for people walking from:

- The surrounding area;
- Commuter car parks;
- Bus and taxi stands; and
- Kiss-and-ride spots.

In some areas this will require new infrastructure including traffic lights, marked crossings, pedestrian refuges and pedestrian bridges.

Potential traffic impacts

The North West Rail Link will not generate traffic in its own right.

Rather, the objective is to reduce traffic across the North West.

The North West Rail Link will provide a viable and readily accessible alternative to cars in a region with the highest levels of household car ownership in Australia

It will provide a real alternative for people travelling to many areas including Epping, Macquarie Park, Chatswood, the lower North Shore, North Sydney and the Sydney CBD; as well as centres including Castle Hill, Showground, Norwest, Bella Vista and Rouse Hill.

Analysis based on Bureau of Transport Statistics data indicates that in 2021 there could be approximately 12,000 fewer car trips in an average weekday morning two-hour peak as a result of the project.

This equates to almost 14 million fewer car trips each year.

By 2036 the corresponding reduction could be about 18,000 fewer car trips resulting in almost 20 million fewer car trips each year.

In addition, the project will provide a reliable alternative to M2 buses that presently provide the bulk of public transport to Macquarie Park, the lower North Shore and the city.

In 2011, some 90 M2 buses entered the Sydney CBD in the AM peak hour alone.

Transport for NSW forecasts that, without the North West Rail Link, there would be a growth of 144 per cent in M2 buses entering the Sydney CBD by 2021.

Forecast traffic changes, including cars, pedestrians and buses around new stations are detailed in the full Environmental Impact Statement 2 documents and the supporting technical paper.

Bus

The North West Rail Link project team will be working across Transport for NSW as well as with bus operators and other key stakeholders to develop an integrated rail / bus public transport system in the North West.

These changes to existing bus services may occur subject to demand, in consultation with bus operators and the community:

- Replacement of some long haul M2 bus services from the western end of the corridor with trains, while preserving some M2 buses mainly in the eastern part of the corridor;
- A major bus-rail and bus-bus interchange at Rouse Hill Station, for buses from the North West Growth Centre and T-way;
- Bus interfaces at Kellyville, Bella Vista and Norwest Stations;



Artist's impression, Kellyville Station

- A small interchange at Showground Station for buses from Kellyville and the new growth precincts of North Kellyville; and
- A major interchange at Castle Hill with cross-regional services to Parramatta and Hornsby, as well as Baulkham Hills and other areas to the south.

Car

To cater for high car ownership and usage patterns in the western part of the corridor and in new residential developments, demand for both commuter parking and kiss-and-ride is expected to be high.

This is especially so because the bus network is less developed across the western part of the corridor, and because of rapid housing development in new areas.

This pattern is consistent with outer stations on the existing rail network where a relatively small number of customers live within walking distance and a large number drive to stations.

These likely patterns of use are an important foundation for the approach adopted for car access to North West Rail Link stations, with:

- The eastern stations have more constraints on car parking and less capacity in the road network, however they have a stronger bus network to offer an alternative to cars; and
- In contrast, the western stations have less existing development around stations and less developed bus networks. As a result, more car parking is targeted for stations at Bella Vista, Kellyville and Cudgegong Road.

Commuter car parking and kiss-and-ride at stations will cater for potential changes to:

- Traffic flows on roads adjacent to stations;
- Reduced parking demand at stations currently servicing North West residents along the Northern, Richmond and Western Lines; and
- Vehicle trips across wider areas of the road network.



Artist's impression, Castle Hill Station

Managing potential construction traffic impacts

Detailed construction traffic management plans will be developed in consultation with councils, police and nearby communities and other key stakeholders.

Generally speaking, the impact of work assessed under Environmental Impact Statement 2 will be much lower and less frequent than during the heavy civil engineering phase of the project which was detailed in Environmental Impact Statement 1.

Potential construction traffic impacts would arise primarily from heavy vehicles and light vehicles (cars and utes) using roads near stations and other construction sites.

These movements may affect traffic levels and impact on intersection performance, buses, pedestrians and cyclists.

Existing on and off street parking may also be affected from construction works and / or construction worker parking. The project team will be working with the construction contractor(s) to identify schemes such as car pooling and bus shuttles to reduce the need for private car use by construction workers.

The forecast construction traffic is detailed in the full Environmental Impact Statement 2 and the supporting technical paper.

Vehicle forecasts and access routes

Construction will require a range of vehicle movements involving light, heavy and specialised vehicles.

Truck movements will primarily be for delivery of materials to construction sites.

Truck arrivals and departures would normally be uniformly distributed between 7am and 6pm on weekdays.

However, during major construction events such as large concrete pours, there may be increases in frequency. The timing of construction traffic movements will be further assessed and advised as construction planning proceeds.

Construction program and traffic management plans will include measures to manage and minimise traffic impacts, particularly during peak periods and other key times like major school examinations and hours of worship.

A summary of proposed access routes and anticipated daily heavy vehicle and light vehicle movements associated with material deliveries, waste removal and the arrival and departure of construction workers is shown below.

Mitigation measures have been developed to avoid, reduce and manage construction traffic, as shown in the table opposite.

Environmental Impact Statement 2: Construction traffic management

| Ref No.* | Traffic mitigation measures | Applicable Sites |
|----------|--|------------------|
| T1 | Signage and line-marking will be used to direct and guide drivers, cyclists and pedestrians past construction sites and on the surrounding network. This would be supplemented by permanent and portable Variable Message Signs, where reasonable and feasible, to advise drivers of any potential delays, traffic diversions, speed restrictions, or alternative routes. | 1 - 17 |
| T2 | The public will be notified of proposed traffic changes by newspaper, radio, project web site and other forms of community liaison. | 1 - 17 |
| T3 | Co-ordination would occur with Transport for NSW and the Transport Management Centre in the event of incidents or undue congestion. | 1 - 17 |
| T4 | Management of pedestrian, cyclist and vehicle access to and past construction sites will ensure safe entry and exit procedures. Depending on the location, this may require manual supervision, physical barriers, temporary traffic signals and modification to existing signals or, on occasions, police presence. | 1 - 17 |
| T5 | Access to existing properties and buildings will be maintained. | 1 - 17 |
| T6 | Traffic controllers will manage heavy vehicle movements at worksites, and monitor the need for pedestrian control. | 1 - 17 |
| T7 | All trucks will enter and exit the worksites in a forward direction, where feasible and reasonable. | 1 - 17 |
| T8 | The management of buses at key interchanges such as Castle Hill and Rouse Hill will be reviewed during detailed construction planning to minimise impacts on existing services. | 5 and 14 |
| T9 | The T-way operations including car parking will be maintained at all times during the construction of the North West Rail Link. This includes existing sight lines to T-way bus stops and within T-way car parks, where possible. Where this is not possible, suitable alternative measures would be implemented (eg CCTV with active surveillance) where reasonable and feasible. | 9 - 14 |
| T10 | The need for, and provision of, alternative remote parking locations and shuttle bus transfers for daytime and night time construction staff will be considered for all construction sites during detailed construction planning. | 1 - 17 |
| T11 | Special event bus services for Sydney Olympic Park (Royal Easter Show and major sporting and entertainment events) will be managed, in particular, in Carrington Road at the Showground Station site, to ensure minimal disruption. | 6 |
| T12 | A Traffic and Transport Liaison Group will consider individual events and any other special event needs, and make reasonable and feasible short-term adjustment to the construction phase activities and/or review and update detailed Construction Traffic Management Plans. | 1 - 17 |
| T13 | Site traffic will be managed, where reasonable and feasible, to avoid significant movements in the AM peak in the critical southbound direction and in the PM peak in the critical northbound direction on Beecroft Road at Epping. | 1 |
| T15 | Access will be maintained to sections of the pedestrian bush track at Cheltenham not affected by construction works. Additionally, the provision of an alternative track will be considered during construction planning. | 3 |
| T16 | Access to the Bella Vista Station site during the daytime will be off Celebration Drive to the east of the Lexington Avenue intersection, to minimise traffic impacts at the Celebration Drive / Lexington Avenue intersection. The Celebration Drive / Lexington Avenue intersection will be used as access during the night and at low traffic times. | 8 |
| T17 | If construction of the project occurs before the planned Schofields Road upgrade, interim upgrading of the road would be undertaken with improved pavement quality and wider sealed shoulders to accommodate heavy vehicle usage. | 15 - 17 |
| T18 | A dilapidation report will be prepared prior to construction for all affected local roads from the construction access/egress point to the arterial road. | 1 - 17 |

| Ref No.* | Traffic mitigation measures | Applicable Sites |
|----------|---|------------------|
| T19 | An alternative pedestrian route via Ray Road and Kandy Avenue will be appropriately signposted for pedestrian movements between Epping Town Centre and the Beecroft Road M2 Motorway over bridge. | 1 |
| T20 | Truck movements on Ray Road will be restricted during the AM and PM peak periods. During these times, truck access and egress to and from the site will be via Beecroft Road only. | 1 |
| T21 | Staff working at the Epping Services Facility will be discouraged from parking on local roads and encouraged to: <ul style="list-style-type: none"> - Use public transport. - Car share. - Park in a designated off-site area and access the site via shuttle bus. | 1 |
| T22 | Where schools are in the immediate vicinity of construction sites, heavy vehicle movements will be minimised (where reasonable and feasible), between 8:00-9:30 am and 2:30-4:00 pm Monday to Friday (on school days). | 1 - 17 |
| T23 | Access and egress via Norwest Boulevard will be intermittent and only outside peak periods. | 7 |
| T24 | Signage will be established at Epping to direct pedestrians via the alternative pedestrian route along Ray Road and Kandy Avenue. | 1 |
| T25 | Construction traffic to and from the Cheltenham Services Facility will be directed to treat Beecroft Road/Kirkham Street intersection as left in / left out only. | 3 |
| T26 | Alternative access to the Showground will be developed and detailed in the relevant Construction Traffic Management Plan. | 6 |
| T27 | Alternative car parking will be provided, in consultation with The Hills Shire Council and the Castle Hill & Hills District Agricultural Society, for any car spaces removed within the Showground precinct. | 6 |
| T28 | Provision for buses to safely pull up to the bus bay located on Norwest Boulevard east of Century Circuit will be investigated as part of the relevant Construction Traffic Management Plan. | 7 |
| T29 | Alternative car parking will be provided for car spaces removed at the Burns T-way bus stop. The alternative parking may be accommodated at the Balmoral Road T-way bus stop. | 10 |
| T30 | Alternative car parking will be provided for car spaces removed at the Riley T-way bus stop. The alternative parking is likely to be provided to the north of Samantha Riley Drive. | 11 |
| T31 | An alternative location for the cycle lockers at Rouse Hill will be identified during detailed construction planning. | 14 |
| T32 | Alternative car parking will be provided for car spaces removed at the Rouse Hill Station construction site. | 14 |
| T33 | Either Cudgegong Road or Tallawong Road will remain open to traffic and bus services to maintain a route from Guntawong Road to Schofields Road. | 17 |

Site 1 - Epping Services Facility, Site 3 - Cheltenham Services Facility, Site 4 - Cherrybrook Station, Site 5 - Castle Hill Station, Site 6 - Showground Station, Site 7 - Norwest Station, Site 8 - Bella Vista Station, Site 9 - Balmoral Road, Site 10 - Memorial Avenue, Site 11 - Kellyville Station, Site 12 - Samantha Riley Drive to Windsor Road, Site 13 - Old Windsor Road to White Hart Drive, Site 14 - Rouse Hill Station, Site 15 - Windsor Road Viaduct, Site 16 - Windsor Road Viaduct to Cudgegong Road, Site 17 - Cudgegong Road Station and Tallawong Stabling Facility, and Tunnels

Note: Site 2, Epping Decline was listed in Environmental Impact Statement 1 but subsequently determined to be not required.

*Please use these reference numbers for any enquires or submissions in relation to the project.

Construction traffic

Generally, construction traffic levels will be much lower and less frequent compared to the major civil construction and excavation works.

Proposed access routes to construction worksites are detailed in the table below, along with expected daily heavy vehicle and light vehicle movements.

These vehicle movements are associated with waste removal, material deliveries and the arrival and departure of construction workers.

Wherever possible, access will only be from major arterial roads. A vehicle movement is defined as a vehicle entering the site or a vehicle leaving the site. Therefore, each vehicle would generate two movements.

Access routes to construction sites

| Construction site | Proposed access route | Peak daily heavy vehicle movements | Daily light vehicle movements |
|---|--|------------------------------------|-------------------------------|
| Epping Services Facility | Beecroft Road (left in, left out) Ray Road (right in, left out) | 100 | 60 |
| Cheltenham Services Facility | M2 Motorway (left in, left out) Kirkham Street (left in, right out) Castle Howard Road (light vehicles only) | 70 | 30 |
| Cherrybrook Station | Castle Hill Road at Glenhope Road (All movements) ¹ Robert Road (left in, left out) ¹ Franklin Road (left in, left out, right out) | 150 | 60 |
| Castle Hill Station | Old Northern Road / Terminus Street (all movements) McMullen Avenue (left in, left out) Crane Road (left out only) | 150 | 30 |
| Showground Station | Showground Road (all movements) Carrington Road (all movements) | 120 | 60 |
| Norwest Station | Norwest Boulevard Brookhollow Avenue | 150 | 20 |
| Bella Vista Station | Celebration Drive (all movements) Balmoral Road (right in, left out) | 100 | 20 |
| Balmoral Road / Memorial Avenue | Balmoral Road (left in, right out) Memorial Avenue (all movements) | 200 | 300 |
| Kellyville Station | Samantha Riley Drive (all movements) | 100 | 40 |
| Rouse Hill Station | White Hart Drive (left in) Rouse Hill Drive (left out) | 100 | 40 |
| Windsor Road Viaduct | Rouse Hill Drive (left in, right out) Commercial Road (right in, left out) Windsor Road (left in, left out) | 150 | 60 |
| Cudgegong Road Station and Tallawong Stabling Facility | Cudgegong Road (all movements) Tallawong Road (all movements) Schofields Road (all movements) | 276 | 240 |

Note 1: The Castle Hill Road access to Cherrybrook Station would be utilised until the permanent Robert Road signalised intersection is established.

Construction hours

Proposed construction hours are as shown in the following table. With the exception of emergency works, activities will not take place outside standard daytime construction hours without prior discussion with and or notification of local residents, businesses and the Environment Protection Authority.

Other works which may occur outside of the above standard daytime construction hours without further approval include:

- Works determined to comply with the relevant noise level at the nearest sensitive receiver;

- Works during rail possessions;
- Works required by roads authorities outside the standard hours;
- The delivery of materials outside of approved hours as required by the police or other authorities for safety reasons;
- Where it is required to avoid the loss of life, property and / or to prevent environmental harm in an emergency; and
- Where agreement is reached with affected people.

Proposed working hours

| Activity | Construction hours | Comments or exceptions |
|---|---|--|
| Underground construction | | |
| Trackwork, tunnel systems and tunnel rail systems. | 24 hours per day, seven days per week | Activities on the surface that support trackwork, tunnel systems and tunnel rail systems may need to occur 24 hours per day, up to seven days per week. |
| Above ground construction | | |
| Above ground construction | <ul style="list-style-type: none"> 7am – 6pm Monday to Friday 8am – 1pm Saturdays No works on Sundays or Public Holidays | <p>Surface works supporting underground construction (e.g. concrete pumping, truck loading) would be expected to be required 24 hours per day, up to seven days per week at sites where noise impact management measures have been established.</p> <p>Non-disruptive preparatory work, repairs or maintenance may be carried out on Saturday afternoons between 1pm and 5pm or Sundays between 8am and 5pm.</p> <p>Activities requiring the temporary possession of roads may need to be undertaken outside the standard daytime construction hours during periods of low demand to minimise safety impacts and inconvenience to commuters.</p> <p>Activities requiring rail possessions may need to be undertaken outside the standard construction hours up to 24 hours per day, seven days per week.</p> |



Artist's impression, the skytrain

Construction

Construction sites

There will be a total of sixteen construction sites.

Environmental Impact Statement 1 listed an additional proposed site – at the Epping Decline. This proposed site was later deleted following a review of construction plans as detailed in the Preferred Infrastructure Report.

Construction sites will be used during track laying, signalling and overhead wiring.

There are three core work zones:

- Epping to Bella Vista Station – inside tunnels;
- Bella Vista Station to Rouse Hill Station – on embankment and viaduct; and
- Rouse Hill Station to Tallawong Road – on surface or bridge structures.

Key construction objectives are:

- Safe construction of the project for the workforce, the public and stakeholders;
- Efficient and timely delivery of the rail systems and stations; and
- Minimisation and management of impacts to the environment and community.

This section outlines construction plans for:

- Station fit-out including platforms, buildings and architectural aspects;
- Completion of the skytrain;
- Rail infrastructure such as railway tracks, signalling systems, ventilation systems, overhead power supply and substations;
- Transport interchanges;
- Commuter car parking, kiss-and-ride, bus stops, taxi ranks and bicycle facilities;
- Fit-out and construction of services facilities, buildings for train stabling and maintenance;
- Access roads and landscaping; and
- Testing and commissioning.

Environmental Impact Statement 1 described the major civil construction works for:

- Site establishment;
- Excavating the 15km of tunnels;
- Excavating the station boxes;
- Construction of above ground infrastructure, including skytrain, viaducts and bridges; and
- Earthworks.

Work program

The rail systems and stations construction work is scheduled to start in early 2016.

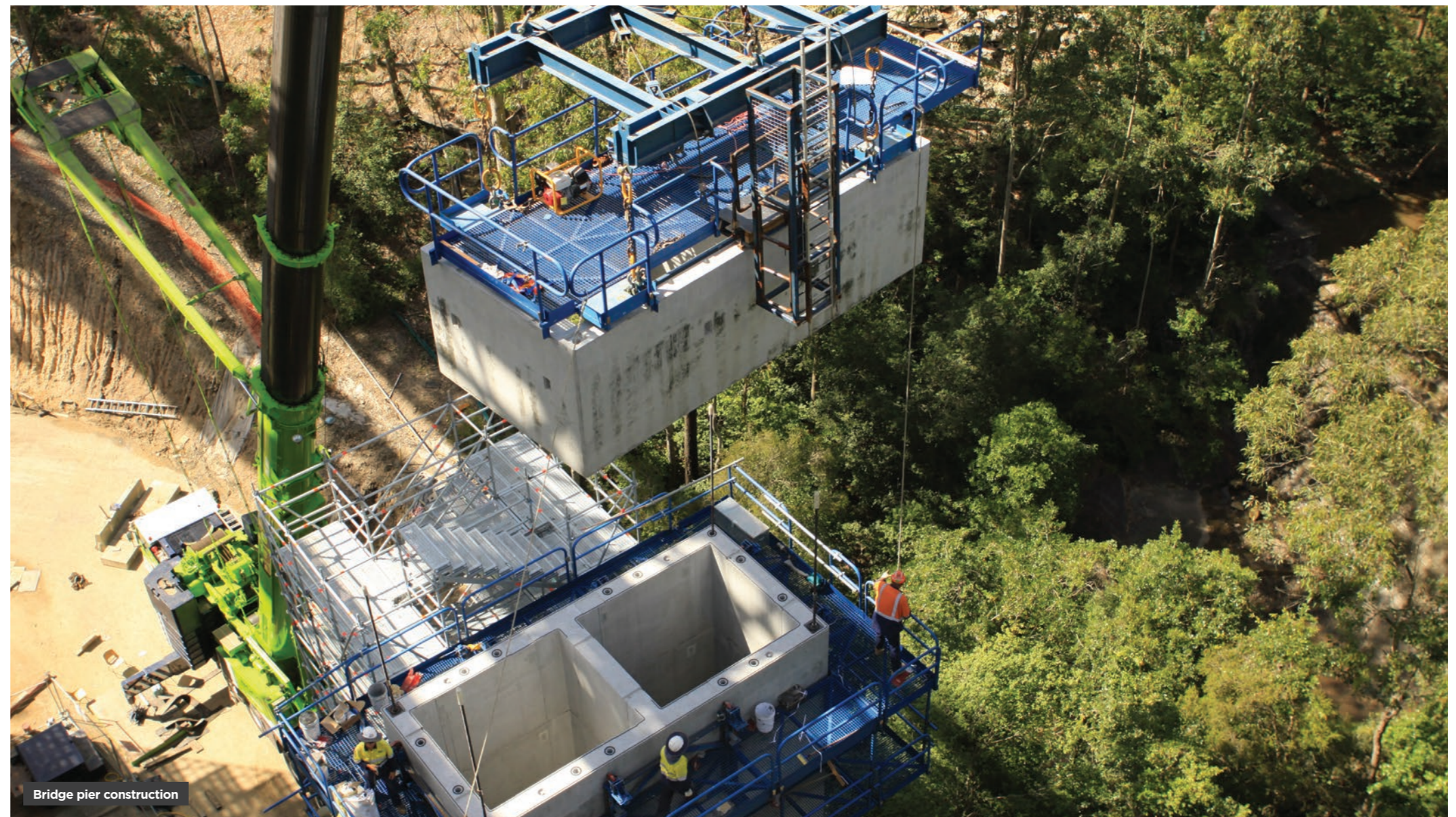
Work will get underway as sites are progressively handed over from the builders of the tunnels and skytrain earthworks. For details of these works, please refer to Environmental Impact Statement 1.

The total period of rail systems and stations construction works is expected to be up to four years.

The construction timeline is subject to confirmation by industry during the detailed design and tendering phases of the project.

An indicative program has been developed, subject to further input from industry and construction contractors.

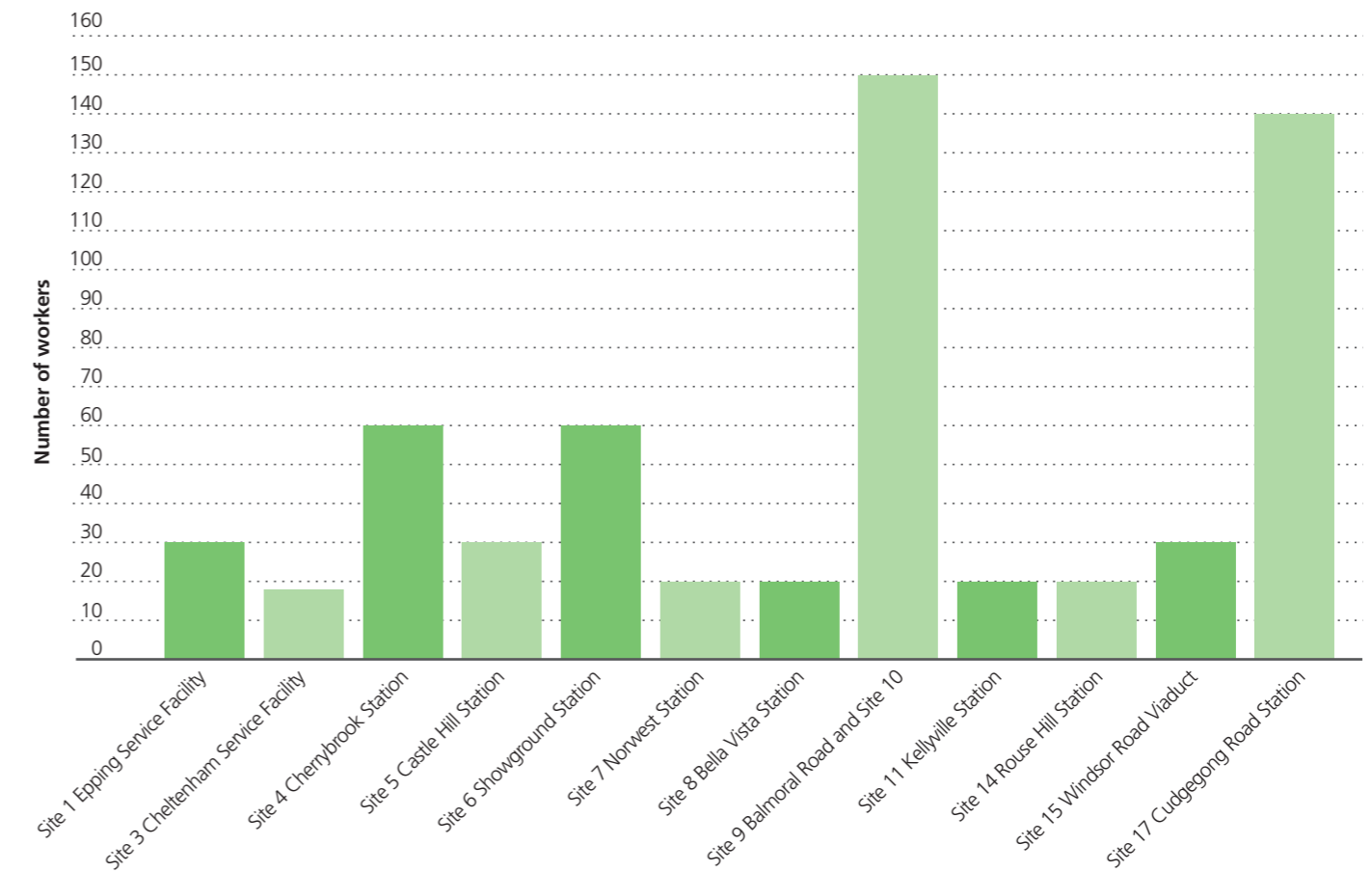
| Construction activities | Indicative construction time frame | | | | |
|---|------------------------------------|------|------|------|--------|
| | 2015 | 2016 | 2017 | 2018 | 2019 → |
| Station construction, fit-out, ventilation and precinct works | | | | | |
| Epping Services Facility fit-out | | | | | |
| Cheltenham Services Facility fit-out | | | | | |
| Trackwork | | | | | |
| Tunnel systems fit-out | | | | | |
| Surface and viaduct systems fit-out | | | | | |
| Testing and commissioning | | | | | |
| Operational readiness | | | | | |
| Systems integration | | | | | |



Construction site activities

| Site | Area (m2) | Station construction and fit-out | Station precinct works | Services facility construction and fit-out | Stabling facility construction and fit-out | Tunnel systems fit-out | At-grade surface and viaduct systems fit-out | Testing and commissioning |
|---|-----------|----------------------------------|------------------------|--|--|------------------------|--|---------------------------|
| Epping to Bella Vista Station | | | | | | | | |
| 1. Epping Services Facility | 12,000 | | | ✓ | | ✓ | | ✓ |
| 3. Cheltenham Services Facility | 9,750 | | | ✓ | | ✓ | | ✓ |
| 4. Cherrybrook Station | 75,000 | ✓ | ✓ | | | ✓ | | ✓ |
| 5. Castle Hill Station | 18,000 | ✓ | ✓ | | | ✓ | | ✓ |
| 6. Showground Station | 85,000 | ✓ | ✓ | | | ✓ | | ✓ |
| 7. Norwest Station | 21,000 | ✓ | ✓ | | | ✓ | | ✓ |
| 8. Bella Vista Station | 63,000 | ✓ | ✓ | | | ✓ | | ✓ |
| Bella Vista Station to Rouse Hill Station | | | | | | | | |
| 9. Balmoral Road | 190,000 | | | | | | ✓ | ✓ |
| 10. Memorial Avenue | 120,000 | | | | | | ✓ | ✓ |
| 11. Kellyville Station | 100,000 | ✓ | ✓ | | | | ✓ | ✓ |
| 12. Samantha Riley Drive to Windsor Road | 50,000 | | | | | | ✓ | ✓ |
| 13. Old Windsor Road to White Hart Drive | 97,000 | | | | | | ✓ | ✓ |
| 14. Rouse Hill Station | 18,000 | ✓ | ✓ | | | | ✓ | ✓ |
| Rouse Hill Station to Tallawong Stabling Facility | | | | | | | | |
| 15. Windsor Road Viaduct | 61,000 | | | | | | ✓ | ✓ |
| 16. Windsor Road Viaduct to Cudgegong Road | 83,000 | | | | | | ✓ | ✓ |
| 17. Cudgegong Road Station to Tallawong Stabling Facility | 590,000 | ✓ | ✓ | | ✓ | | ✓ | ✓ |

Indicative workforce



Materials

Rail systems and stations construction work will use of a variety of construction materials. Major items and indicative quantities are:

- Concrete - 250,000m³; and
- Steel - 35,000 tonnes.

Workforce

Up to 600 people, drawn from many trades and professions, will be working on sites.

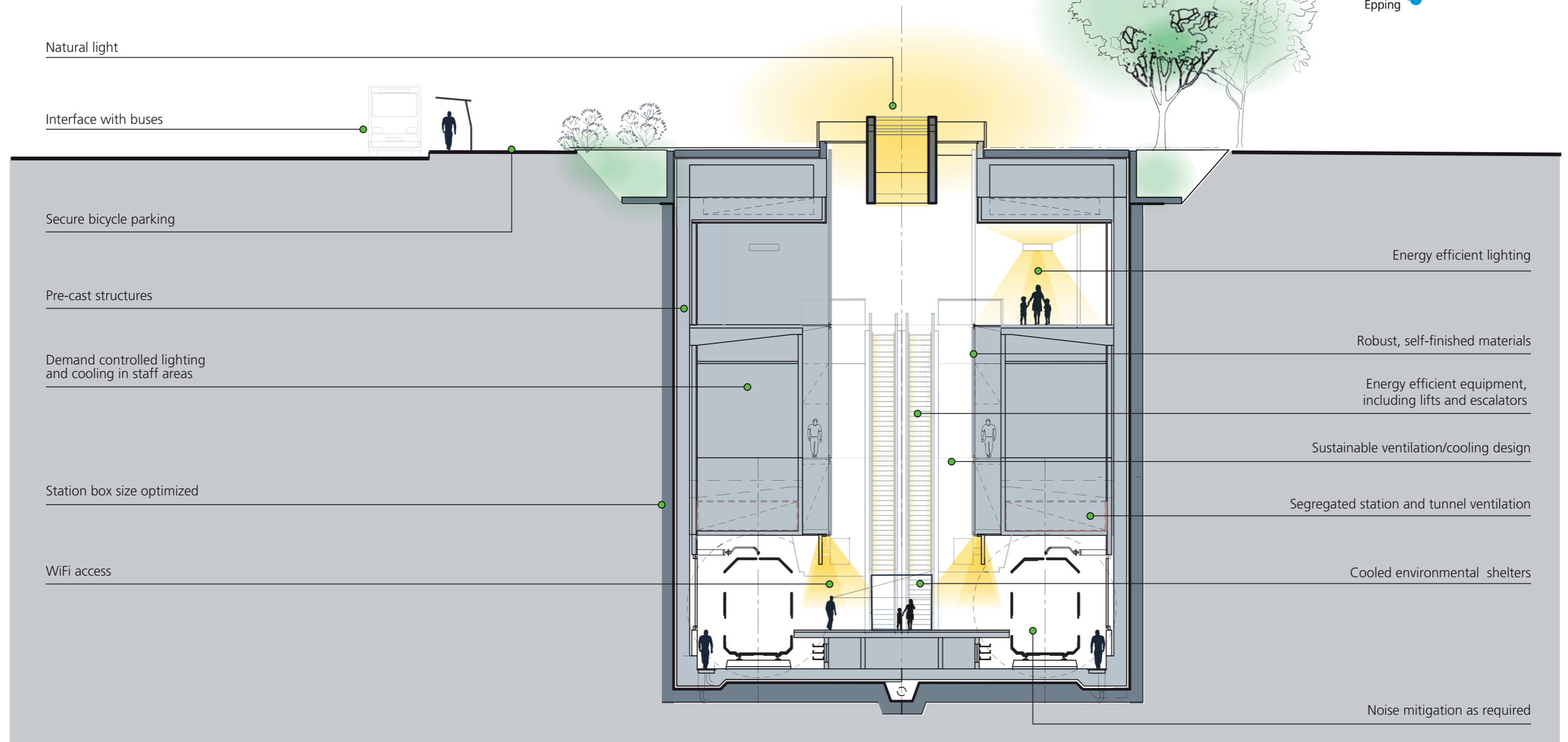
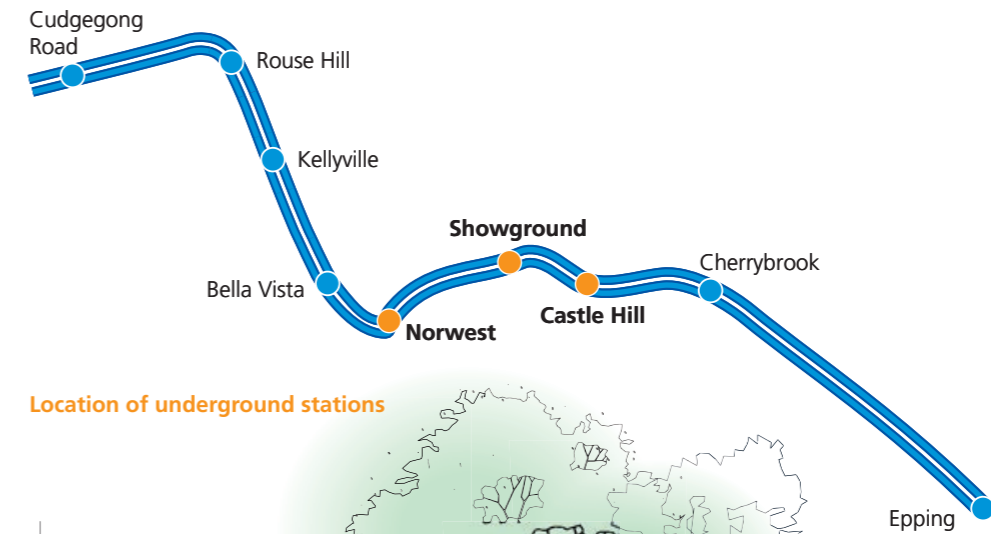
Underground stations construction phases

Three stations, Castle Hill, Showground and Norwest are underground in tunnels and will be built using a “cut and cover” method.

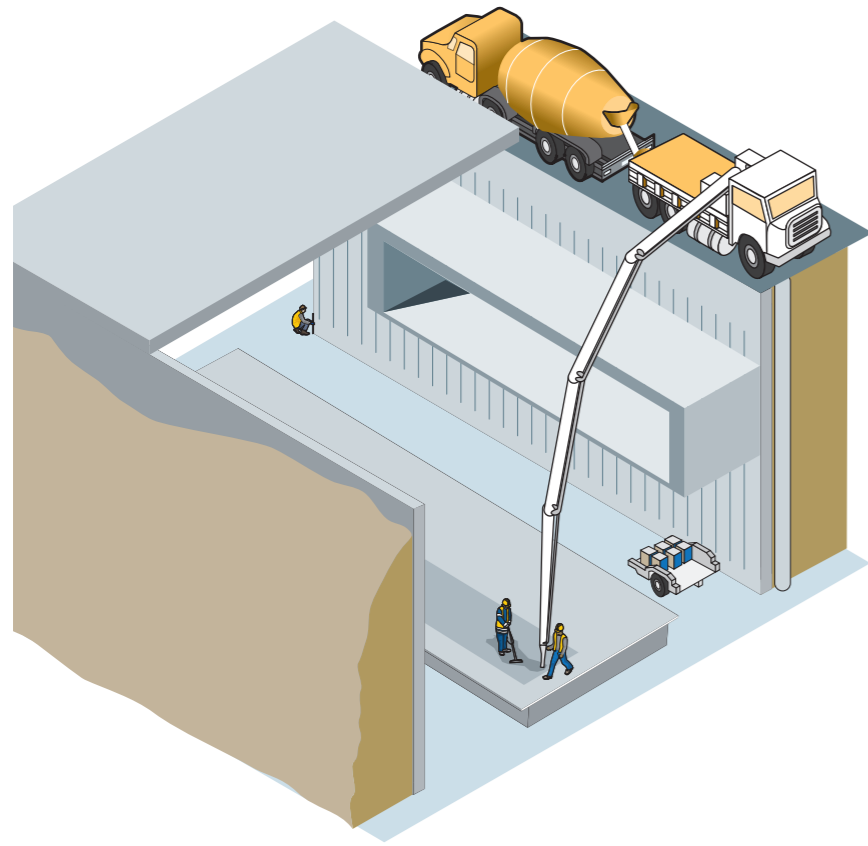
The following material provides a guide to:

- The typical layout of the station types; and
- The typical steps used to build the stations.

More detailed information is available in the complete Environmental Impact Statement 2 document and its technical papers.



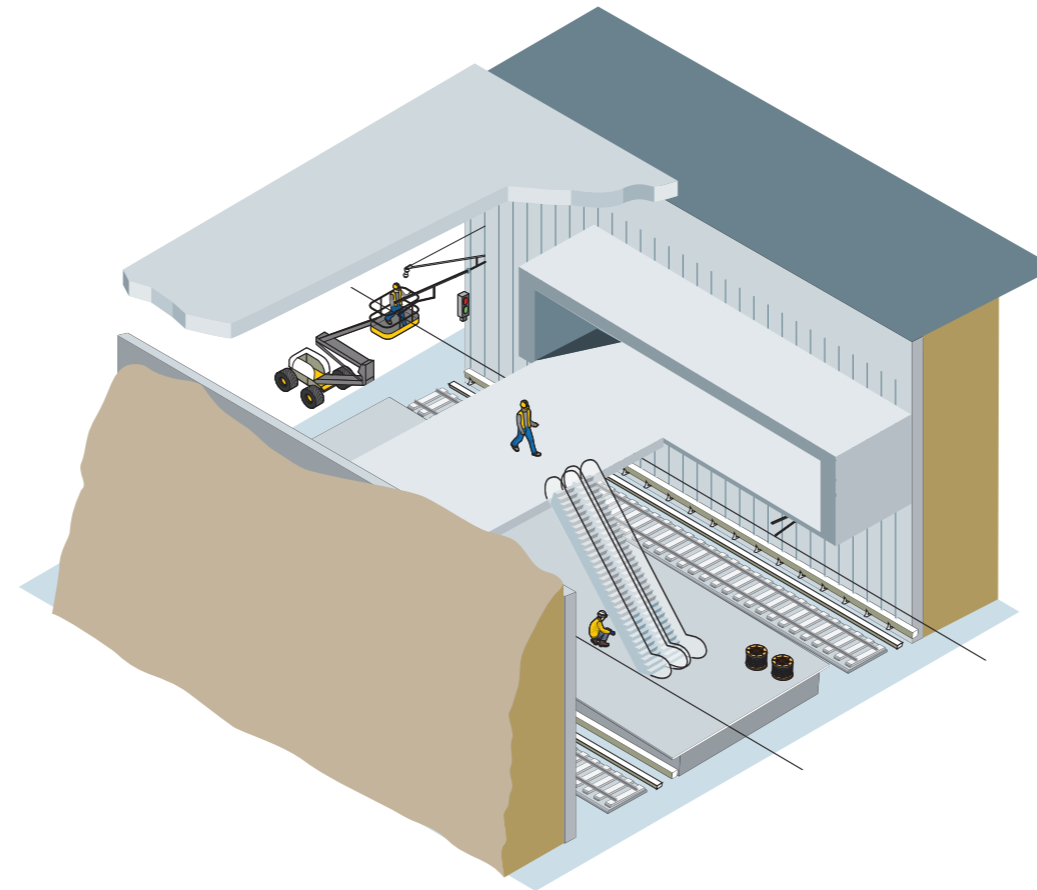
Underground stations construction phases



1 Structure

Underground station work involves:

- Platforms;
- Vertical supports;
- Intermediate floors; and
- Roof slabs.



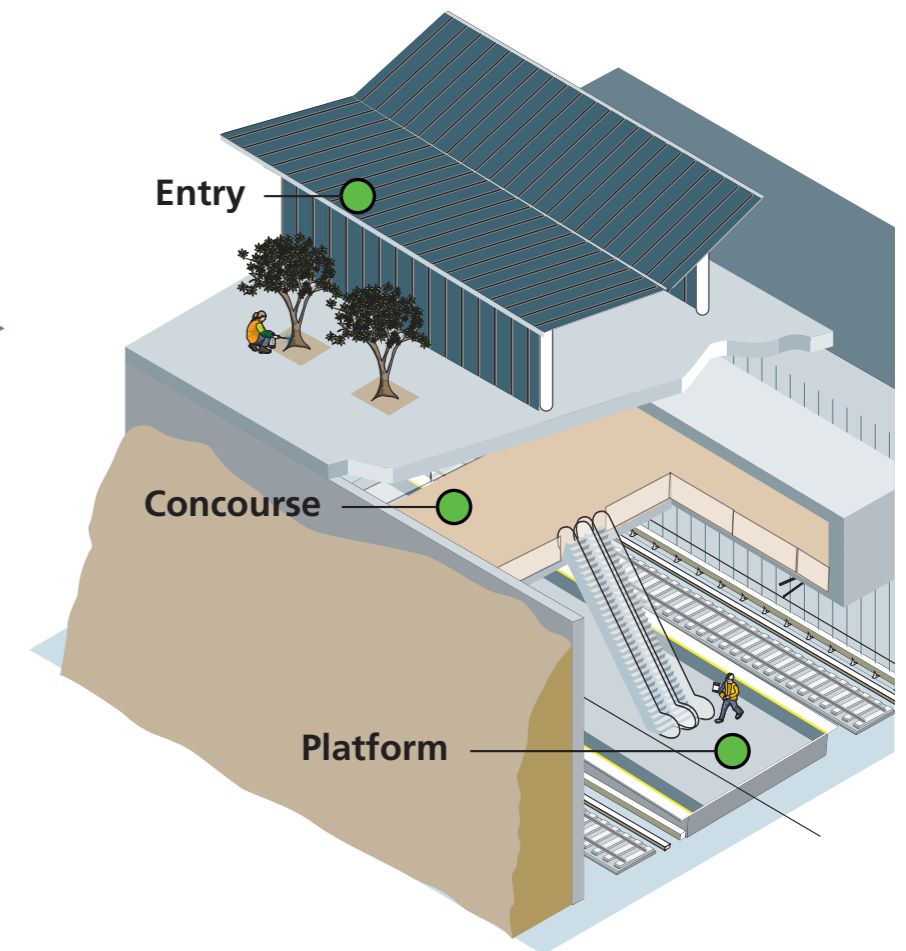
2 Fit-out

Mechanical and electrical work on:

- Rail systems; and
- Station systems such as ventilation fans.

Initial fit-out takes place at the same time as structural works using openings left in the floors and roof.

Final fit-out follows structural work and is at the same time as architectural fit-out.



3 Finishing touches

Architectural fit-out applies finishing touches including glazing, wall and ceiling cladding, painting and floor finishes.

Stations in cutting construction phases

These methods will be used at Cherrybrook, Bella Vista and Cudgegong Road Stations.

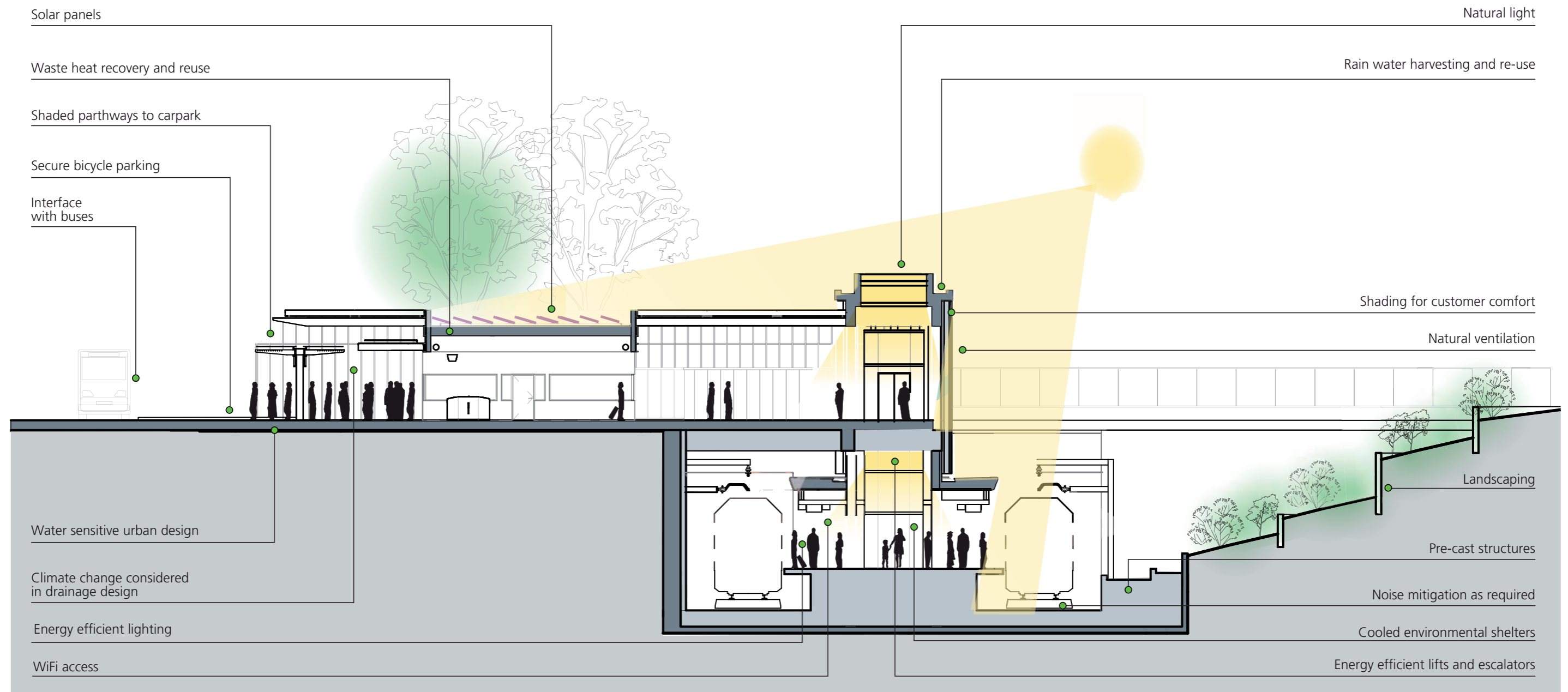
The following material provides a guide to:

- The typical layout of the station types; and
- The typical steps used to build the stations.

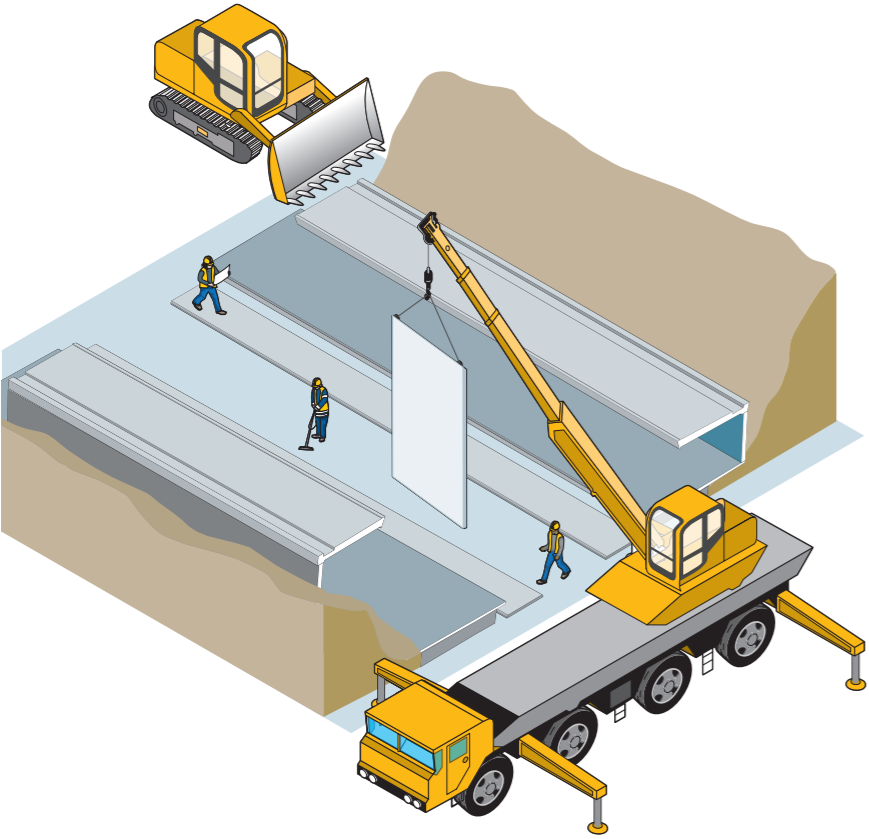
More detailed information is available in the complete Environmental Impact Statement 2 document and its technical papers.



Location of cutting stations



Stations in cutting construction phases



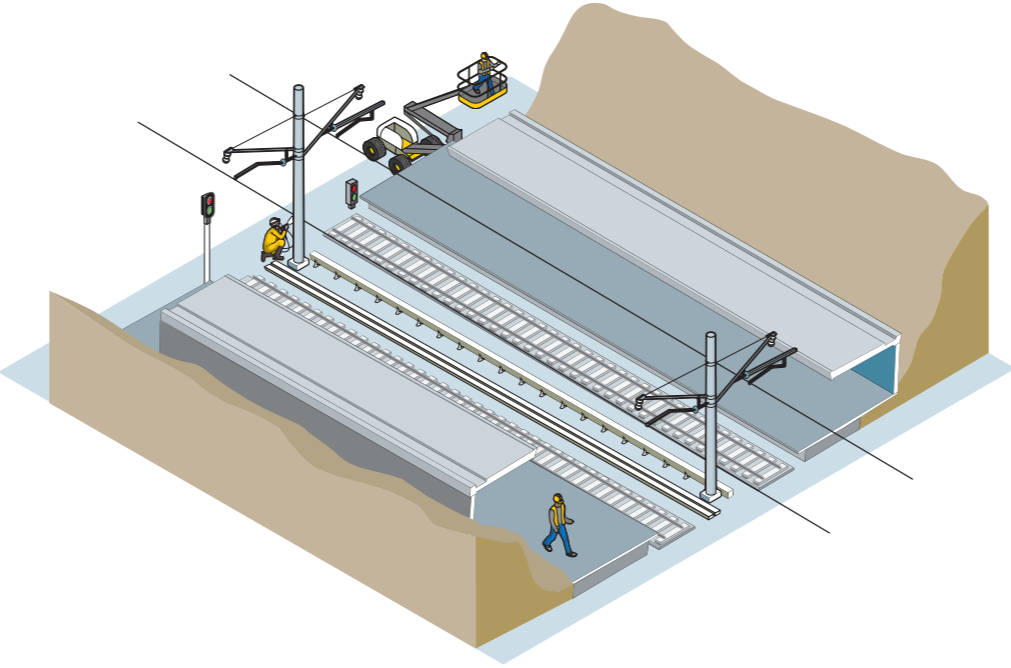
1 Structure

Construction includes:

- Support columns and foundations for elevators and station buildings etc;
- The platform and canopy;
- Lifts, escalators and pedestrian access;
- Emergency stairs; and
- Buildings.

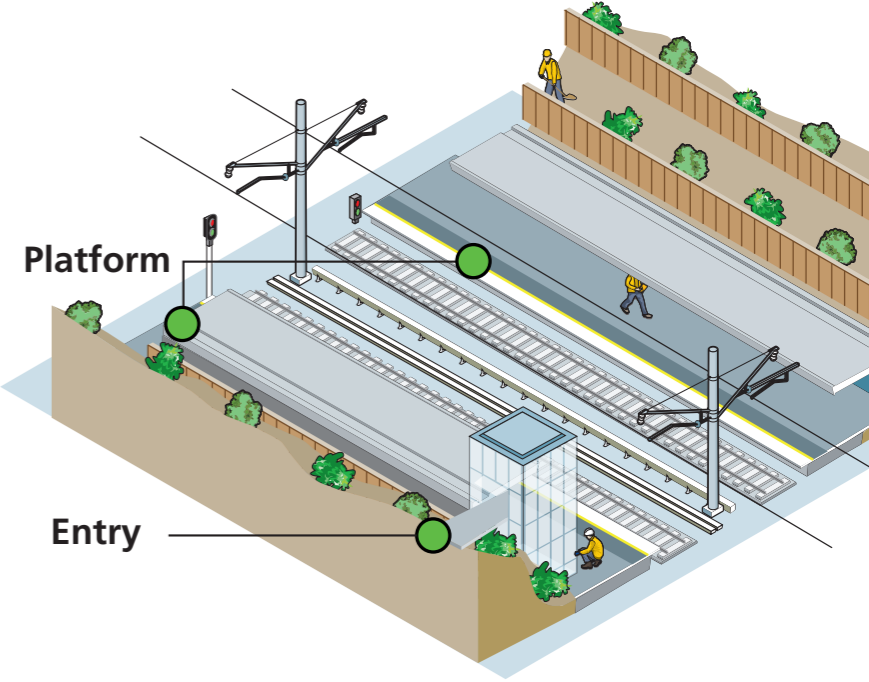
Platform canopies, emergency stairs and framework for elevators are pre-fabricated and assembled on site at ground level and then moved into place by cranes.

Station buildings are built at the same time as station construction.



2 Fit-out

Mechanical and electrical fit-out includes rail systems and services for station operations. Fit-out of the stations is similar to the elevated stations.



3 Finishing touches

Architectural fit-out follows structural work and involves final finishing touches, including glazing, wall and ceiling cladding, painting and floor finishes.

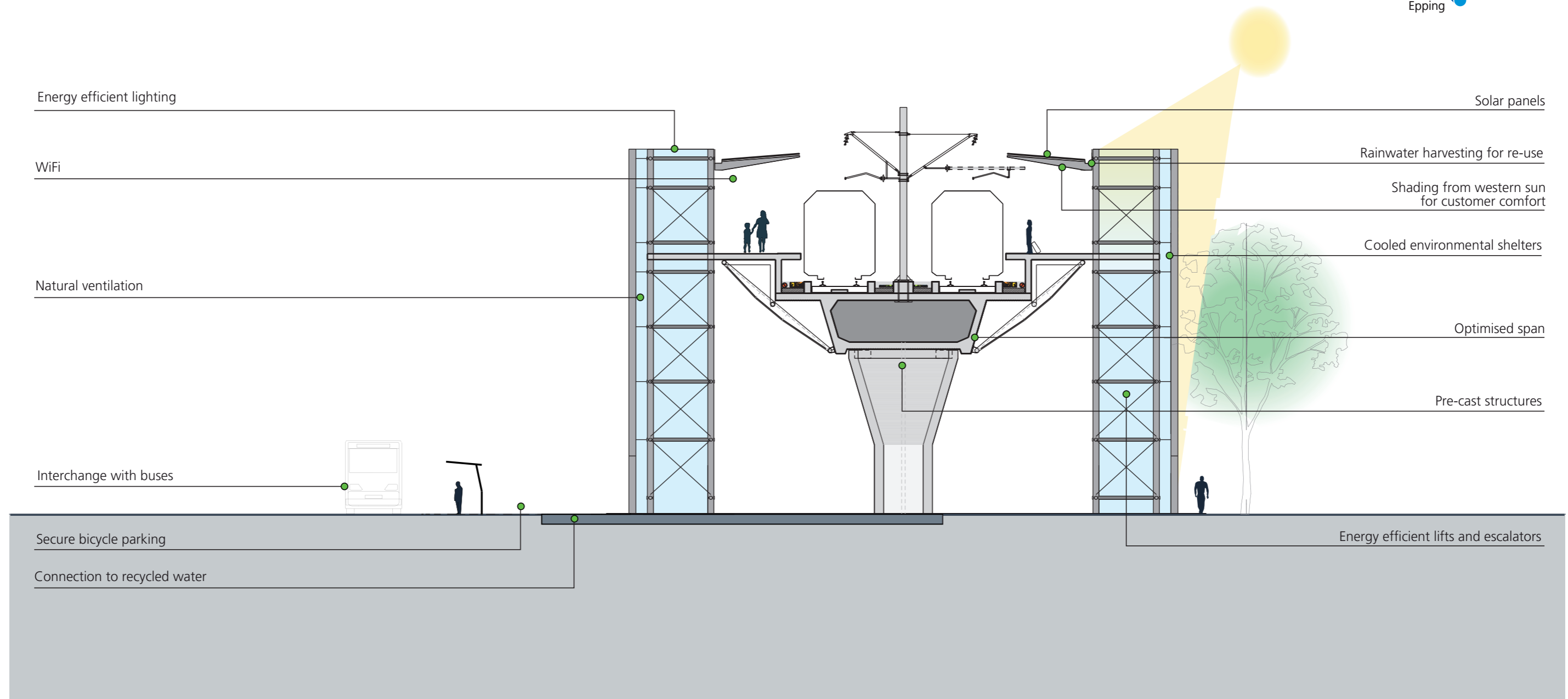
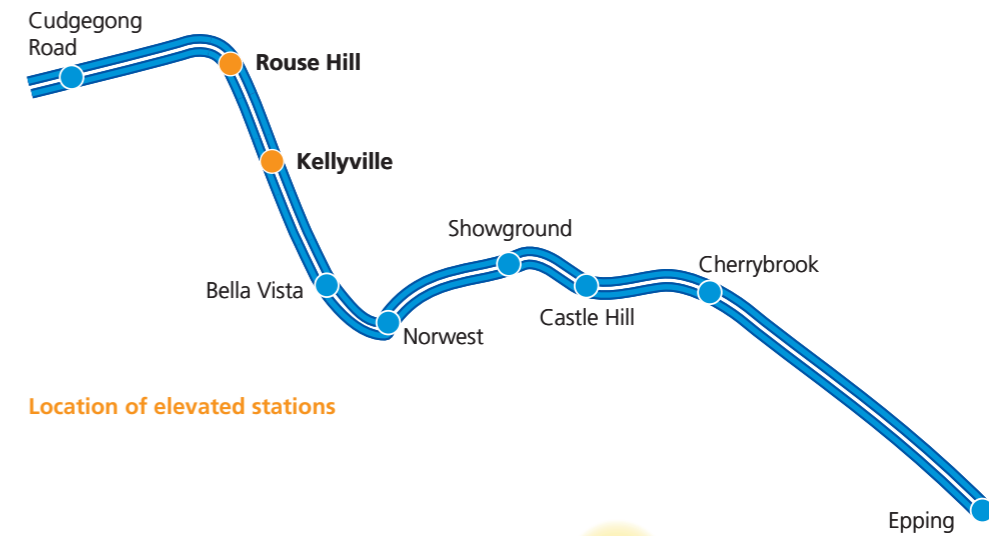
Elevated stations construction phases

Two stations, Kellyville and Rouse Hill, are on the skytrain.

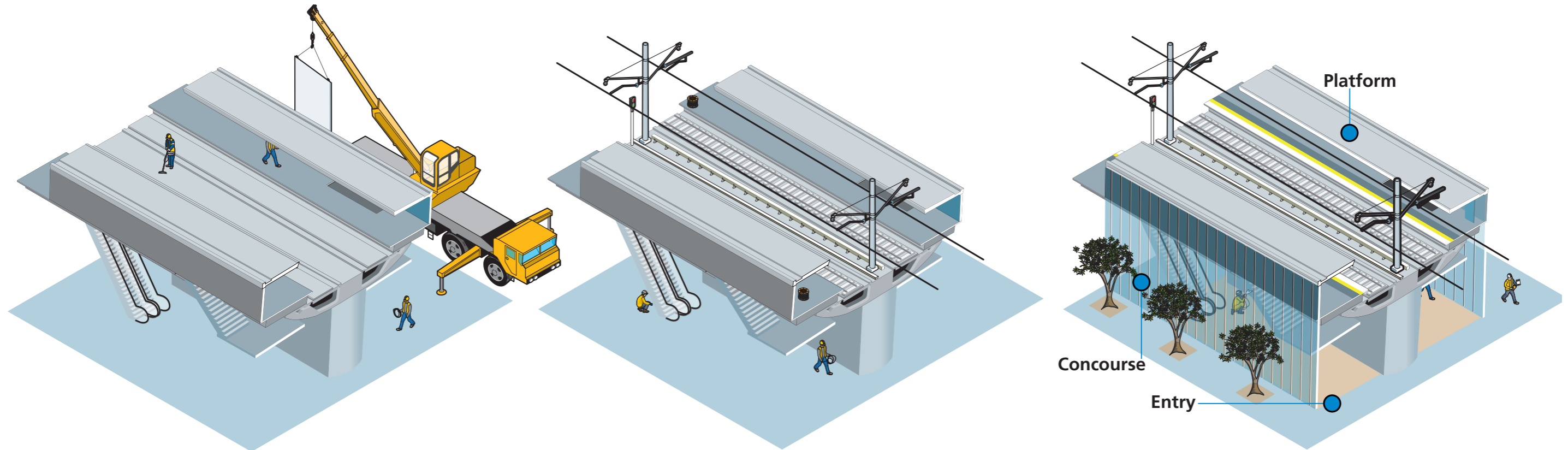
The following material provides a guide to:

- The typical layout of the station types; and
- The typical steps used to build the stations.

More detailed information is available in the complete Environmental Impact Statement 2 document and its technical papers.



Elevated stations construction phases



1 Structure

Construction includes:

- Support columns and foundations;
- Emergency stairs;
- The platform and canopy;
- Lifts and escalators; and
- Station buildings.

Platforms will typically be built using pre-cast concrete. Stairs, escalators and lifts can be pre-fabricated, assembled at ground level then lifted into place by cranes.

The platform canopy is built after platforms and other major items using the same method as for stairs and escalators. Station buildings will be built using conventional steel frame methods.

2 Fit-out

Like the underground stations, mechanical and electrical fit-out of elevated stations has two major elements – rail systems and services.

Services are installed at the same time as structural and building frame construction. Final fit out follows structural work and at the same time as architectural fit-out.

3 Finishing touches

Architectural fit-out of skytrain stations involves final finishing touches including glazing, wall and ceiling cladding, painting and floor finishes.

Tracks, infrastructure and systems

Construction in the tunnels

Fit-out works in the tunnels include:

- Ventilation fit out;
- Track slab and rail fastening;
- Rail installation, fixing and welding;
- Cable and equipment installation including signalling, communications and electricity;
- Overhead wiring installation; and
- Other equipment such as – lighting (including emergency lighting), drainage works and fire and life safety systems (including emergency walkways and fire hydrant systems).

Access points for tunnel fit-out include the portal at Bella Vista as well as Showground and Cherrybrook stations.

The Balmoral Road and / or Memorial Avenue construction sites will be used to store and co-ordinate material for delivery into the tunnels.

Track form

Tracks in the tunnels will be based on a fixed concrete slab and include:

- The track slab formed by mass concrete pours;
- Rail fasteners attached to the concrete incorporating base plates that will help reduce train noise and vibration;
- Resilient boot-sleepers. This involves providing a rubber 'boot' around the sides and bottom of sleepers to which the rail is fastened. The rubber boot reduces transfer of noise and vibration into the surrounding ground and any buildings above; and
- Higher attenuation track form provided where reasonable and feasible to further mitigate ground-borne noise in areas where tunnels run close to sensitive areas such as houses, medical facilities or churches.

The tracks

- Continuously welded rail;
- Lengths of rail between 13 metres and 20 metres delivered to a main welding yard at Bella Vista, with additional yards at Tallawong Road and Cherrybrook. The rail will then be welded into 110 metre lengths before being carried into the tunnels;
- In-tunnel welding will also be required once rail is in place;
- Automated placement, fixing and fastening of rail within the tunnels; and
- It is possible that some rail may be delivered by work trains from the Main North rail line, subject to availability of train paths.

Ventilation

Most tunnel ventilation equipment will be at the stations and service facilities and installed as part of station fit out and construction.

Impulse fans will be installed inside small caverns beneath the Cheltenham Services Facility, and are likely to be delivered through the Epping Services Facility.

Cable and equipment installation

There will be dedicated cable routes inside the tunnels for signalling, communications and electricity. Rooms for signalling and communications equipment will be provided at every second cross passage, alternating with power equipment rooms at the other cross passages.

Overhead wiring

Overhead wiring will be installed at intervals between 20 metres (on tight curves) to 70 metres (on straight sections of track). Overhead wiring will have a main support located centrally over the track with a secondary support to the side of the tunnel.



Underground track laying

Construction above ground

Track laying and other works on the surface and the skytrain is similar to what happens in the tunnels.

The main access point for the skytrain fit-out will be the Tallawong Stabling Facility and the Balmoral Road and / or Memorial Avenue construction sites, with secondary access provided via other surface work sites.

Above ground works include:

- Track and rail fastening;
- Rail installation, fixing and welding;
- Cable and equipment installation including signalling, communications and electricity;
- Overhead wiring structures; and
- Other equipment such as – lighting (including emergency lighting), drainage works, noise attenuation and fire and life safety systems – walkways connecting to emergency egress – and fire hydrant systems.



Above ground track work

Track and rail fastening

Track is likely to be laid using a mobile track laying machine.

Rails

Rail will be delivered to main welding yards at Balmoral Road and / or Memorial Avenue construction sites and Tallawong Road in lengths between 13 metres and 20 metres where it will be welded into 110 metres lengths. Track welding will also be required once rail is in place.

Cable and equipment installation

Cable brackets, trays and conduits will be installed by rubber tyred machines before track fit-out. Dedicated cable routes will be provided for signalling, communications and electricity.

There will be signal equipment rooms at the stabling area, at each station and alongside the alignment as required.

Communication rooms will be at the stabling area, and at each station. The signal and communication rooms at the stations would be connected to a centralised communications system.

Overhead wiring

Overhead wiring structures will use footings installed beside the track.

On the skytrain, there will be a more complex overhead wiring system with structures connected directly to the viaduct segments.

Overhead wiring structures at the stabling yard will support the stabling roads and turnouts.

Wiring will be installed at intervals between 20 metres (on tight curves) to 70 metres (on straight sections).

Testing and commissioning

Rail systems at each individual site – stations, services facility or stabling yard – will be commissioned as stand-alone entities.

Once all services fit-out work is complete, commissioning will follow three stages:

- Assemble testing procedures and pre-checks – the collection of safety and quality assurance documentation and commissioning readiness checks;
- Installation and operation tests – all tests and checks across all elements of work; and
- Site acceptance tests – final inspection, testing, commissioning and validation of individual systems.

During the final stages of commissioning, test trains will run on the line for final signal system testing and commissioning as well as traction power testing.

Signalling and control systems

Advanced Signalling Technology

The North West Rail Link and future rapid transit rail lines will use advanced signalling technology, including Automatic Train Protection (ATP) and Automatic Train Regulation (ATR).

The ATP system is designed to keep each train a safe braking distance away from the train ahead.

Advanced signalling technology will control the train as it stops, ensuring trains stop at the correct location.

The technology will also control speed between stations and make sure that only doors on the correct side can be opened at stations and also control door closing.

The train lines will allow bi-directional operation in special circumstances where trains can run along either track.

When combined with rail crossovers along the route, this feature provides flexibility to respond to incidents and to support continuity of service.

All operating and control systems will be integrated with rail systems to provide consistent performance, including high levels of safety.

Integrated information control system

An integrated information control system will allow communication with passengers and staff via audio and visual links, both on stations and trains.

Systems will include:

- Radio and digital communications systems for operator and emergency services;
- Passenger mobile phone and other modern telecommunications;
- Passenger information display and public address;
- Closed-circuit television; and
- Emergency warning information.

Traction power supply, sub-stations and overhead wiring

Power to drive the trains will be provided through new substations at Epping West, Cherrybrook, Castle Hill, Showground, Norwest and Tallawong Road. There will also be an off site traction substation at Bella Vista.

The electrical network will include:

- 1500 volts direct current overhead wire traction power to trains via a 33kV system; and
- Lower voltage power for electrical services at stations and the Stabling Facility, signalling and communications systems via an 11kV system.

The 33kV and 11kV systems will be independent of the external energy authorities and will be designed with suitable redundancy to continue rail operations under fault conditions.

The 33kV feeder system and 11kV network will be located inside the rail corridor and connect the traction substations with the existing high voltage network.

Station precinct works

Precinct works include activities such as road works, car parks building works and landscaping.

Precinct works around each station will take place after substantial completion of major station works, and concurrently with testing and commissioning.

Each of the stations includes some form of interface with other transport modes.

Station precinct works will include:

- Roads and car parks;
- Earthworks;
- Drainage;
- Kerb and guttering;
- Surfacing including asphalt, concrete and pavers;
- Bus shelters and other buildings; and
- Line marking, signage and other finishes.

Landscaping will include:

- Earthworks;
- Soil improvement and topsoil dressing;
- Drainage;
- Irrigation systems;
- Planting, starting with large plants and finishing with smaller plants and turf; and
- Finishing works.

Construction site layouts

The following indicative material is provided as a guide to the probable layout of construction sites, and the likely time frames required for construction activity associated with Environmental Impact Statement 2.

During detailed design and project tendering, this information will be refined and further communicated to local communities and stakeholders.

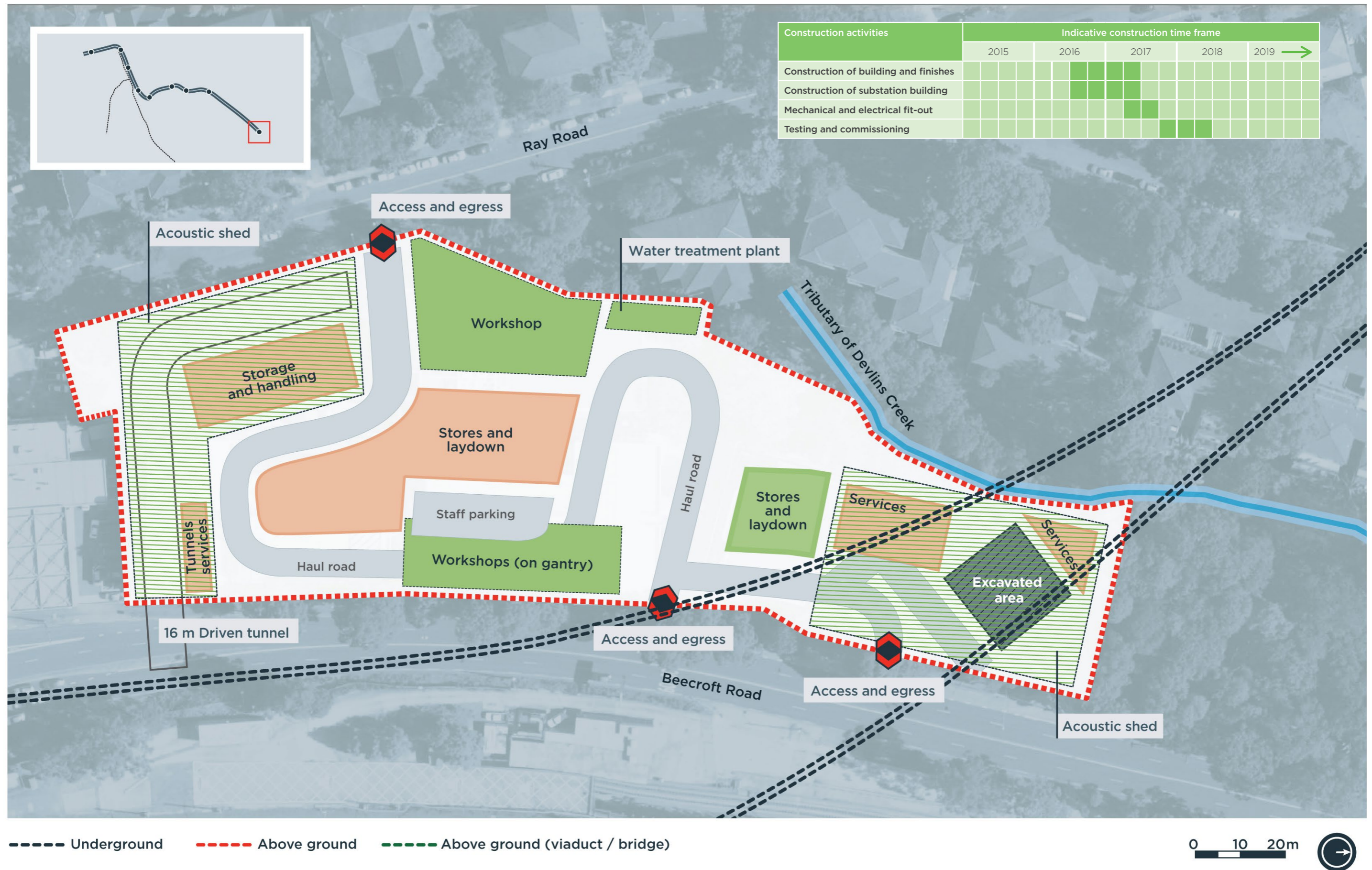
Place managers will work in close consultation with directly affected communities, to mitigate and resolve any issues.



Underground station construction

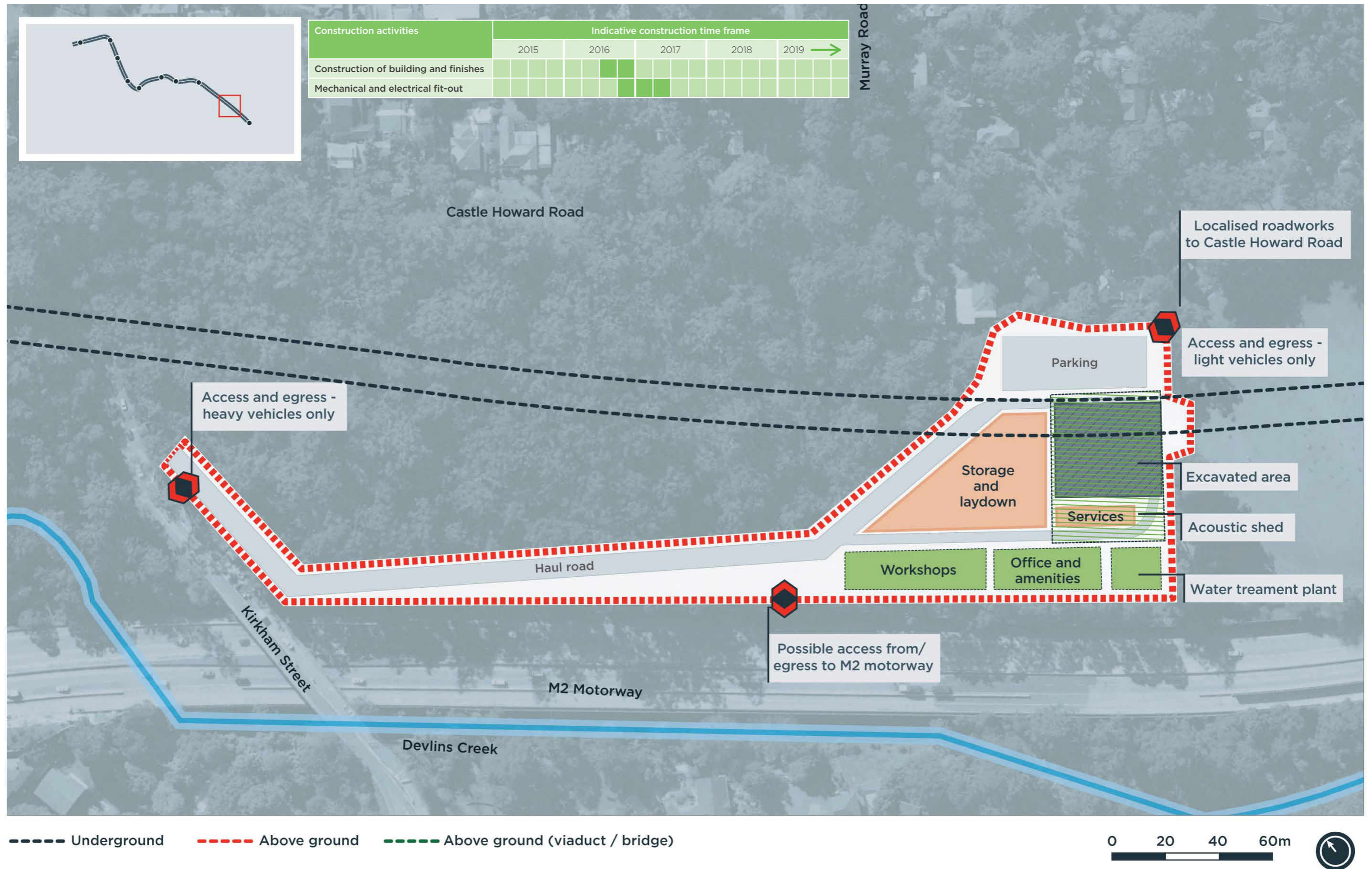
Epping Services Facility

Epping Services Facility construction site layout



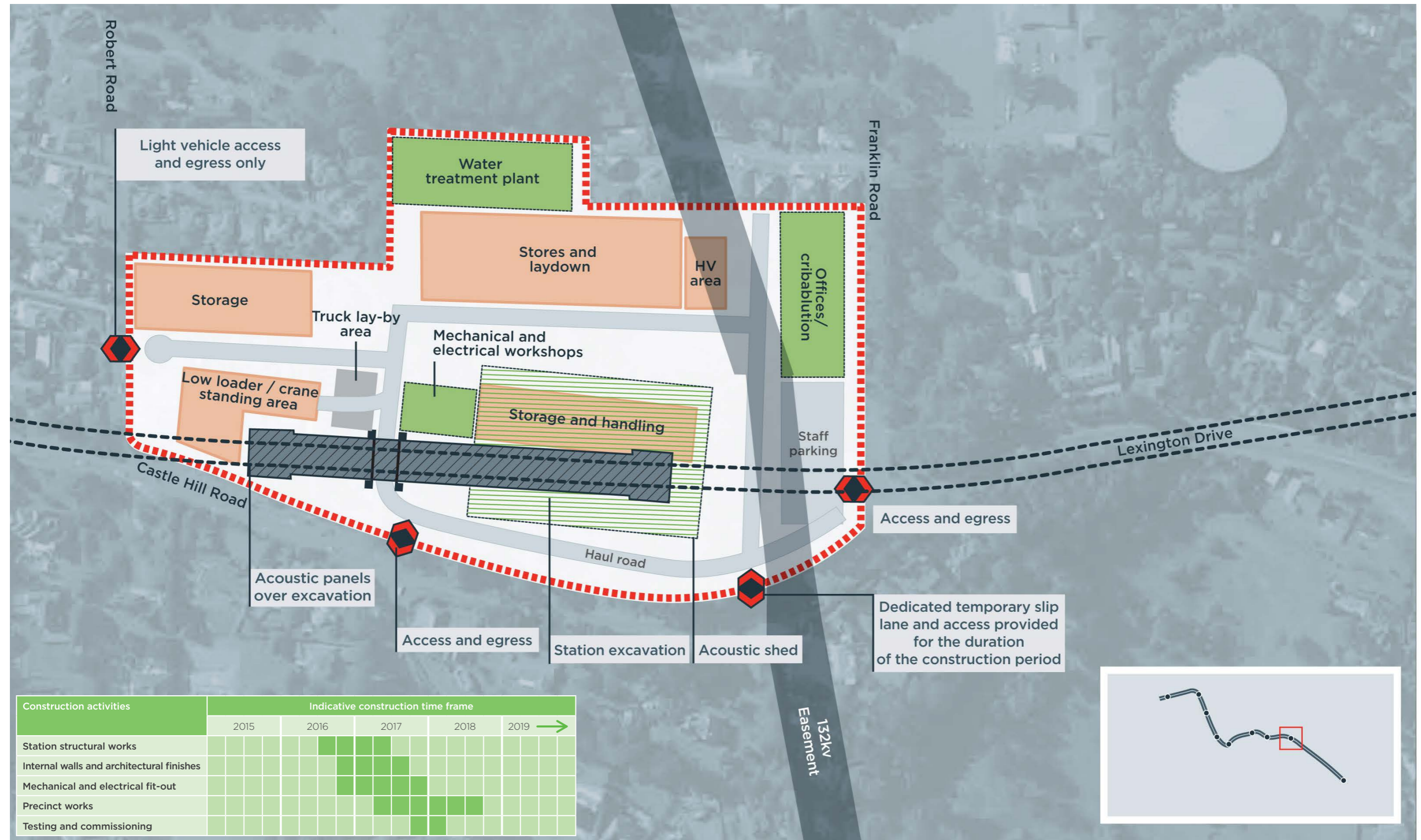
Cheltenham Services Facility

Cheltenham Services Facility construction site layout

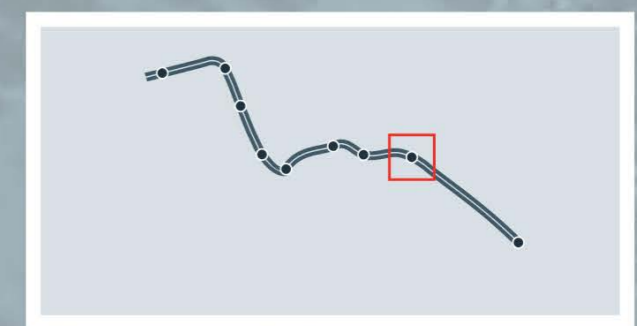


Cherrybrook Station

Cherrybrook Station construction site layout



| Construction activities | Indicative construction time frame | | | | |
|---|------------------------------------|------|------|------|--------|
| | 2015 | 2016 | 2017 | 2018 | 2019 → |
| Station structural works | | | | | |
| Internal walls and architectural finishes | | | | | |
| Mechanical and electrical fit-out | | | | | |
| Precinct works | | | | | |
| Testing and commissioning | | | | | |

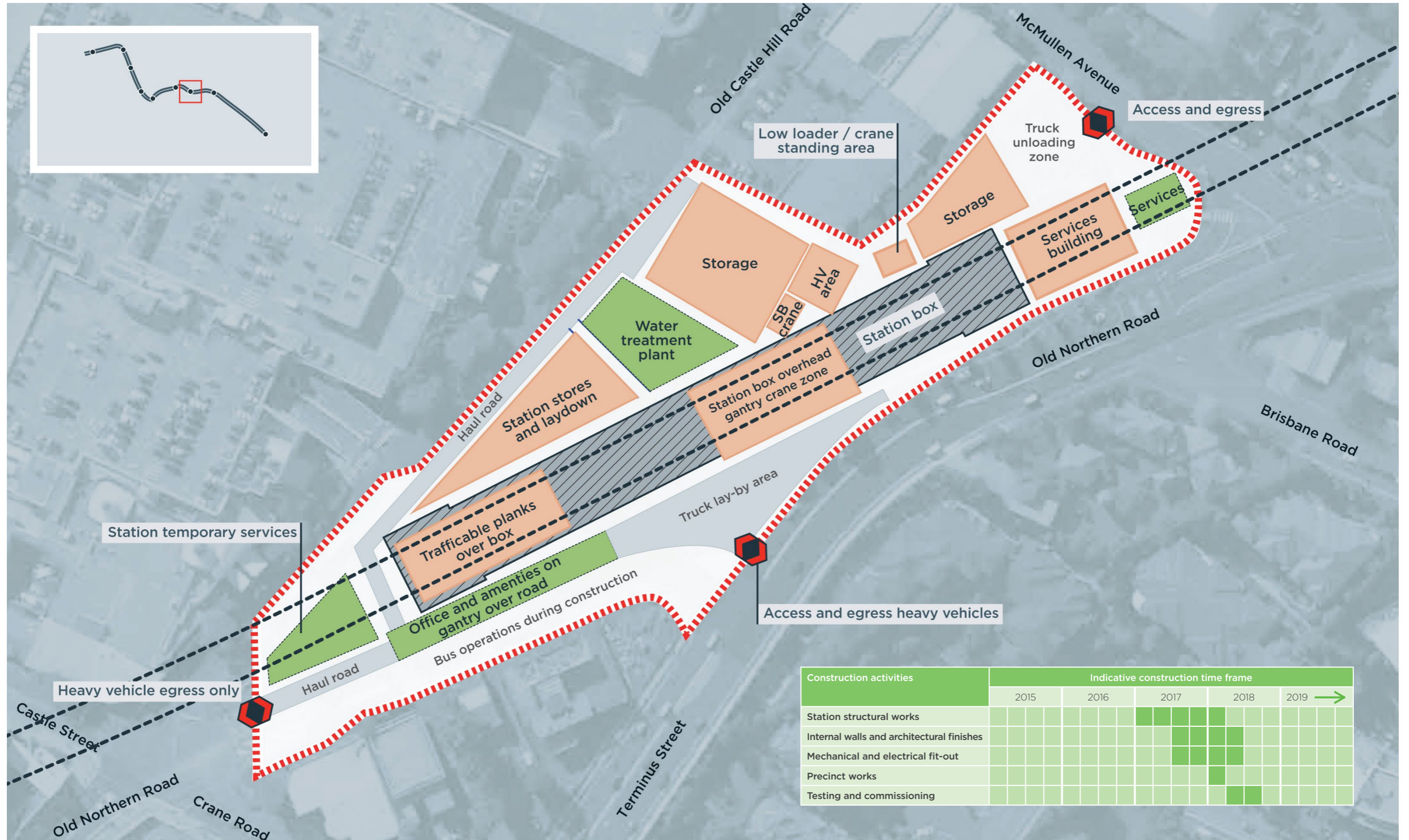


----- Underground - - - - - Above ground - - - - - Above ground (viaduct / bridge)



Castle Hill Station

Castle Hill Station construction site layout



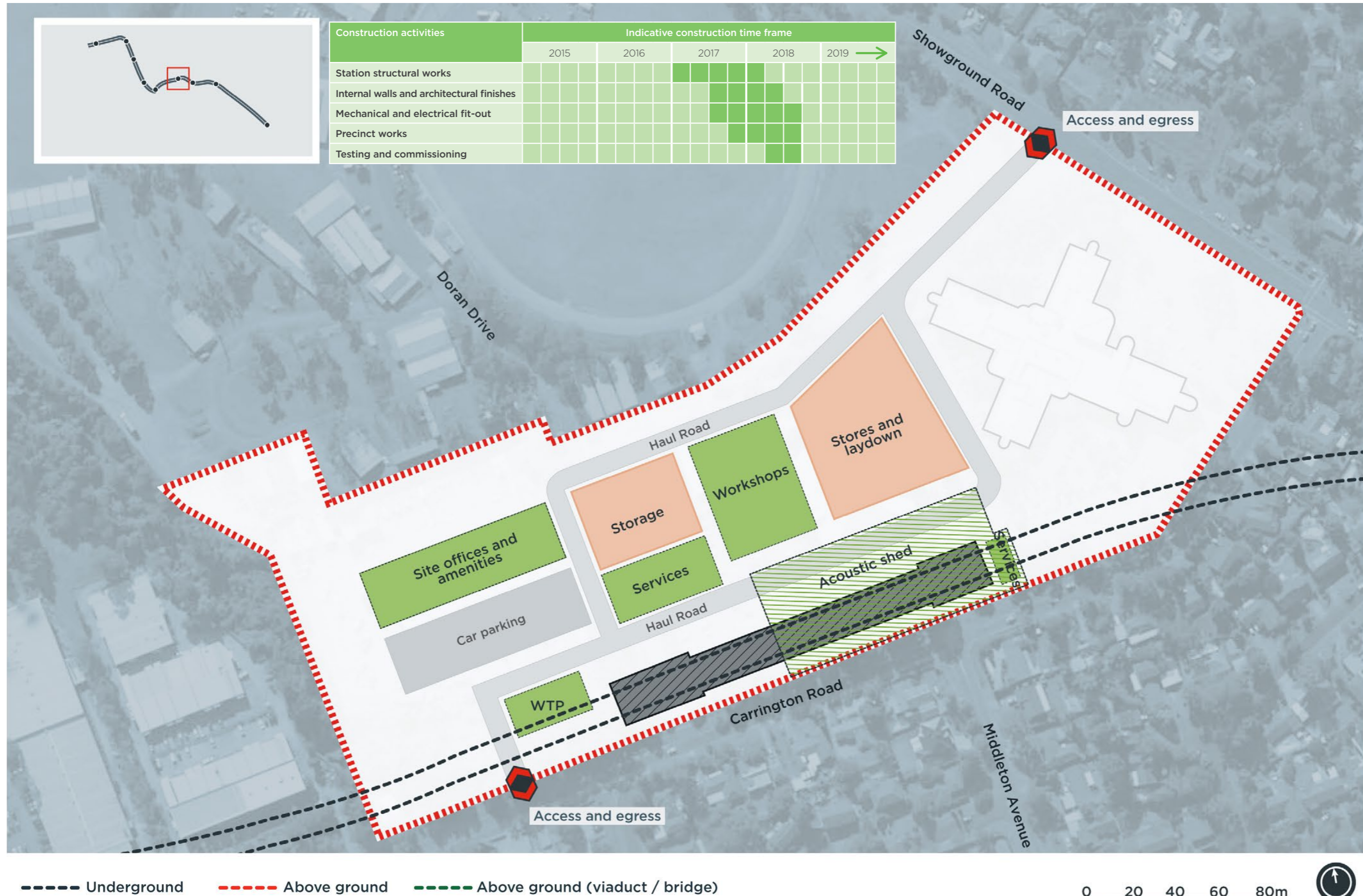
| Construction activities | Indicative construction time frame | | | | |
|---|------------------------------------|------|------|------|--------|
| | 2015 | 2016 | 2017 | 2018 | 2019 → |
| Station structural works | | | | | |
| Internal walls and architectural finishes | | | | | |
| Mechanical and electrical fit-out | | | | | |
| Precinct works | | | | | |
| Testing and commissioning | | | | | |

Underground
 Above ground
 Above ground (viaduct / bridge)



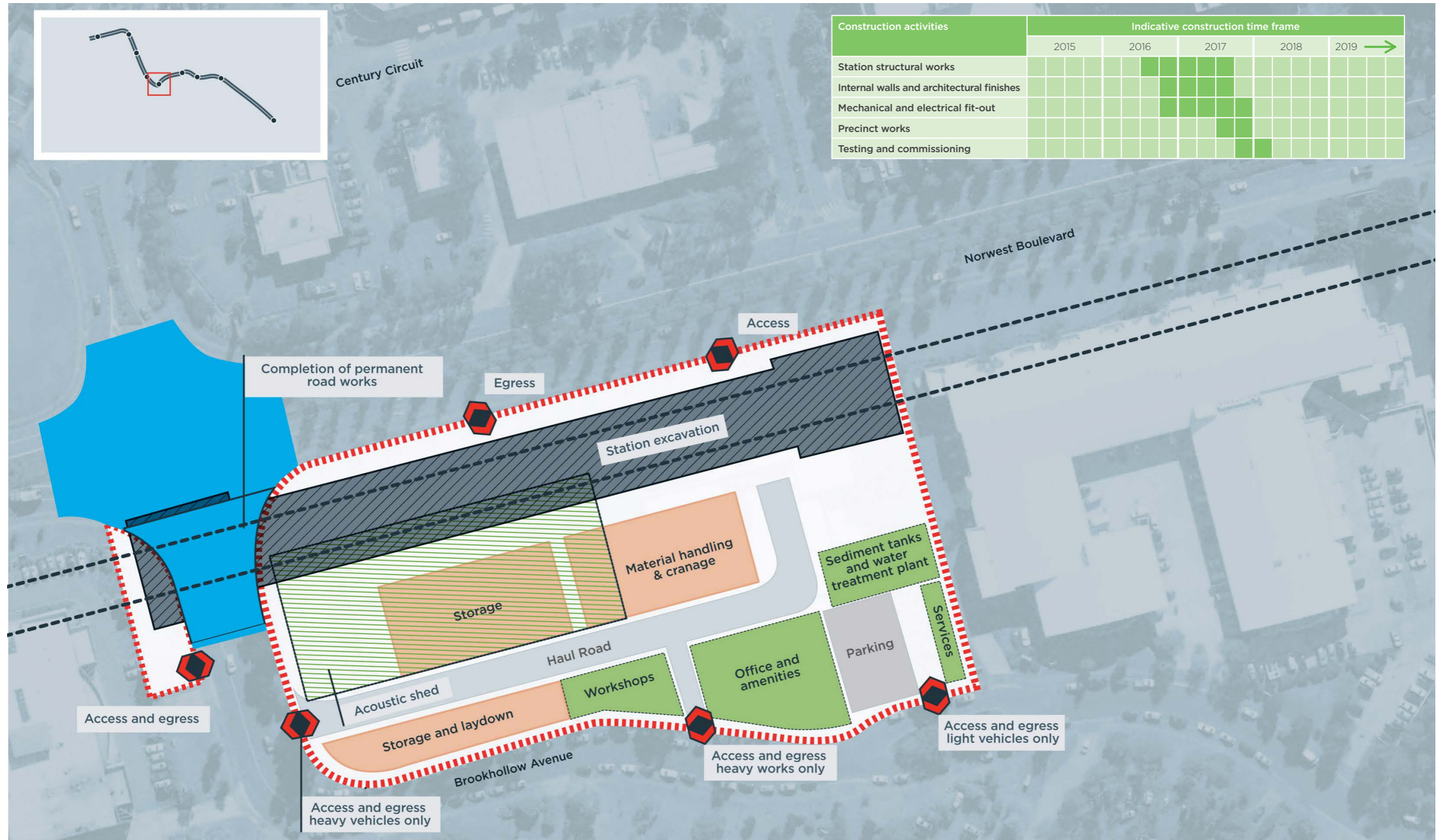
Showground Station

Showground Station construction site layout



Norwest Station

Norwest Station construction site layout

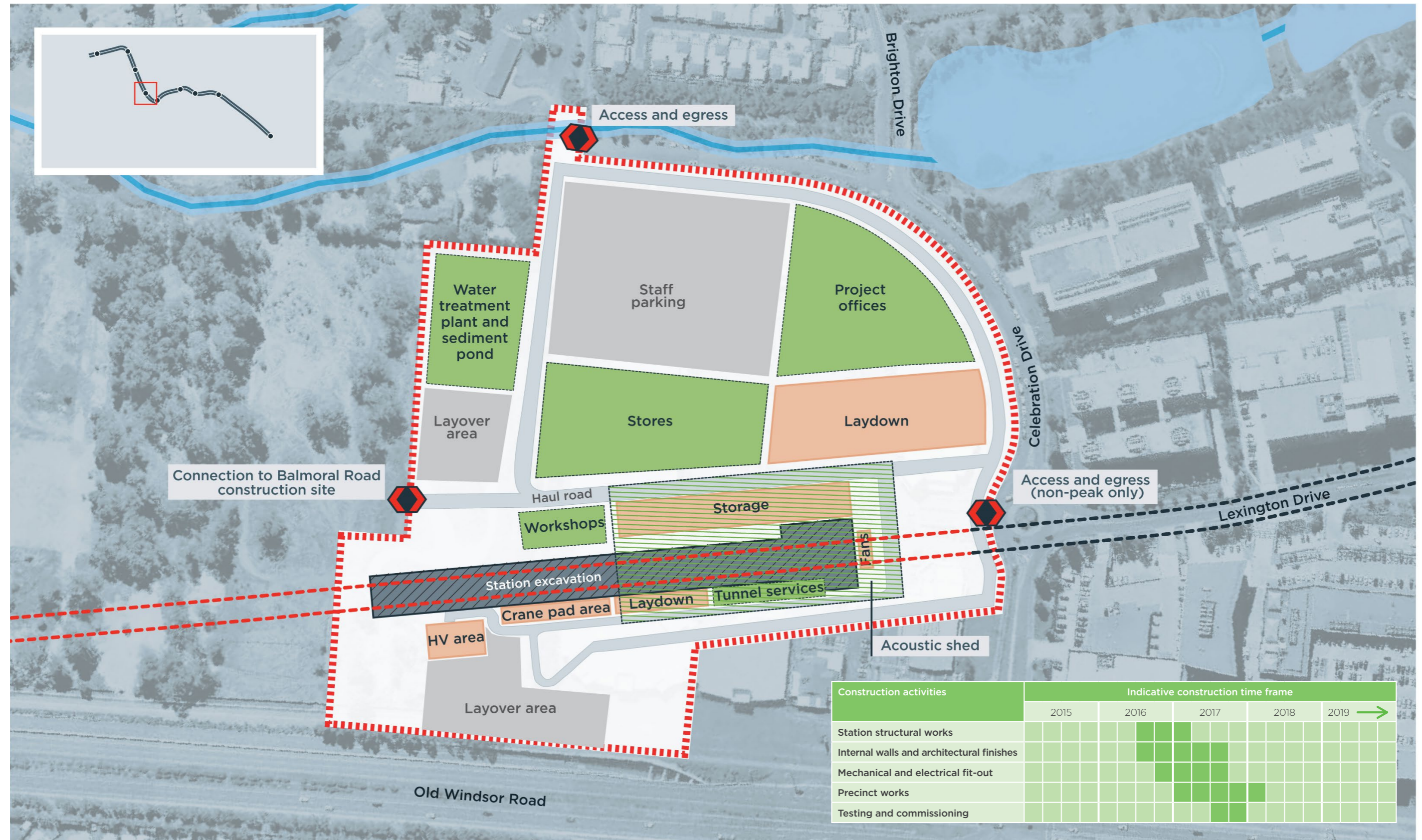


| Construction activities | Indicative construction time frame | | | | |
|---|------------------------------------|------|------|------|--------|
| | 2015 | 2016 | 2017 | 2018 | 2019 → |
| Station structural works | | | | | |
| Internal walls and architectural finishes | | | | | |
| Mechanical and electrical fit-out | | | | | |
| Precinct works | | | | | |
| Testing and commissioning | | | | | |

Underground
 Above ground
 Above ground (viaduct / bridge)



Bella Vista Station construction site layout

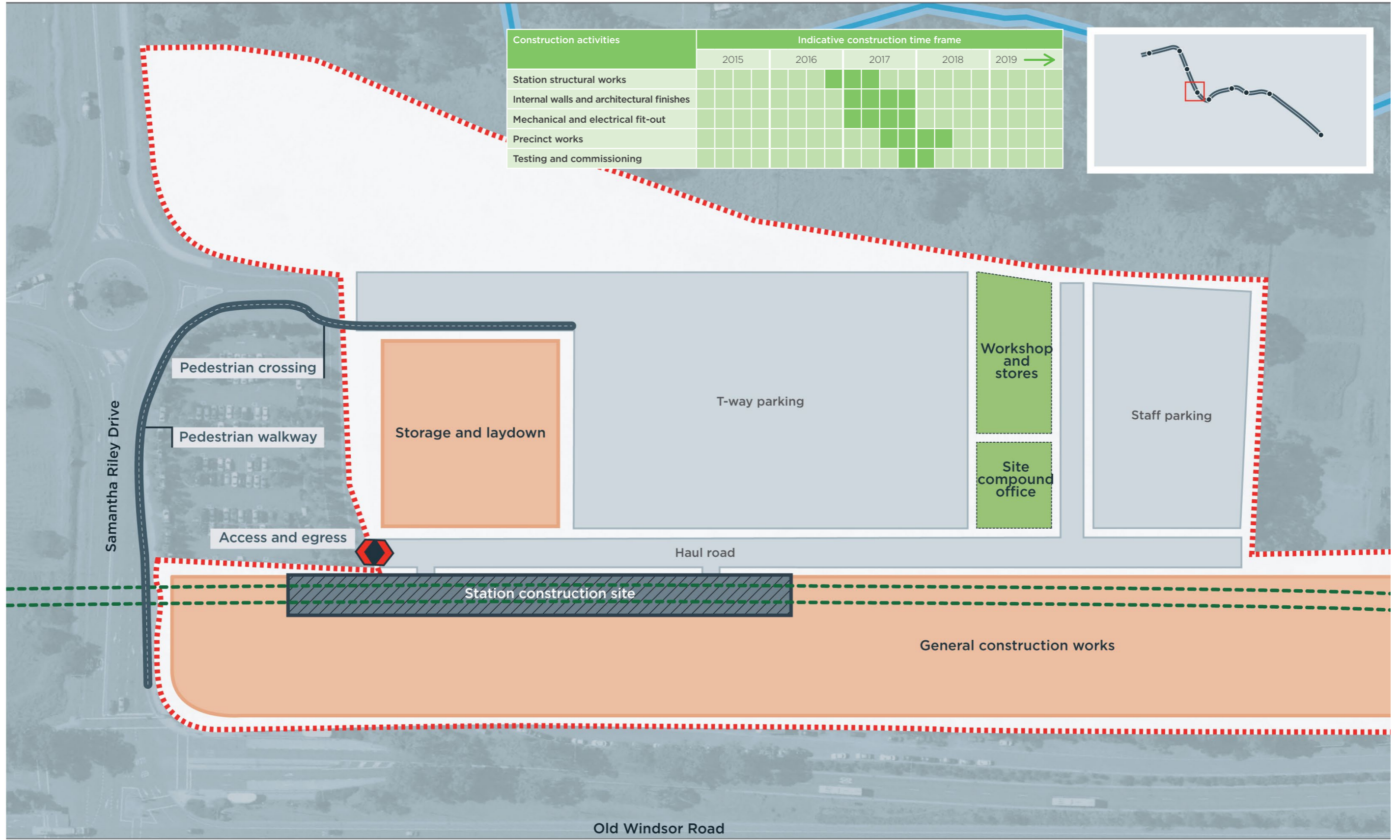


----- Underground - - - - - Above ground - - - - - Above ground (viaduct / bridge)



Kellyville Station

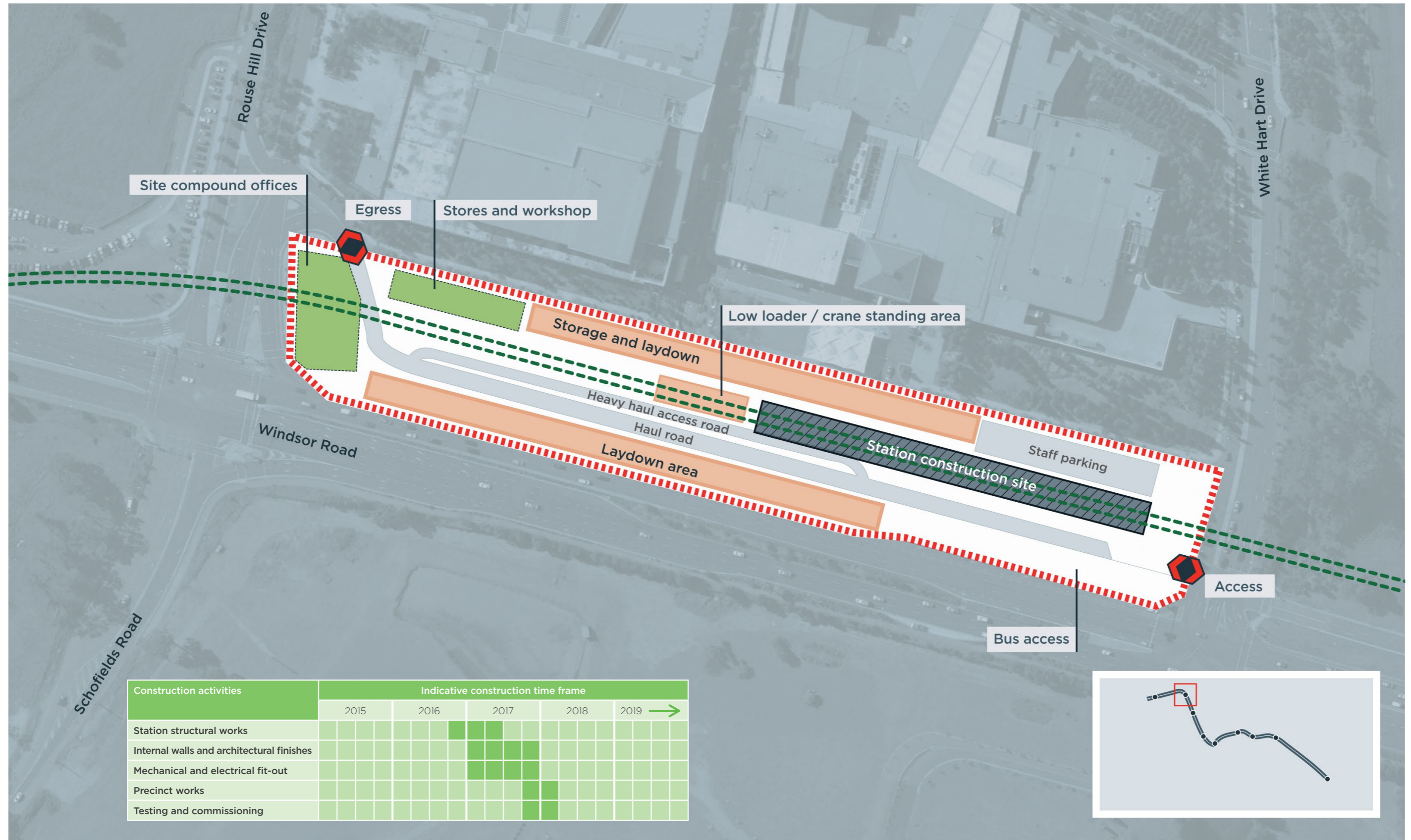
Kellyville Station construction site layout



Underground
 Above ground
 Above ground (viaduct / bridge)



Rouse Hill Station construction site layout

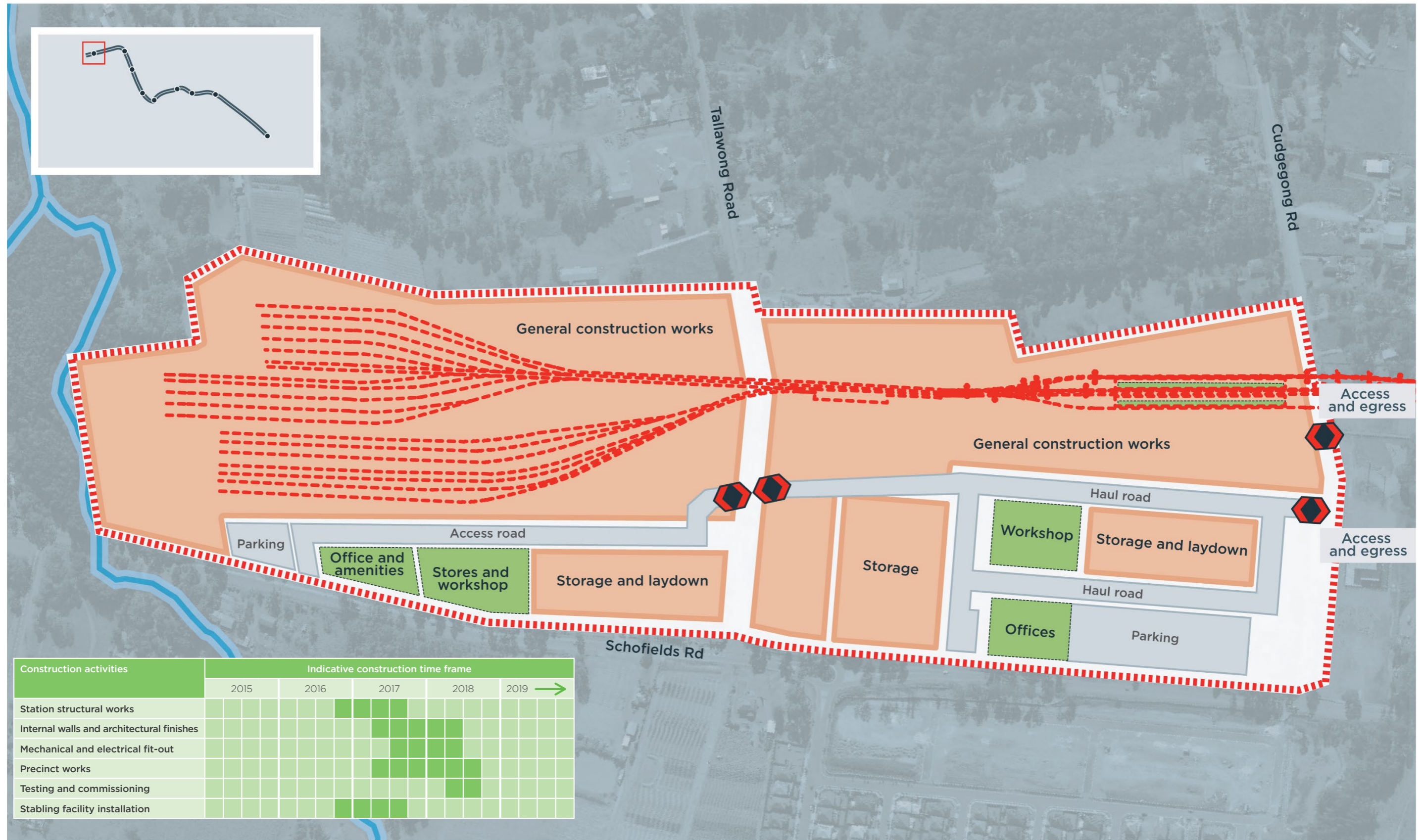


----- Underground
 ----- Above ground
 ----- Above ground (viaduct / bridge)



Cudgegong Road Station and Tallawong Stabling Facility

Concept for Cudgegong Road Station and Tallawong Stabling Facility construction site layout. Actual track layout will be determined as part of detailed design.



| Construction activities | Indicative construction time frame | | | | |
|---|------------------------------------|------|------|------|--------|
| | 2015 | 2016 | 2017 | 2018 | 2019 → |
| Station structural works | | | | | |
| Internal walls and architectural finishes | | | | | |
| Mechanical and electrical fit-out | | | | | |
| Precinct works | | | | | |
| Testing and commissioning | | | | | |
| Stabling facility installation | | | | | |

- - - - Underground
 - - - - Above ground
 - - - - Above ground (viaduct / bridge)





Aerial view, looking towards Cudgegong Road, Rouse Hill

Managing noise and vibration

Construction noise and vibration

Overview

The North West Rail Link is one of the largest transport infrastructure projects ever undertaken in Sydney and a project of this scale will have some noise and vibration impacts during construction.

Work assessed in this Environmental Impact Statement will be concentrated around the stations with some activities required along the alignment and at the Tallawong Stabling Facility.

Computer modelling has shown that potential noise and vibration impacts associated with the Environmental Impact Statement 2 work will be much lower compared with the earlier major civil engineering activities.

Station construction works will typically involve trucks, including concrete trucks and concrete pumps, vibrators, machinery, cranes and hand tools, including:

- Station platform and station buildings;
- Elevator support structures, lifts and fire stairs;
- Concrete support structures including the 'cover' of the underground stations;
- Car parks; and
- Landscaping works.

Rail systems construction will complete the rail line and its support systems. This work will typically involve delivery trucks, machinery, cranes and hand tools, including:

- Tunnel and station ventilation;
- Tunnel fire and safety systems;
- Track formation and track work; and
- Installation of overhead wire systems and cable support.

Stabling facility construction work includes:

- Track formation and track work;
- Installation of overhead wire systems and cable support; and
- Construction of buildings.

Summary of assessment methodology

Construction noise and vibration has been assessed for each of the major worksites and construction activities.

For each worksite, a computer noise model was developed to calculate likely noise and vibration levels. These scenarios are considered representative of the typical worst case impacts for each scenario.

The computer noise model incorporates a comprehensive range of acoustic parameters including:

- Noise from various types of construction plant;
- Location of houses and businesses;
- Three dimensional ground topography;
- Height of noise sources and receivers;
- Noise shielding effects of intervening noise barriers, structures or acoustic sheds; and
- Likely operating patterns and times of construction equipment.

For the station sites, the major civil construction works assessment (Environmental Impact Statement 1) proposed 3 metre high noise barriers around the perimeters of a number of construction sites.

These site perimeter solid timber fences have been assumed to remain in place for the assessments for Environmental Impact Statement 2 works.

Construction traffic noise

The assessment of road traffic noise on public roads addressed noise levels based on existing traffic movements on the local and arterial road network, the typical noise levels associated with heavy vehicle movements and the proposed number of truck movements, particularly during the sensitive night-time period.

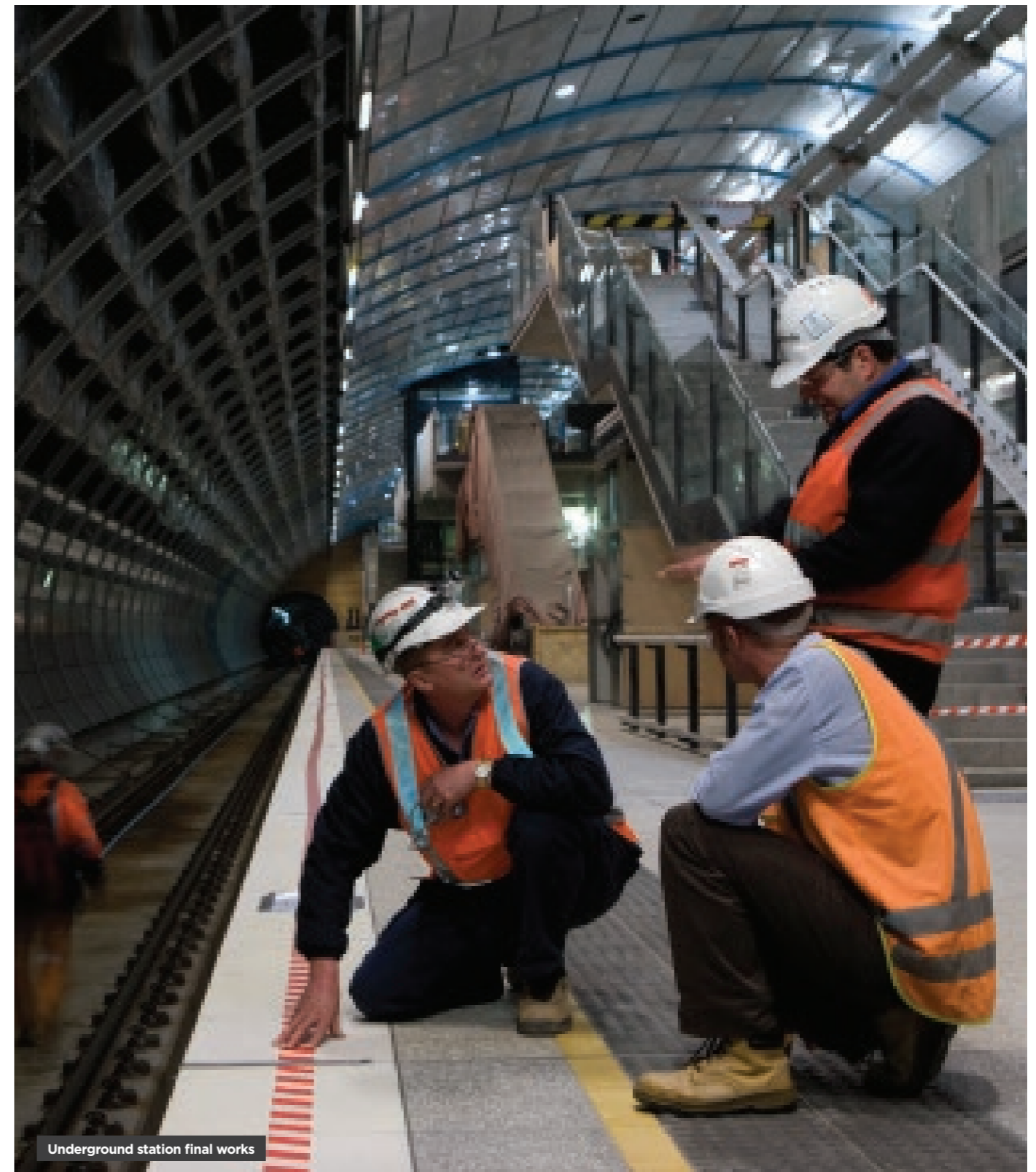
For each construction site and activity, consideration has been given to reducing the potential noise and vibration impacts through the implementation of feasible and reasonable mitigation measures. These measures comprise a three-part approach including:

1. Site specific mitigation measures;
2. Standard mitigation measures to be implemented across all construction sites; and
3. Additional mitigation and management measures to be implemented where the construction noise and vibration levels remain above the noise and vibration management levels.

Environmental Impact Statement 1 detailed noise and vibration associated with major civil engineering works including excavation of the tunnels, excavation of underground railway station, major earthworks and construction of the skytrain.

These major works, including the removal of spoil or excavated material, will have been substantially completed by the time that the work assessed in this second Environmental Impact Statement start.

Please refer to information on page 92 of this document in relation to noise and vibration associated with train operations.



Underground station final works

Summary of construction noise and vibration mitigation measures

| Ref No.* | Mitigation measure | Site |
|----------|--|---------------------|
| NV1 | Noise and vibration mitigation measures described in the Construction Noise and Vibration Strategy would be implemented. | All |
| NV5 | Three metre high noise barriers (site hoardings) around the perimeter of construction sites. | 1 - 3, 5 - 7 and 14 |
| NV6 | Six metre high barriers at Cherrybrook to manage night-time spoil truck movements. | 4 |
| NV7 | Three metre high noise barriers (site hoardings) at Bella Vista Station site on the north and eastern side of the main construction site and to the west of the station box. | 8 |
| NV8 | Attended vibration monitoring would be undertaken at the nearest commercial building during high vibration activities to ensure vibration levels remain below safe limits. | 1 and 5 - 7 |
| NV9 | Attended vibration monitoring would be undertaken at the nearest residential buildings during high vibration activities to ensure vibration levels remain below safe limits. | 1, 3 and 4 |
| NV10 | Noise measurements in the Gold Class cinema complex at Castle Hill during high vibration activities would be undertaken to determine ground-borne noise levels. Depending on the results of this monitoring, discussions would be held with the cinema managers to identify additional feasible and reasonable mitigation measures such as respite period and use of alternative equipment. | 5 |
| NV13 | Night-time truck access at Bella Vista Station site would be via the Celebration Drive roundabout to the south of the site. | 8 |
| NV16 | Noise attenuation measures would be implemented where reasonable and feasible on tunnel ventilation equipment and other items of fixed plant (e.g. pumps, water treatment plant, diesel generators) that would be required to operate on a 24 hour a day, seven days a week basis in support of the underground works (e.g. ventilation fan enclosures and silencers, and additional enclosures and silencers for diesel generating equipment). At each site, the combined noise from this equipment would aim to not exceed the rating background level at nearest residential receivers. | 1-10 |
| NV18 | A site management and / or physical mitigation solution would be implemented at the Epping Services Facility to ensure noise levels from onsite heavy vehicle movements during the night-time period comply with the sleep disturbance criteria. This may include restricting night-time heavy vehicle access from Beecroft Road directly into the acoustic sheds and the establishment of a dedicated unloading bay directly adjacent to Beecroft Road for night-time deliveries. | 1 |

Site 1 - Epping Services Facility, Site 3 - Cheltenham Services Facility, Site 4 - Cherrybrook Station, Site 5 - Castle Hill Station, Site 6 - Showground Station, Site 7 - Norwest Station, Site 8 - Bella Vista Station, Site 9 - Balmoral Road, Site 10 - Memorial Avenue, Site 11 - Kellyville Station, Site 12 - Samantha Riley Drive to Windsor Road, Site 13 - Old Windsor Road to White Hart Drive, Site 14 - Rouse Hill Station, Site 15 - Windsor Road Viaduct, Site 16 - Windsor Road Viaduct to Cudgong Road, Site 17 - Cudgong Road Station and Tallawong Stabling Facility, and Tunnels.

Note: Site 2, Epping Decline was listed in Environmental Impact Statement 1 but subsequently determined to be not required.

*Please use these reference numbers for any enquires or submissions in relation to the project.



Train noise and vibration

Train noise and vibration

This section provides an overview of noise and vibration studies conducted for the operation of trains on the North West Rail Link – together with planned management and mitigation measures. The studies assessed likely noise and vibration:

1. During construction of railway stations and their precincts, laying of rail tracks and installing railway systems;
2. Operating new rapid transit trains between:
 - Rouse Hill and Epping; and
 - Epping and Chatswood.

Environmental Impact Statement 1 assessed noise and vibration topics associated with major civil engineering works including excavation of the tunnels, excavation of underground station boxes, major earthworks and construction of skytrain.

This chapter provides a brief overview of noise and vibration studies for construction and operation of the North West Rail Link – and planned mitigation and management measures.

You can find more detailed assessment and information about noise and vibration – including thorough assessments around station sites and other key areas – in the main volumes of Environmental Impact Statement 2, and its supporting technical papers.

The studies established the existing noise environment, assessed possible noise and vibration and recommended mitigation and management measures.

Key features of noise mitigation and management include:

1. Noise walls a minimum of one metre high along all above-ground sections of the railway line, including the skytrain;
2. Noise and vibration absorbing materials used beneath train lines;
3. Other noise treatments in locations as required;
4. No train horn testing at the stabling facility; and
5. Fixed hoardings erected during heavy civil engineering will remain while further construction work takes place to help mitigate and minimise any construction noise.

Methodology

The main steps involved in the noise and vibration assessment were to:

- Identify existing noise levels using noise measurements at a series of locations along the entire project route;
- Establish noise and vibration objectives and management levels in line with relevant guidelines;
- Assess potential noise and vibration impacts;
- Assess the level and significance of any impacts; and
- Identify ways to mitigate and manage construction noise and vibration.

Before work begins

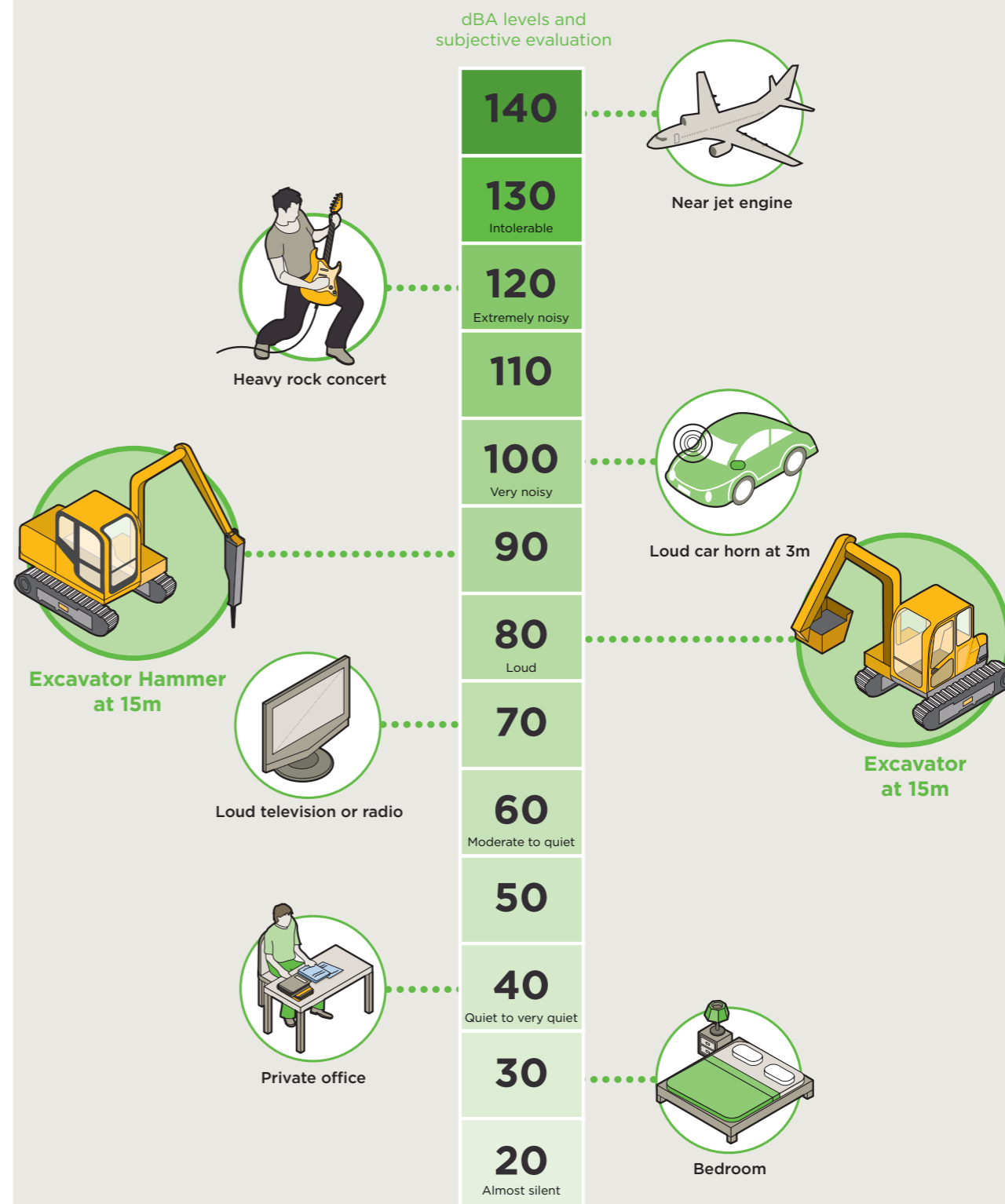
Before construction starts, the successful tenderer must prepare construction noise and vibration impact management plans for each major activity.

These plans outline potential noise and vibration impacts together with mitigation and management measures – and the community consultation process. They must be approved before work starts.

During detailed design, the rapid transit train operator must prepare an operational noise and vibration management plan that identifies mitigation measures and processes to manage noise and vibration.

NOISE LEVEL COMPARISONS

People's perception of noise is strongly influenced by their environment. A noise level that is perceived as loud in one situation may appear quiet in another.



Note:

- A change of 1 dB or 2 dB in the level of a sound is difficult for most people to detect.
- A 3 dB to 5 dB change corresponds to a small but noticeable change in loudness.
- A 10 dB change corresponds to an approximate doubling or halving in loudness.

Existing noise conditions vary along the length of the project and across a wide range of commercial, urban, residential and industrial areas.

Ambient noise measurements were taken at 10 locations along the alignment, supplemented with experts taking measurements to confirm major noise sources.

This information was further supplemented with noise data collected during studies for Environmental Impact Statement 1 and other recent projects, resulting in a total of 25 locations across the project area.

Ambient noise surveys were used to help determine noise criteria at stations, substations, tunnel ventilation systems and the train stabling and maintenance facility.

They also set baseline noise levels to establish construction noise management levels.

For construction, relevant ambient noise was evaluated during:

- Day time (7am to 6pm);
- Evening (6pm to 10pm); and
- Night time (10pm to 7am).

For train operations, day time is defined as 7am to 10pm and night time is defined as 10pm to 7am.

Sensitive receivers

Sensitive receivers were identified through a study of existing and proposed land uses 100 metres either side of the North West Rail Link alignment.

During the noise and vibration studies, all residential areas were considered to be of a sensitive nature.

Other sensitive receivers included commercial outlets, educational facilities, schools, childcare centres, places of worship and hospitals.

Some facilities such as sound recording studios, performance spaces and precision laboratories have an increased sensitivity to noise and vibration.

Above ground train noise

Noise from suburban electric trains is mainly from the rolling contact of steel wheels on steel rails.

Other noise sources on trains such as air conditioning and air compressors are considered insignificant compared with the wheel and rail contact.

Noise assessments for the new rapid transit system were calculated to reflect the fleet of new single-deck trains operating on slab track.

Some key considerations were:

- Trains will run on continuously welded rail – no “clickety clack”;
- The locations of crossovers;
- Any tight curves;
- Track geometry in relation to surrounding terrain; and
- The location of sensitive receivers.

Managing above ground train noise

A one metre high noise barrier will be installed along all areas of above-ground track to suppress train noise.

In addition, the railway tracks both inside tunnels and in open areas will be fitted with devices to minimise noise and vibration from passing trains. (See track diagrams on page 94)

The studies conducted found that noise generated by trains will be below accepted noise levels along most of the route.

However, based on modelling which includes likely noise levels 10 years after the first trains run, there are some areas west of Bella Vista where housing is close to the rail corridor and marginal noise exceedances have been predicted.

These marginal noise level exceedances can be reduced by:

- Design skytrain (shape, materials and track design) to minimise structure-radiated noise in the detailed design stage;
- Use of additional absorptive material, for example to the viaduct deck (only effective in conjunction with reduced structure-radiated noise levels);
- Acceptance of minor exceedances of noise levels at locations where road traffic noise dominates; and
- Property treatments, both in the design and construction phases.

Noise mitigation strategies

Noise mitigation strategies could include:

- One metre high noise barriers at all above-ground locations (except where the track is in cutting);
- On both sides of the line near the OK Caravan Park at Rouse Hill, the noise barrier will be two metres high; and
- Rail dampers will be installed on surface track between Kellyville Station and Cudgegong Road Station, except in the immediate vicinity of the stations where lower speeds mean there would be no benefit.

It may be possible to further reduce noise levels between Kellyville and Rouse Hill stations by managing train speeds. The benefits of this option will be considered against operational consequences.

Train noise and vibration mitigation measures

| Ref No.* | Mitigation measure | Site |
|----------|--|---|
| OpNV1 | Implementation of feasible and reasonable noise and vibration mitigation such as: <ul style="list-style-type: none"> - One metre high noise barriers with absorptive facing provided between Bella Vista Station and Cudgegong Road Station, except where the track is in cutting. - For the viaduct section, noise barriers located on the outer edge of both sides of the structure. - For the surface track, noise barriers positioned as close as possible to the train taking into account access and safety requirements. | Bella Vista Station to Cudgegong Road Station |
| OpNV2 | Implementation of feasible and reasonable noise and vibration mitigation measures such as two-metre high noise barrier with absorptive facing provided on the track side adjacent to the OK Caravan Park. Noise barriers positioned as close as possible to the train taking into account access and safety requirements. | Rouse Hill Station to Cudgegong Road Station |
| OpNV3 | Implementation of feasible and reasonable noise and vibration mitigation measures such as rail dampers between Kellyville Station and Cudgegong Road Station, except in the immediate vicinity of stations where train speeds are lower. | Kellyville Station to Cudgegong Road Station |
| OpNV4 | Implementation of feasible and reasonable noise and vibration mitigation measures such as resilient rail fasteners on the viaduct and rail bridges. | Viaduct and bridges |
| OpNV5 | During detailed design, options will be investigated to reduce airborne noise along the viaduct and surface track sections where exceedances have been predicted. | Bella Vista to Cudgegong Road |
| OpNV6 | Implementation of feasible and reasonable noise and vibration mitigation measures such as investigating the option of managing train speeds between Kellyville Station and Rouse Hill Station. The investigation would consider factors such as the impact to journey time and the existing noise exposure from road traffic. | Kellyville Station to Rouse Hill Station |
| OpNV7 | Implementation of feasible and reasonable noise and vibration mitigation measures such as standard, high and very high track attenuation provided through the tunnel section. | Tunnels |
| OpNV8 | The implementation of feasible and reasonable noise and vibration mitigation measures such as the design of the sheds and equipment for the train wash and wheel lathe to include noise mitigation. | Tallowong Stabling Facility |
| OpNV9 | The implementation of feasible and reasonable noise and vibration mitigation measures such as investigating the option to incorporate silencers in the compressed air lines of the trains to reduce noise associated with brake testing. | Tallowong Stabling Facility |
| OpNV10 | The implementation of feasible and reasonable noise and vibration mitigation measures such as investigating during procurement methods to minimise train stock auxiliary noise levels. | Tallowong Stabling Facility |
| OpNV11 | The implementation of feasible and reasonable noise and vibration mitigation measures such as noise sources at stations like PA systems, air conditioners, substations and mechanical plant designed to meet noise criteria. | Stations |
| OpNV12 | The implementation of feasible and reasonable noise and vibration mitigation measures such as options during detailed design to reduce noise impacts from the car parks at Cherrybrook and Showground. | Cherrybrook and Showground Stations |
| OpNV13 | A detailed assessment of the road traffic noise impacts, including identification of preferred mitigation measures for station access roads at Cherrybrook and Kellyville during detailed design. | Cherrybrook and Kellyville Stations |

*Please use these reference numbers for any enquires or submissions in relation to the project.

Train noise and vibration

Train noise and vibration in tunnels

Train noise and vibration in tunnels is generated by dynamic forces at the interface of the rail and train wheels and might be transmitted into buildings by the tunnel structure and intervening ground.

Studies assessed the potential for train ground-borne noise and vibration for the tunnels between Epping and Bella Vista and computer models were developed to predict likely outcomes for buildings above or close to the tunnels.

The modelling took into account:

- Vibration generated by trains already running in a similar railway tunnel (Epping to Chatswood line);
- Proposed track design and operating speeds;
- Ground characteristics;
- Tunnel depth; and
- Typical building characteristics.

Ground-borne noise and vibration measurements were used to validate and refine the model.

As part of the modelling, train vibration levels were assumed to be equivalent to Waratah trains, the most modern trains currently operating on the Sydney network. This assumption is conservative because rapid transit, single-deck passenger trains are likely to weigh less compared with Waratah trains, resulting in marginally lower vibration levels.

Reducing or mitigating ground-borne noise and vibration in buildings near railway lines can be achieved through track design and by initiatives like inserting a rubber layer between the rail and tunnel base.

The rubber layer may take the form of resilient rail fasteners, booted sleepers, floating slab track or a combination of approaches.

The following three track form options were evaluated:

- **Standard attenuation track** – incorporating hard resilient base plates. This is standard specification for the project and will be used in areas with low sensitivity to ground-borne noise and vibration impacts, or where the diagonal distance between the track and housing is approximately 25 metres or more.
- **High attenuation track** – incorporating medium resilient base plates. This will be used in sensitive areas where the standard track is not sufficient and a higher performance track is required.
- **Very high attenuation track** – incorporating soft resilient base plates or floating slab track. This would only be required in very sensitive areas where the tunnel depth is particularly shallow.

Computer modelling was used to investigate ground-borne noise and vibration levels and to identify the type of track forms (or level of attenuation) needed along the tunnels.

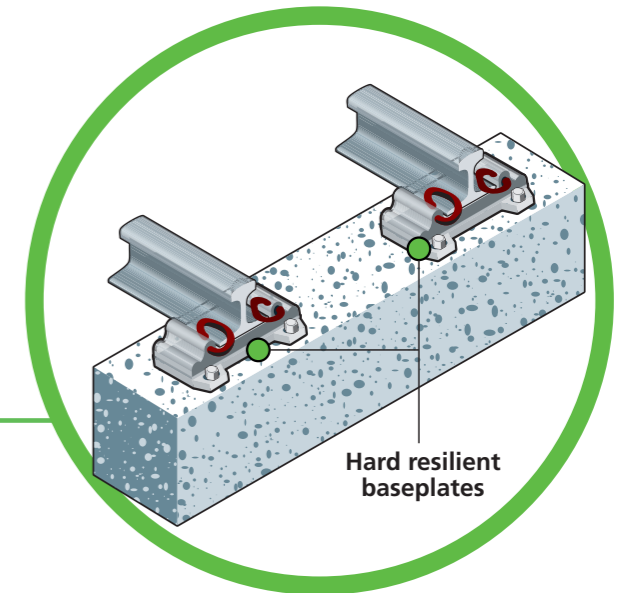
The noise and vibration assessment has shown that the rail line will be compliant in all residential areas using different types of track in different areas. For the majority of the tunnels (89 per cent), standard attenuation track will be sufficient, and the remainder of the tunnel sections will be fitted with high attenuation or very high attenuation track.

For all above ground sections from Bella Vista to Cudgegong Road, the distance from tracks to homes and businesses is sufficient to ensure any ground-borne vibration impacts are negligible.

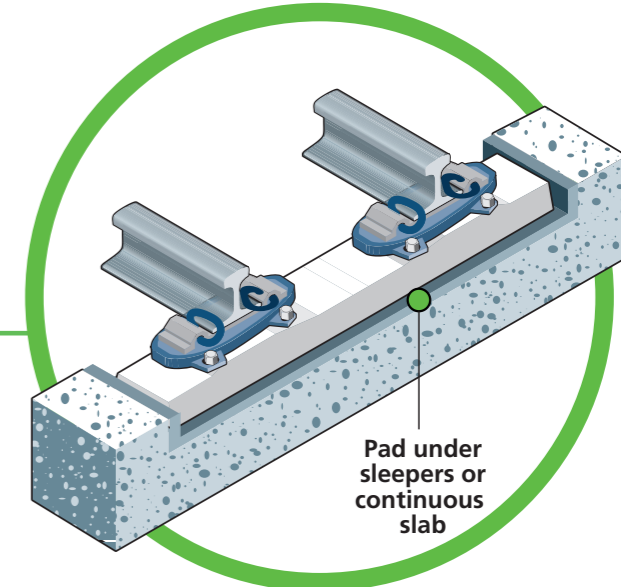
NOISE REDUCTION

The following three track form options were evaluated:

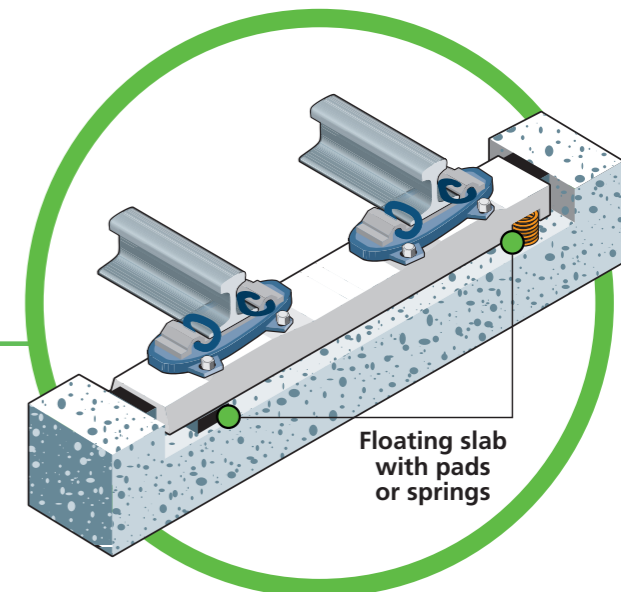
Standard attenuation track – incorporating hard resilient base plates. This is standard specification for the project and will be used in areas with low sensitivity to ground-borne noise and vibration impacts, or where the diagonal distance between the track and housing is approximately 25 metres or more.



High attenuation track – incorporating medium resilient base plates. This will be used in sensitive areas where the standard track is not sufficient and a higher performance track is required.



Very high attenuation track – incorporating soft resilient base plates or floating slab track. This would only be required in very sensitive areas where the tunnel depth is particularly shallow.



Note: Diagrams are indicative only

Proposed track form in tunnels



— - Standard Attenuation — - High Attenuation — - Very High Attenuation — - Cross-over — - Surface Track

Train noise and vibration

Stabling facility noise

At opening, the Tallawong Stabling Facility will have capacity for 20 trains.

A summary of operational noise goals for the facility is provided below. These goals have been determined from estimated background noise around the time of opening.

Stabling and maintenance activities

Likely train stabling activities is based on typical requirements for modern trains.

Arriving trains

Train movements inside the facility would be at low speed and noise would be created by on-board equipment (such as compressors and air-conditioners) rather than wheel-rail noise.

As trains enter the stabling facility, a number of activities occur:

- Once the train comes to a stop, the brakes are applied by exhausting the brake pipe and the parking brake is engaged;
- Exhausting the brake pipe releases compressed air, causing peak noise levels of short duration. The air typically exhausts from underneath the train at the end carriages; and
- After the parking brake is applied, trains would be stabled with all auxiliary equipment shut down, as is typical with modern rapid transit trains. These trains can be shut down in a few minutes.

Most train maintenance will take place inside the maintenance facility.

While stabled, train interiors are cleaned. Train cleaning does not involve external noise and would not contribute significantly to noise emissions in the surrounding community.

Within the stabling facility, trains will enter an enclosed train wash, passing through at walking pace over a few minutes. Design of the maintenance shed and washing equipment will include noise mitigation.

There will be a separate wheel lathe inside a shed designed to include noise mitigation. The wheel lathe will be used to remove wheel defects and restore wheels to the correct profile. Trains would pass through the facility and stop at the required location during wheel lathe operations.

Departing trains

Trains need to undergo safety checks before entering service.

These include testing of the braking systems, normally by compressed air being exhausted from the brake pipe, generating peak noise levels of short duration.

Prior to the train departing, all auxiliary equipment operates for up to 30 minutes. This includes air-conditioning, air compressors and static inverters.

There will be no testing of train horns. If required, an alternative warning system will be used to alert staff of moving trains inside the stabling and maintenance facility.

Train stabling facility noise modelling

The approach to modelling stabling facility noise was first to assess noise impacts with no specific noise mitigation, apart from shielding provided by the proposed site buildings, natural terrain and site earthworks (the stabling facility is partially located in a cutting).

This base case was assessed against both opening and future capacity scenarios.

Where exceedances of the noise criteria were identified, reasonable and feasible noise mitigation measures were considered.

Brake test noise was modelled as individual noise events for assessment against accepted sleep disturbance screening criteria.

The modelling concluded that while noise associated with brake testing may be noticeable at the nearest home sites, the likelihood of potential sleep disturbance is low.

Proposed noise mitigation measures include limiting the source noise levels of the trains – with new rapid transit trains, it may be possible to incorporate silencers in the air lines to reduce noise associated with brake testing.

Other noise mitigation measures include designing maintenance buildings to contain noise and implementing operational procedures to minimise noise impacts.

Further detailed assessment of the potential noise impacts will take place during detailed design.

Specific noise mitigation measures in the form of noise barriers or earth mounding are not proposed for the stabling facility.

Stations, facilities, roads and car parks

Potential noise around stations from public address systems, car parks and equipment including tunnel ventilation systems has been assessed.

Mitigation measures are likely to be required for some station and tunnel ventilation equipment.

These mitigation measures include appropriate equipment selection, noise barriers, acoustic enclosures and the strategic positioning of plant and equipment away from homes and businesses.

Stations

For the stations, the main source of noise is likely to be announcements over the public address (PA) system.

Station PA noise can be managed through appropriate loudspeaker selection and placement, as well as ambient noise sensing microphones that automatically reduce the volume during times with lower ambient noise levels, such as at night.

Other noise sources such as air conditioning, substations and mechanical plant will be designed to meet standard criteria.

Fresh air ventilation shafts and Intermediate Services Facility

Train noise break-out through the fresh air ventilation shafts (at underground stations) is not expected to exceed accepted noise level criteria.

In-duct noise attenuation is likely to be used at underground stations to meet applicable noise limits.

The Cheltenham Services Facility will be used for emergency access only. As there will be no tunnel ventilation at this site during operation, no noise and vibration impacts are predicted.

Car parks

Noise from car parks has been assessed and in most cases is predicted to comply with noise criteria. If the following noise mitigation and management measures are applied at Cherrybrook Station and Showground Station, the operation of these two stations will also comply.

At Cherrybrook Station, two car parks are proposed: one above the south-east end of the station, and a second ground level car park in the east corner of the station area.

Noise associated with the car parks is predicted to meet noise criteria at nearby residences on Castle Hill Road without the need for specific noise mitigation measures.

For the proposed ground level car park, specific noise mitigation measures may be required, including noise barriers along the north-east boundary or closing this car park at night.

At Showground Station, a three level car park is proposed in the south-west corner of the station precinct, alongside Carrington Road.

During the night, noise level exceedances at the nearest two homes could be mitigated by enclosing the car park at the south-east corner or installing sound absorptive panels on the roof of each car park level near the south end.

Rapid transit between Epping and Chatswood

As part of the Sydney's Rail Future, rapid transit trains will operate along the new North West Rail Link and continue on the existing Epping to Chatswood line.

In relation to potential noise and vibration assessments, rapid transit operations would mean more trains compared with the existing timetable – 12 trains an hour compared to the current four.

Trains may also run at higher speeds – up to 100 km/h where possible – compared with the current maximum speed of 80 km/h.

The noise and vibration assessment considered the original approval conditions for the Epping to Chatswood project and how noise and vibration levels might change.

Surface track at Chatswood

For the surface track between Chatswood Station and the tunnel portals, night-time noise levels are expected to remain relatively unchanged as a result of rapid transit operations.

If maximum train speeds are increased from 80 km/h to 90 km/h on this comparatively short section of track, the change in maximum noise levels from individual trains passing by is not likely to be noticeable at the nearest residences.

Potential ground-borne noise and vibration impacts above tunnels between Epping and Chatswood

The assessment concluded it is unlikely that higher speed single deck train operations within the Epping to Chatswood tunnels would result in a noticeable increase in ground-borne noise and vibration levels above the tunnels.

For the tunnels between Epping and Chatswood, rapid transit operations would result in a more frequent single deck train service, with trains potentially travelling at higher speeds of up to 100 km/h.

The increase in ground-borne noise and vibration is estimated to be approximately 2 dB at locations where the maximum train speed increases from 80 km/h to 100 km/h.

A change of 1 dB or 2 dB in maximum noise or vibration level is difficult for most people to detect.

In relation to the ground-borne noise and vibration criteria which formed part of the approval to build the Epping to Chatswood rail line, the expert assessment noted that compliance with the original criteria has been achieved at all locations.

(Apart from one complaint received in 2009 – shortly after project opening – no other complaints have been received about ground-borne noise and vibration from trains in these tunnels.)



Artist's impression, underground station

Have your say

Next steps

The Environmental Impact Statement will be exhibited for at least 30 days.

During this time, you are invited to make a written submission to the Director-General of the Department of Planning and Infrastructure on any topic relating to the assessment.

All submissions will be documented and considered by Transport for NSW as part of a submissions report.

The Director-General will prepare an assessment report to advise the Minister for Planning and Infrastructure's consideration of the application.

The Minister for Planning and Infrastructure will then decide whether or not to approve the carrying out of the project.

Community information sessions

The project team has organised a series of community information sessions where displays and information about the proposals contained in Environmental Impact Statement 2 will be available.

You are invited to attend these sessions and meet expert members of the project team who will be happy to answer any questions you may have.

There is no need to make an appointment.

| Date | Venue |
|-------------------------------------|---|
| Thursday 8 November 4pm-8pm | Crowne Plaza Norwest, 1 Columbia Court, Baulkham Hills |
| Saturday 10 November 10am-2pm | Cherrybrook Uniting Church, 134 New Line Road, Cherrybrook |
| Thursday 15 November 4pm-8pm | North West Rail Link, Community Information Centre, 299 Old Northern Road, (corner of Crane Road), Castle Hill |
| Saturday 17 November 10am-2pm | Rouse Hill Town Centre, Level 1, Link Lane, off Main Street, Rouse Hill |
| Thursday 22 November 4pm-8pm | Epping Club, 45-47 Rawson Street, Epping |

Information about Environmental Impact Statement 2 is also available at the North West Rail Link Community Information Centre, 299 Old Northern Road (corner of Crane Road and opposite Castle Towers), Castle Hill.

You can also visit the project website www.northwestrail.com.au and take part in interactive forums about aspects of the project.

Environmental Impact Statement 2 - Have your say

There is no set format on how to make a submission.

Your submission must reach the **Department of Planning and Infrastructure** by **December 3** and must include:

1. Your name and address;
2. The name of your application;
3. The application number (SSI-5414);
4. A brief statement on whether you support or object to the proposal; and
5. The reasons why you support or object to the proposal.

Your submission should be marked "**Attention: Director, Infrastructure Projects**" and can be:

- Emailed to plan_comment@planning.nsw.gov.au
- Website via www.majorprojects.planning.nsw.gov.au
- Faxed to (02) 9228 6355
- Posted to **Major Projects Assessment, Department of Planning and Infrastructure, GPO Box 39, Sydney, NSW 2001.**

People lodging submissions must declare reportable political donations (including donations of \$1,000 or more) made in the previous two years.

Under section 1152(5) of the *Environmental Planning and Assessment Act, 1979*, the Director-General may provide copies of submissions received during the exhibition, or a summary of the submissions, to the Proponent.

It is the Department of Planning and Infrastructure's policy to also place a copy of your submission on their website. If you do not want your name made available to the proponent, or on the Department's website, please clearly state this in your submission.

Place managers

The North West Rail Link has appointed Place Managers to act as the single, direct point of contact between directly affected members of the community and the project team.

| Stations/locations | Place manager | Email address | Mobile number |
|---|------------------|---------------------------------------|---------------|
| Rouse Hill, Cudgegong Road, Kellyville, Bella Vista | Faye Rescigno | Faye.Rescigno@transport.nsw.gov.au | 0478 407 154 |
| Norwest, Showground, Castle Hill | Katherine Martin | Katherine.Martin@transport.nsw.gov.au | 0478 407 155 |
| Cherrybrook, Cheltenham, Epping | Cecilia Densham | Cecilia.Densham@transport.nsw.gov.au | 0478 407 152 |
| Early Works | Moira Sharp | Moira.Sharp@transport.nsw.gov.au | 0403 529 081 |

| Project status | |
|--|---|
| Long-term Government commitment to the project | ✓ |
| Dedicated multi-disciplinary project team established | ✓ |
| Funding allocated: State Government committed to fully funding project | ✓ |
| Key part of a long-term plan to transform Sydney's rail network | ✓ |
| Community engagement and support | ✓ |
| Positive industry engagement process over last 12 months | ✓ |
| Overall delivery strategy confirmed - formal procurement underway | ✓ |
| Planning approval processes well advanced | ✓ |
| Early construction works managing contractor appointed | ✓ |
| Tunnels and stations civil works contract, three companies shortlisted to tender | ✓ |
| The skytrain contract tender process started | ✓ |
| Operations, trains and systems contract registration of interest started | ✓ |
| Environmental Impact Statement 1 - approved | ✓ |
| Environmental Impact Statement 2 - on display | ✓ |
| On program for tunnel boring machines in ground by end 2014 | ✓ |



KELLYVILLE

NEXT TRAIN 1 MINUTE
SYDNEY SUNNY 21°C 7:57AM

Artist's impression, Kellyville Station

Key Contacts:

Phone: 1800 019 989

Web: www.northwestrail.com.au

Email: info@northwestrail.com.au

Disclaimer: Information in this document has been prepared in good faith and is correct at the time of printing. Please refer to project website for updates.