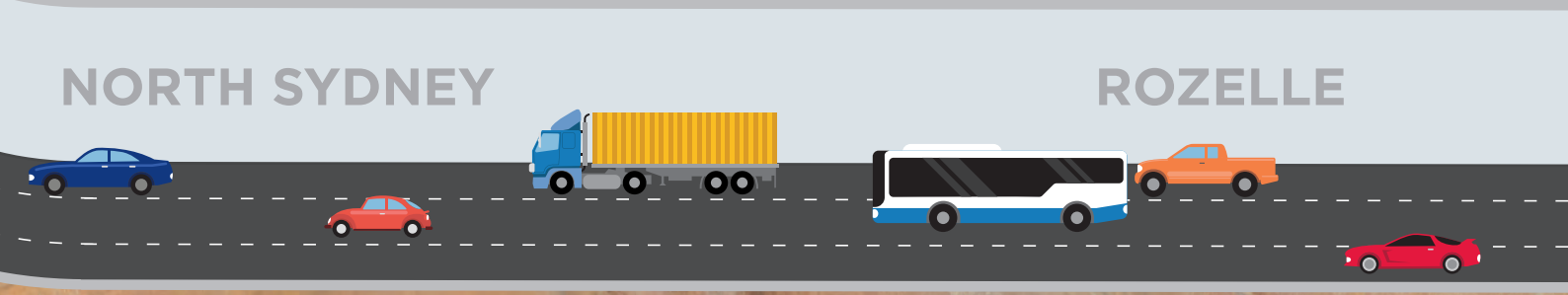
Western Harbour Tunnel and Warringah Freeway Upgrade

Your guide to the Environmental Impact Statement

January 2020



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About this document

The Western Harbour Tunnel and Warringah Freeway Upgrade Environmental Impact Statement (EIS) is now on public exhibition. The EIS assesses the expected impacts of the construction and operation of this project including, environmental and social impacts, proposed locations for construction sites, truck movements and how we are managing the potential impacts to local flora and fauna.

We understand people are short on time, so we have created this handy guide to accompany the full EIS. We have included information on the project's design, potential impacts from building and operating the project and the measures we will put in place to manage these impacts.

We encourage you to visit our online interactive portal nswroads.work/whtportal, to see maps, videos and more. The online portal will also provide you links through to the chapters and technical papers included in the EIS.

We thank you for all the feedback you have provided so far. It has made a real difference to this project. We encourage you to submit your thoughts on the EIS via the Department of Planning, Industry and Environment (DPIE) to ensure our project delivers an outcome which balances the needs of motorists and commuters with those of our local communities.

Please note: The potential environmental impacts and mitigation measures are described in more detail in the Western Harbour Tunnel and Warringah Freeway Upgrade EIS and technical working papers. You can view these documents on DPIE's website www.planningportal.nsw.gov.au/major-projects/project/10451. Please ensure you make your submissions to DPIE directly on the EIS and not this document, which provides a summary only.

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Sydney Harbour Bridge and North Sydney

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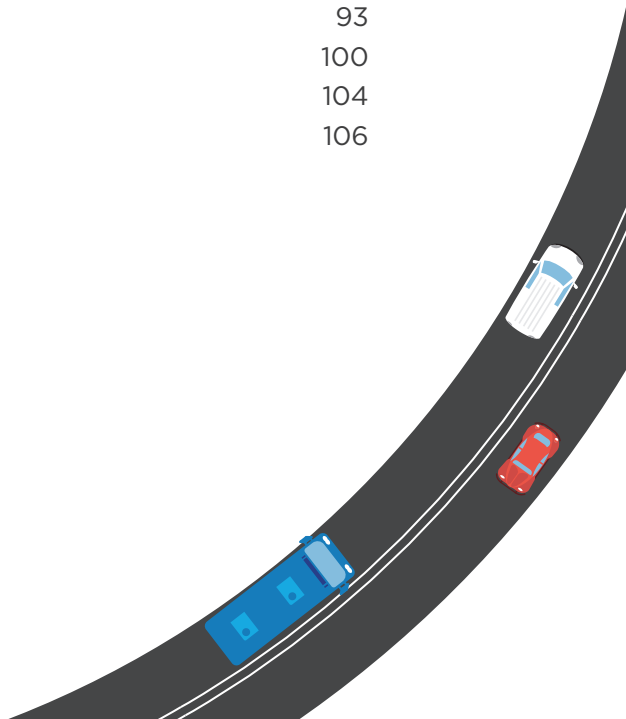


Sydney Harbour from Rozelle

Section 1

About the Western Harbour Tunnel and Warringah Freeway Upgrade

Locals in Cammeray CBD, Sydney

Sydney's future

The NSW Government's vision for Sydney is one of an integrated road and public transport network that gives you the freedom to choose how and when you get around, no matter where you live and work.

One area of focus in Sydney is to complete the missing links in the motorway network to support the growth of our communities, places and economy, and enable people and goods to move safely and reliably around our city and beyond.

We know Sydney traffic can be frustrating, especially in peak hour. The Western Harbour Tunnel and Warringah Freeway Upgrade will change the way you travel across Sydney Harbour. This project will get you to places faster by improving capacity and providing new direct routes and reliability on both sides of the harbour.

This much needed new crossing of Sydney Harbour will be a game changer for our city. You will save time on your journeys and enjoy more direct bus routes between the Inner West, Sydney and North Sydney, with seamless connections to the future Sydney Metro and Sydney Trains.

We would like to sincerely thank all the local community, businesses and industry who have taken the time to meet with us to share their views on this city shaping project. Your feedback has been valuable in helping us understand what is important to you, and in delivering positive changes to the design.

We are now exhibiting the Environmental Impact Statement (EIS) and are seeking your important feedback to help us continue to shape this iconic project.

Future Transport 2056

Transport for NSW's *Future Transport Strategy 2056* provides a 40-year vision, direction and framework for customer mobility in NSW, which will guide transport investment over the longer term. The Strategy is the first transport plan in Australia to harness technology to improve customer and network outcomes, and it starts with a long term vision for our communities. We have aligned how we plan the future of the transport network with how Transport for NSW plans land usage by working closely with key stakeholders such as the Greater Sydney Commission, Infrastructure NSW and DPIE.

The Strategy focuses on the role of transport in delivering movement and place outcomes that support the character of the places and communities we want for the future.

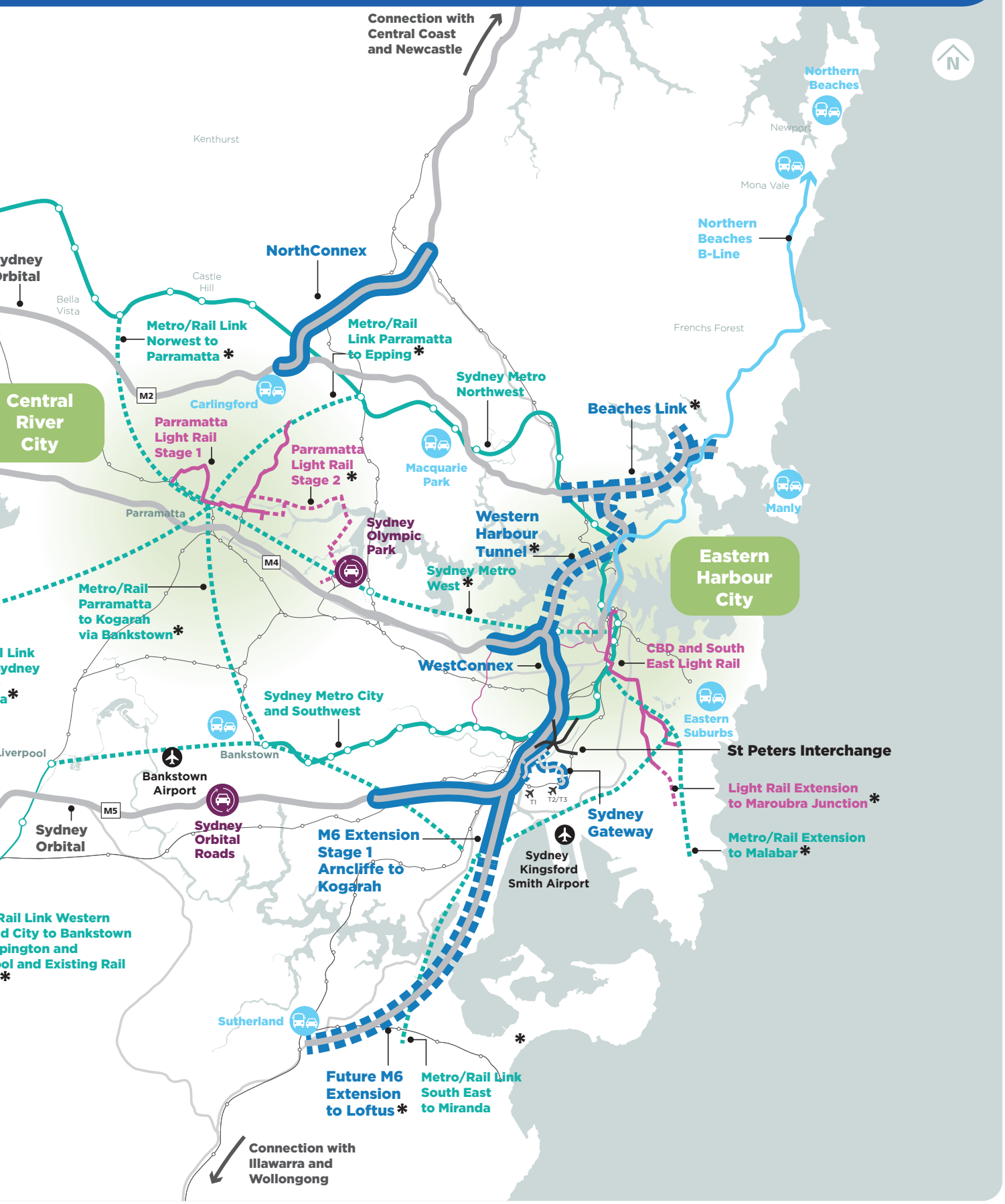
Roads remain a critical element in this integrated transport network, servicing buses, freight, commercial and many other individual journey needs.

Western Harbour Tunnel and the upgrade of the Warringah Freeway is a critical element of this broader transport Strategy. Visit **future.transport.nsw.gov.au** for more information.

Get you to your destination faster

Complete the missing links on Sydney's motorway network

Save time on your Journeys



Support the growth of our communities

Providing new direct routes

Why it's needed

We are addressing congestion, improving safety and providing more choice for how you move around Sydney.

Improvements to road, rail and public transport will ensure our transport network enables easier, faster and safer journeys. That's why we are investing more than ever before in transport infrastructure over the next four years, helping to grow the NSW economy and create tens of thousands of jobs in the process.

So what's happening?

Population in our great city is expected to grow from five million to eight million in the next 40 years.

We also expect to see Sydney's economic output double by 2031. This includes significant growth in high-skilled jobs in the Global Economic Corridor, which stretches from Macquarie Park and Chatswood to North Sydney, the Sydney CBD and beyond to Sydney Kingsford Smith Airport.

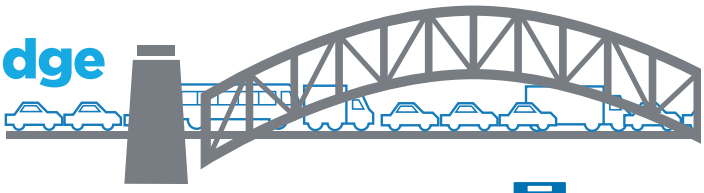
The Sydney Harbour Bridge, Warringah Freeway and Eastern Distributor have been identified as among Australia's 30 most congested roads.

Improvements to existing transport networks and the creation of new transport connections will be essential for our city to continue to have a competitive economy and meet the growing needs of our communities.

Current situation

The Sydney Harbour Bridge

one of the busiest roads in NSW



over **165,000 vehicles** per day

79,000 bus passengers per day

Warringah Freeway

one of the busiest and most complex road corridors in Australia

The Sydney Harbour Tunnel

8th busiest road in the state

carrying **94,000 vehicles** per day

Western Harbour Tunnel and Beaches Link

Legend

- Beaches Link
- Western Harbour Tunnel
- Warringah Freeway Upgrade
- Surface works
- WestConnex
- Northern Beaches Hospital roadworks
- Motorways
- Major roads

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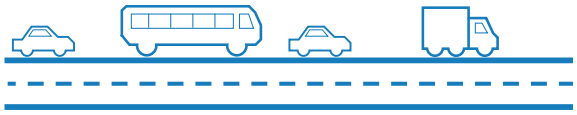
Western Harbour Tunnel and Warringah Freeway Upgrade benefits at a glance

Travel time savings

Western Harbour Tunnel will provide a safer, more reliable trip as you bypass the Sydney CBD to get to your destination faster

- **Save up to 20 minutes**
  Sydney Olympic Park to North Sydney
- **Save up to 20 minutes**
  Leichhardt to North Sydney
- **Save up to 15 minutes**
  North Sydney to Sydney Kingsford Smith Airport
- **You will also save up to 20 minutes on your city commute when driving from:**
  - Chatswood
  - Roseville
  - Lindfield
  - Forestville
  - Belrose
  - Frenchs Forest
  - Cromer
  - North Narrabeen



You will see traffic significantly reduce on the:

- Western Distributor **35% less traffic**
- Sydney Harbour Tunnel **20% less traffic**
- Sydney Harbour Bridge **17% less traffic**

Air quality

With traffic moving underground there will be an overall improvement to air quality

Our tunnels are designed to ensure:

- we meet strict in-tunnel air quality requirements
- no emissions from portals
- negligible impact to local air quality

Less stop-start traffic will result in a reduction of greenhouse gas emissions

Improved surface roads

Moving traffic underground will improve urban amenity and reduce pressure on our main roads

You will **experience less congestion** on the Sydney Harbour Bridge, Sydney Harbour Tunnel, the Western Distributor and Anzac Bridge

The Warringah Freeway Upgrade will **streamline traffic** movements to make your trip safer and simpler

Walking paths and cycleways

We are building a **dedicated cycleway** between Miller and Falcon Streets at Cammeray to improve safety and journey times for cyclists

The Ernest Street Bridge across the Warringah Freeway will be **upgraded** to link Cammeray Golf Course with Anzac Park with **more room for cyclists and pedestrians**

We will be **rebuilding the Ridge Street Bridge** and upgrading High Street Bridge in North Sydney to provide more room for cyclists and pedestrians

Improved amenity and open space

We will be seeking your help to **design open space areas** once we are finished, such as new open space at Berrys Bay

We are working with the original architect for Yurulbin Park to bring his original vision of the park to life

Once open to traffic, some areas will experience **less noise due to reduced traffic on the surface**, new noise walls and noise property treatments

The site we are temporarily using at Ridge Street North, North Sydney will be **returned as public open space**. We will work with Council and the community as to what the future site will look like

Economic benefits

We are supporting up to 7,500 full-time-equivalent jobs during the five years of construction for the Western Harbour Tunnel and Warringah Freeway Upgrade projects

Improving the transport network will bring you closer to your jobs

Your local businesses will have more efficient access to Greater Sydney, making it **easier to move goods, provide services and access your customers**

You will spend less time in stop-start traffic, meaning you can spend more time doing what you want to do

By using the tunnels **you will experience savings in vehicle running costs**

Integrated transport

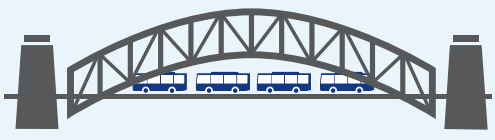
We have designed the project to **integrate with the broader public transport network** to provide significant travel time savings and reliability benefits

You will experience **improved public transport connections** with quicker access to interchanges and a new, direct connection to North Sydney

You will see **improvements to walking and cycling routes,** providing you with more shared transport options

You will experience **faster and more reliable bus journeys** across the bridge with a continuous southbound bus lane from Miller Street to the Sydney Harbour Bridge

We will be providing opportunities for **new direct bus routes** between the Inner West and North Sydney using the Western Harbour Tunnel



Your bus trips on the Sydney Harbour Bridge, Anzac Bridge and other surface corridors will be **faster and more reliable with reduced congestion on existing roads**

Our community

We recognise a project of this scale will have an unavoidable impact on local communities. This is why we have completed one of the most extensive engagement programs for a motorway project ahead of the EIS exhibition period.

Since the release of the preferred route and concept design in 2017, we have engaged with thousands of you who live and work, in and around our project area. We have listened to better understand your concerns and have incorporated your feedback and suggestions into our design where possible.

Our commitment to you is we will continue to listen and actively engage with you to hear your feedback on this city shaping project.

Overview

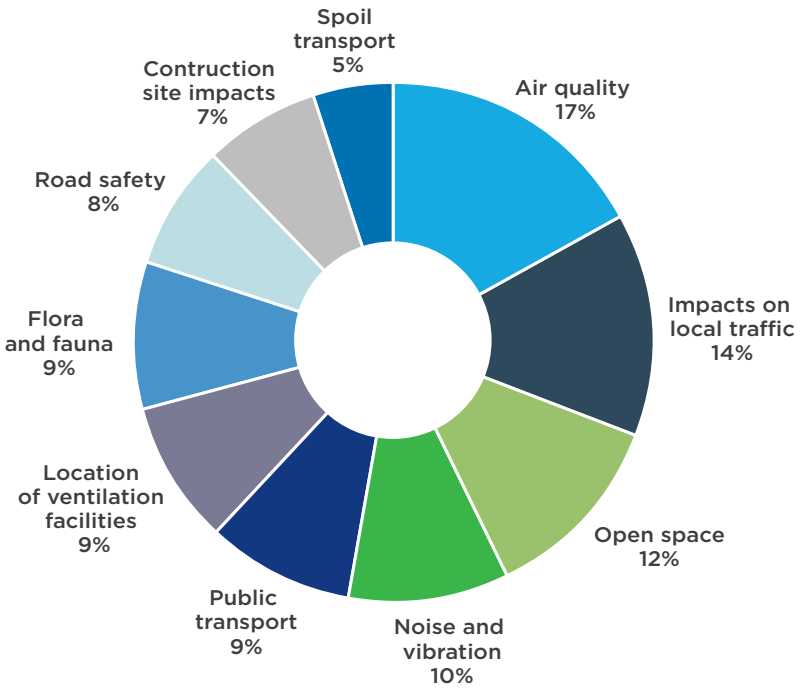
Our engagement program for the Western Harbour Tunnel and Warringah Freeway Upgrade project included the companion project, Beaches Link. We are preparing a separate Environmental Impact Statement (EIS) for the Beaches Link project which will assess any temporary and permanent impacts. We expect to have this EIS available for public exhibition from mid-2020.

In 2018, we carried out a wide range of consultation and engagement activities to help refine our design based on community feedback and we aimed to reduce community impact where possible.

What you told us

Your feedback on the Western Harbour Tunnel and Beaches Link Proposed Reference Design 2018 focused on the following topics:

- Air quality
- Impacts on local traffic
- Open space
- Noise and vibration
- Public transport
- Location of ventilation facilities
- Flora and fauna
- Road safety
- Construction site impacts
- Spoil transport



Design changes

We thank you for the feedback which has helped us make a number of positive improvements to the project. They include:

- maintaining the connection between the Warringah Freeway and Ernest Street by keeping the Ernest Street ramps
- working with the original landscape architect for Yurulbin Park to develop plans which will finally deliver the original vision for this park
- committing to collaborating with the community in 2020 to develop new public open space at Berrys Bay once the project is complete
- minimising the impact of our work at the Ridge Street North construction site
- reducing the land we need to use at the Cammeray Golf Course during construction and for our permanent motorway facilities
- retaining more trees and plantings along the northern boundary of the Cammeray Golf Course to minimise visual impact from our work
- putting our motorway facilities within the Warringah Freeway corridor so we can move them further away from communities where possible
- revising the construction staging at the Warringah Freeway to reduce impact to you at night
- improving pedestrian and cycle paths along and across the Warringah Freeway
- improving public access to the beach at Berrys Bay and working with North Sydney Council on providing boat or kayak storage racks at the beach before construction starts.

Managing community concerns

We know building a road of this scale and significance does not go without impact.

We will have a community contact system in place during construction and will ensure there are a number of different ways you can contact us and raise concerns or make enquiries at any time.

We will also be working closely with teams from nearby construction projects to help minimise the construction and consultation fatigue in your local area.

Western Harbour Tunnel and Beaches Link Concept Design consultation

April – June 2017

- More than **4,000** face to face conversations
- **16** community feedback sessions
- Email "blasts" to **2,300** stakeholders
- Over **1,000** telephone calls received
- **25** meetings with community groups
- Directly contacting owners of properties about potential property impacts **71**
- **12** 'pop-up' shopping centre displays
- More than **6,300** notifications about marine and land-based geotechnical work
- Over **700** emails received
- **1,700** comments on online engagement map

Western Harbour and Beaches Link Proposed Reference Design consultation

July 2018 – December 2018

- **20** community feedback sessions with 2,639 visitors
- **3,892** door knocks around proposed construction sites
- Around **337** telephone calls received
- **2,320** written submissions received via email
- **4,029** comments on online engagement map
- **6** 'pop-up' shopping centre displays with 691 visitors
- **400,000** letterbox drops
- **37** community groups & committees actively engaged

Overview of the Proposed Reference Design

Following two extensive rounds of community consultation, we have revised our design to incorporate feedback and suggestions from stakeholders and the community. This revised reference design is the design we have presented in the EIS.

Our project will:

- improve the efficiency, safety and reliability of the Sydney Harbour Bridge, Anzac Bridge and Western Distributor for around 149,000 bus passengers per day who rely on this critical transport corridor
- take pressure off the Sydney Harbour Bridge and Sydney Harbour Tunnel
- provide improved travel options for commuters, services and freight travelling between Sydney's international gateways, including Sydney Kingsford Smith Airport, Port Botany, the Sydney CBD, North Sydney and Western Sydney
- improve safety and provide more reliable journeys for commuters, freight and bus customers
- allow for efficient connection of the new Western Harbour Tunnel into the transport network, reducing congestion and providing more reliable trips on existing corridors like the Sydney Harbour Bridge, Sydney Harbour Tunnel and Anzac Bridge.

Surface road connections will integrate with the main road network to provide efficient access at:

- City West Link and The Crescent at the Rozelle Interchange to allow users from areas including Leichhardt, Annandale, Camperdown and surrounds to access the new Western Harbour Tunnel – bypassing the congested Western Distributor corridor
- Falcon Street at North Sydney to provide connectivity to North Sydney, Crows Nest and surrounding areas
- the existing Berry Street on ramp to the Warringah Freeway to provide easy and safe access to the new Western Harbour Tunnel for users travelling from North Sydney.

The project will create opportunities to deliver new levels of connectivity for the Northern Beaches region. This includes the Beaches Link tunnel (subject to a separate planning approval process) which will deliver significant improvements to journey times and reliability for bus passengers, as well as new opportunities for express bus services to integrate with the new Sydney Metro at North Sydney, and new express services to Macquarie Park and other strategic centres.

Planning for the future

As part of our EIS, we have assessed the impact associated with installing tolling gantries for northbound traffic crossing Sydney Harbour. Although no decision has been made on the future tolling strategy, our work includes provision for this infrastructure should there be a decision to introduce northbound tolling at some point in the future.

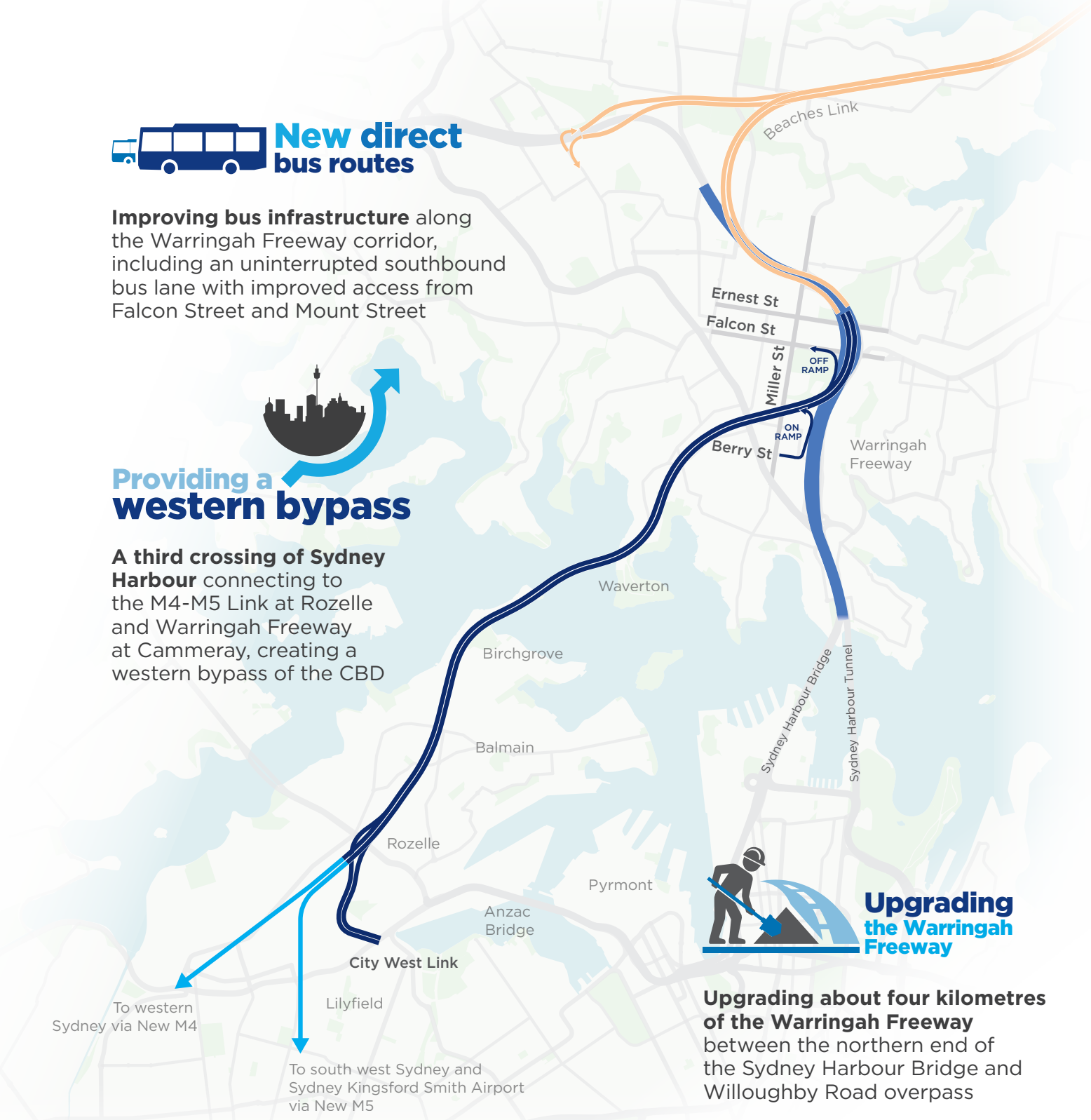
Western Harbour Tunnel and Warringah Freeway Upgrade Proposed Reference Design

New direct bus routes

Improving bus infrastructure along the Warringah Freeway corridor, including an uninterrupted southbound bus lane with improved access from Falcon Street and Mount Street

Providing a western bypass

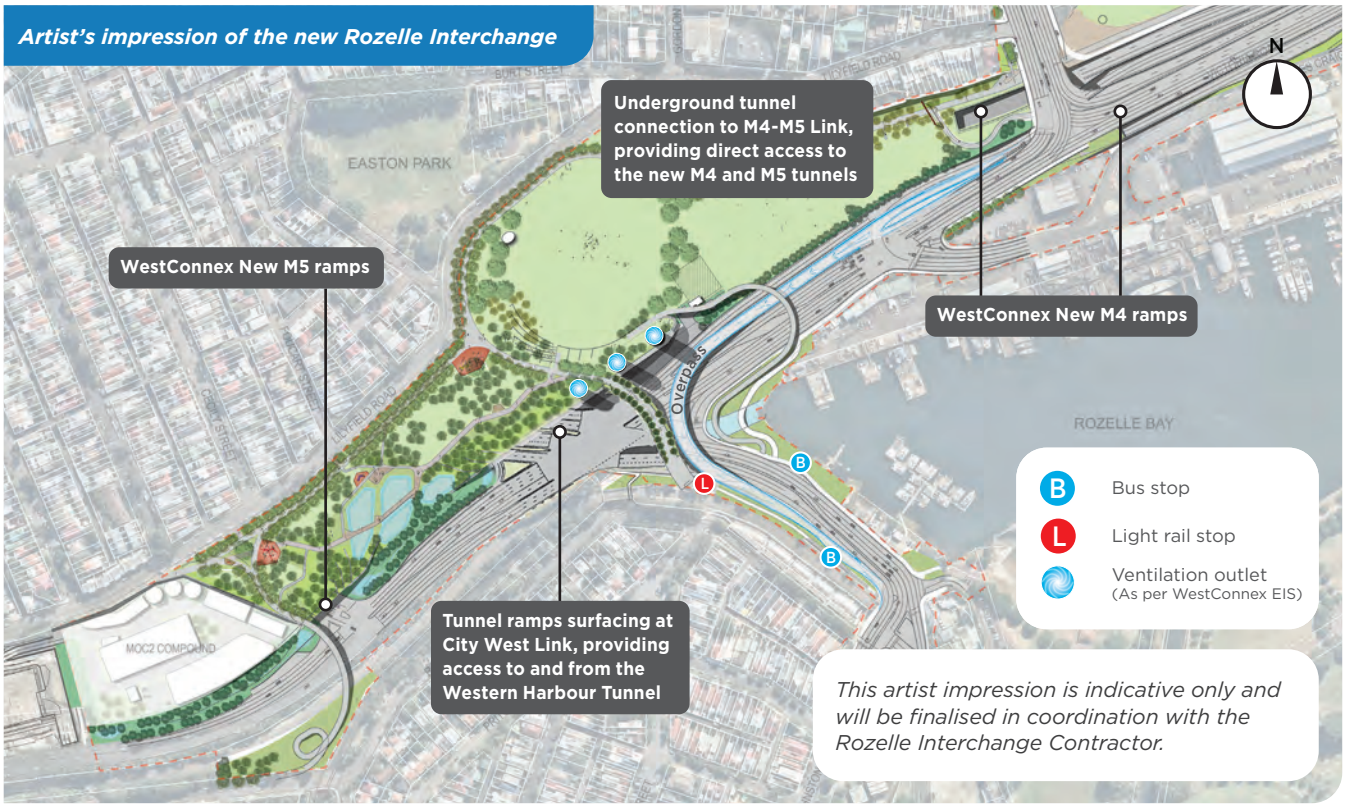
A third crossing of Sydney Harbour connecting to the M4-M5 Link at Rozelle and Warringah Freeway at Cammeray, creating a western bypass of the CBD



Upgrading the Warringah Freeway

Upgrading about four kilometres of the Warringah Freeway between the northern end of the Sydney Harbour Bridge and Willoughby Road overpass

Rozelle Interchange connection



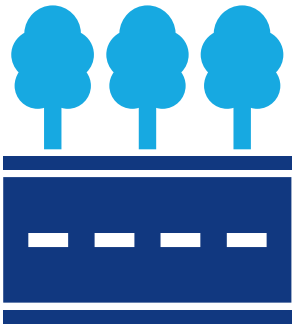
Benefits

With seamless underground connections to the New M4 and New M5 you can bypass the Anzac Bridge, Western Distributor and Sydney Harbour Bridge corridor, improving travel speeds and reliability for these journeys. You will also experience improved travel times on these surface roads, including around 149,000 bus passengers, each day.

Providing a new harbour crossing link for areas including Leichhardt, Annandale, Campberdown, Lilyfield and Rozelle to the new harbour crossing.

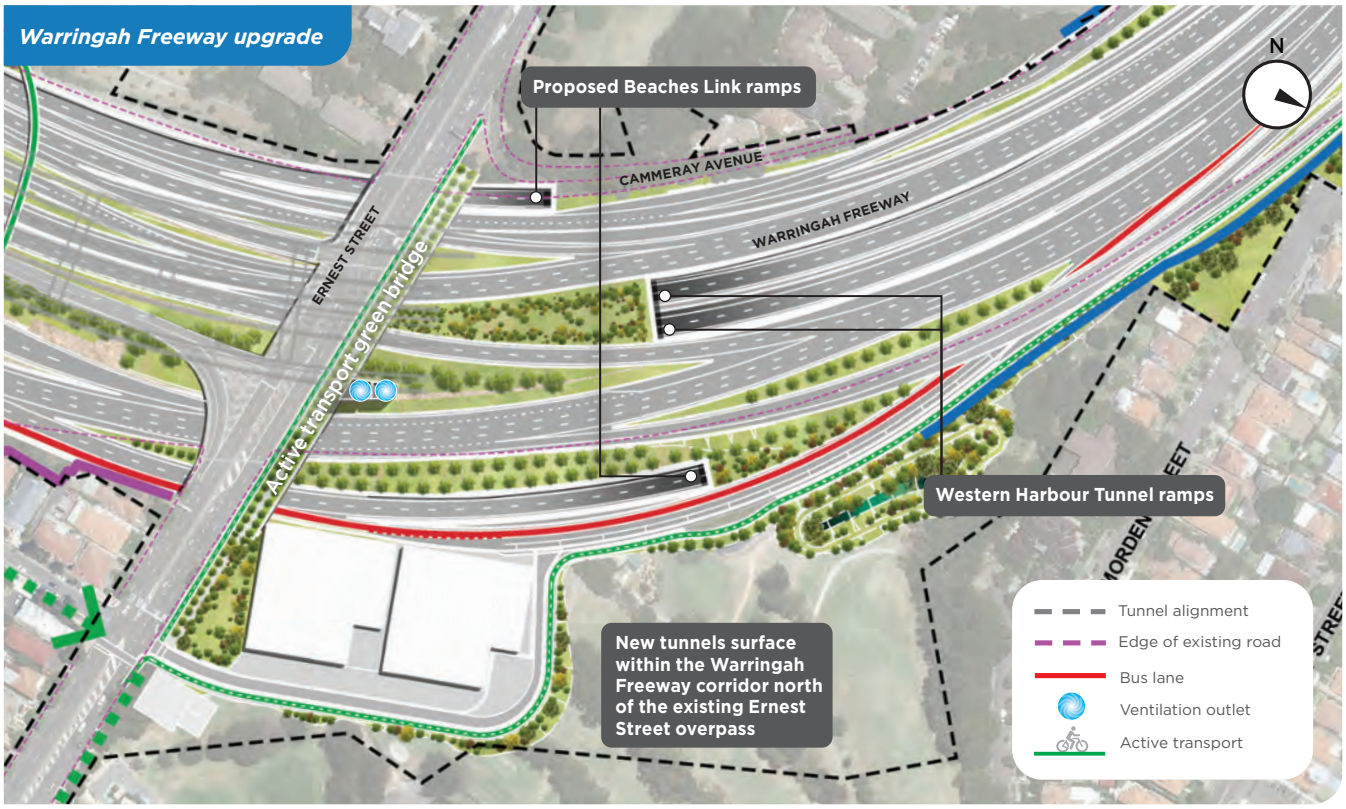
Improving connectivity from the north to key employment areas in the Inner West, North West, South West and Western suburbs of Sydney.

Improving Sydney's road freight, directly connecting with WestConnex and the broader Sydney motorway network. You will notice a reduction of heavy vehicle movements on many surface roads, reducing traffic and noise impact and improving ambient air quality.



Improving surface roads

Connections with the Warringah Freeway



Benefits

Customers will enjoy direct access to the Western Harbour Tunnel which will provide a western bypass of the Sydney CBD, providing reduced travel times to Western Sydney.

Reducing congestion on the Sydney Harbour Bridge, Sydney Harbour Tunnel and the Warringah Freeway south of Ernest Street, will make travel easier, faster and safer.

Greater access to shared transport and better connectivity to existing cycle and pedestrian routes by upgrading cycling and pedestrian infrastructure between Cammeray and North Sydney. This includes:

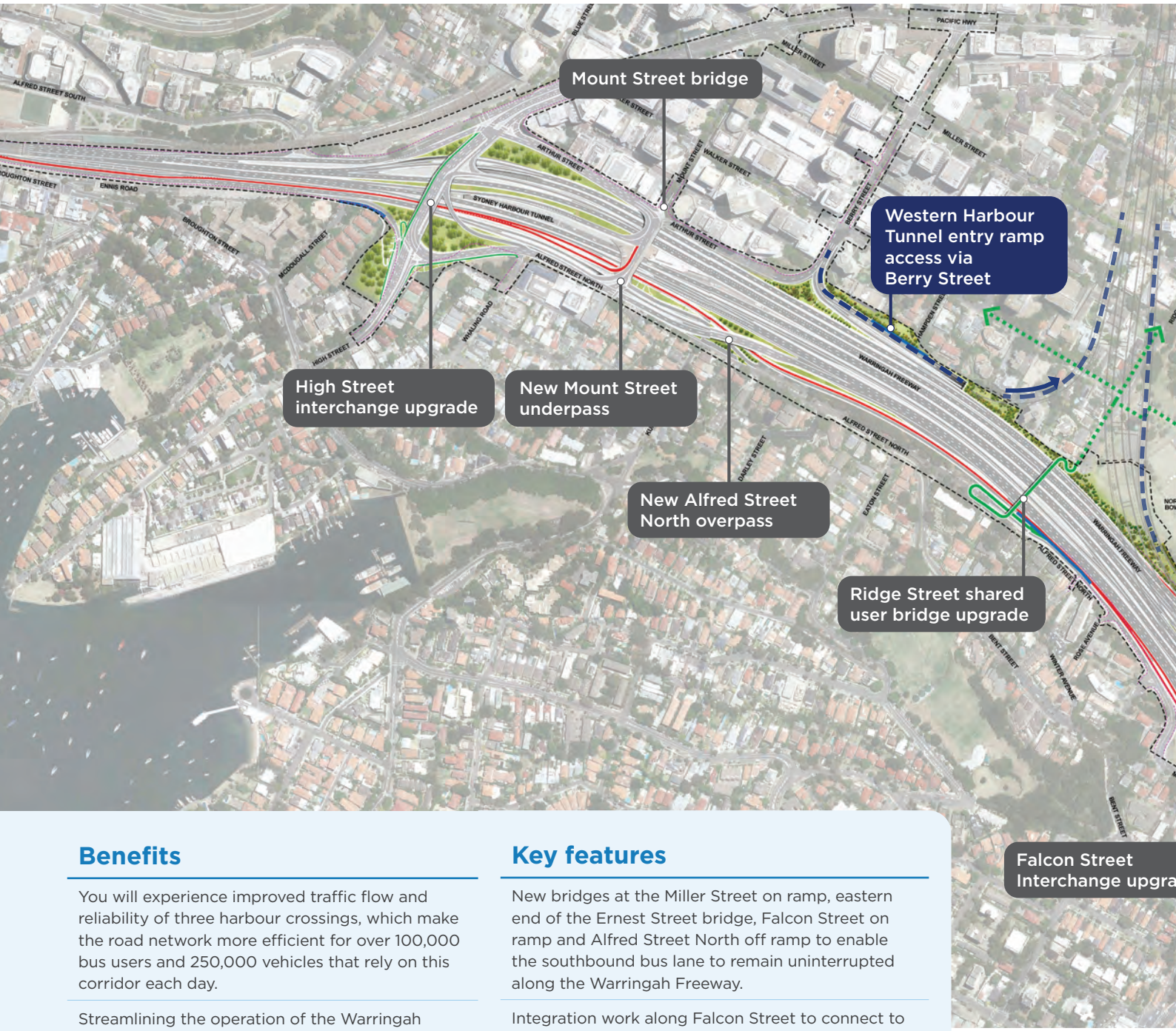
- a new pedestrian and cycle bridge between Cammeray Park and Anzac Park
- upgraded cycleway facilities between Cammeray and Neutral Bay
- upgraded shared user bridge at Ridge Street
- improved pedestrian and cyclist links at High Street, North Sydney.

Customers will enjoy improved efficiency, safety and connectivity for bus services along the Warringah Freeway through upgrades to the existing southbound bus lane on the Freeway.

Proposed tunnel entry and exit location within the Warringah Freeway:

- minimises private property acquisition
- enables us to build the tunnel entry and exit while keeping the critical Warringah Freeway operational
- enables us to carry out some construction work during the day and reduce noisy work at night for local residents.

Warringah Freeway Upgrade



Benefits

You will experience improved traffic flow and reliability of three harbour crossings, which make the road network more efficient for over 100,000 bus users and 250,000 vehicles that rely on this corridor each day.

Streamlining the operation of the Warringah Freeway by reducing the number of merges and weaves. You will benefit from improved safety and efficiency of this corridor.

New on ramp at High Street will improve northbound access to the Warringah Freeway, reducing reliance on the existing Berry Street on ramp and ensures you continue to have toll free access to the Warringah Freeway when travelling to Willoughby Road, Gore Hill Freeway and the Lane Cove Tunnel.

Key features

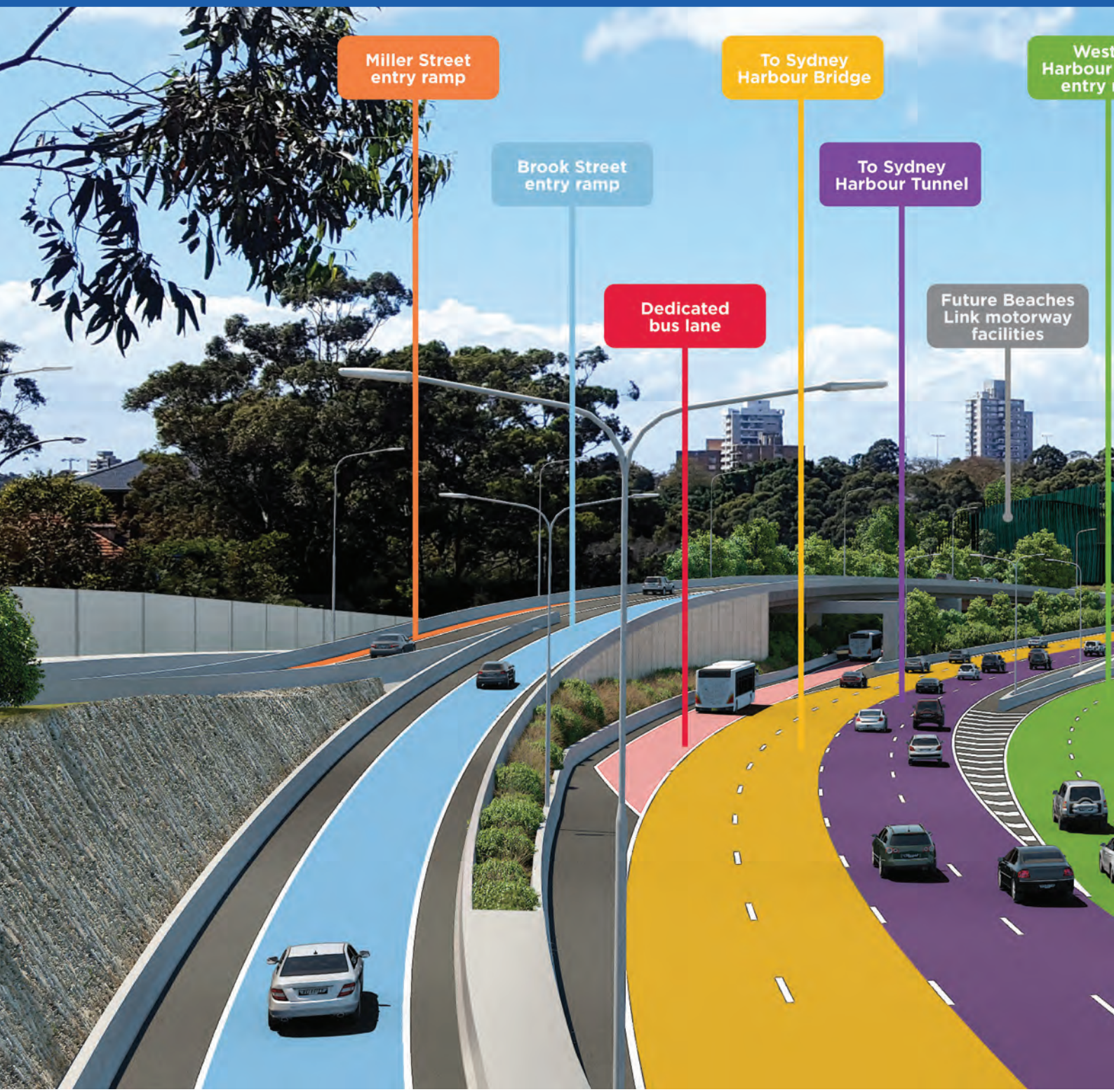
New bridges at the Miller Street on ramp, eastern end of the Ernest Street bridge, Falcon Street on ramp and Alfred Street North off ramp to enable the southbound bus lane to remain uninterrupted along the Warringah Freeway.

Integration work along Falcon Street to connect to the off ramp from the Western Harbour Tunnel to provide access from the new harbour crossing to the North Sydney and Crows Nest area.

Subject to planning approval, construction of the Beaches Link portals will be carried out during the Warringah Freeway Upgrade to minimise the impact on the community.

The upgrade of the Warringah Freeway and dedicated bus lane from Miller Street, Cammeray to Sydney Harbour Bridge will improve bus transit times for all buses using the Warringah Freeway.

Transport is collaborating with North Sydney Council and the Greater Sydney Commission to develop the North Sydney Integrated Transport Program. This will support and facilitate the outcomes envisaged for North Sydney CBD and surrounds by the *Greater Sydney Region Plan* and *Future Transport Strategy 2056*. It will build on the benefits from Sydney Metro and the Western Harbour Tunnel and Beaches Link Program and will guide transport planning and investment in this area over the next 20 years and beyond. This work is continuing and may lead to alternative outcomes in the North Sydney CBD to those shown in our EIS.



Warringah Freeway Upgrade lane configuration

We will be upgrading around four kilometres of the Warringah Freeway between the northern end of the Sydney Harbour Bridge and Willoughby Road overpass to improve safety and provide more reliable journeys for commuters, freight and bus customers. This includes the provision of a dedicated continuous southbound bus lane from Miller Street to the Sydney Harbour Bridge.

The Warringah Freeway will be reconfigured in the Cammeray area (as shown in the figure above) to allow the new connection to the Western Harbour Tunnel and Beaches Link tunnels, and make it easier to access and use the harbour crossings. This includes local widening into the Cammeray Golf Course to create space for the new tunnel entry and exits.


tern
Tunnel
ramp
Western Harbour Tunnel exit ramp
Western Harbour Tunnel motorway facilities
From Sydney Harbour Tunnel
Falcon Street entry ramp
Miller Street exit ramp
From Sydney Harbour Bridge
Brook Street exit ramp

Western Harbour Tunnel Vertical Alignment

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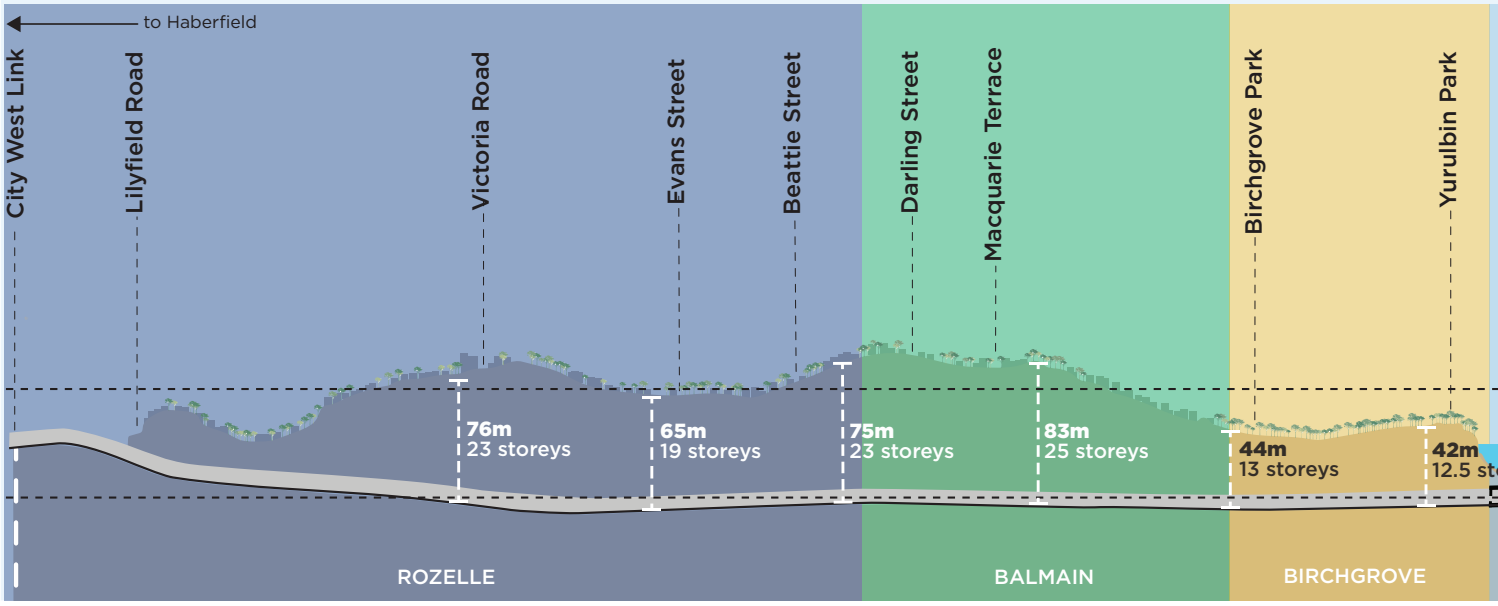
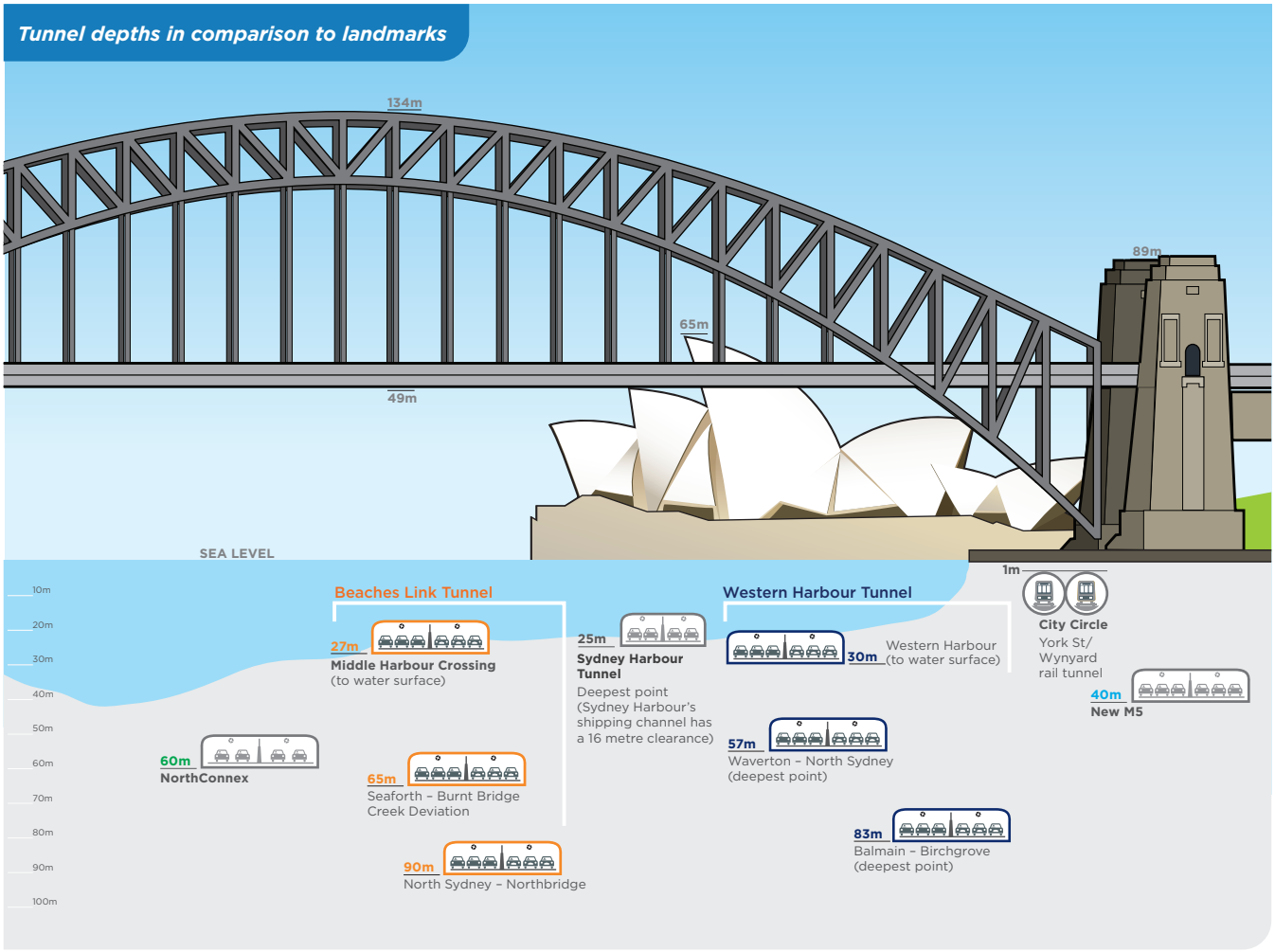
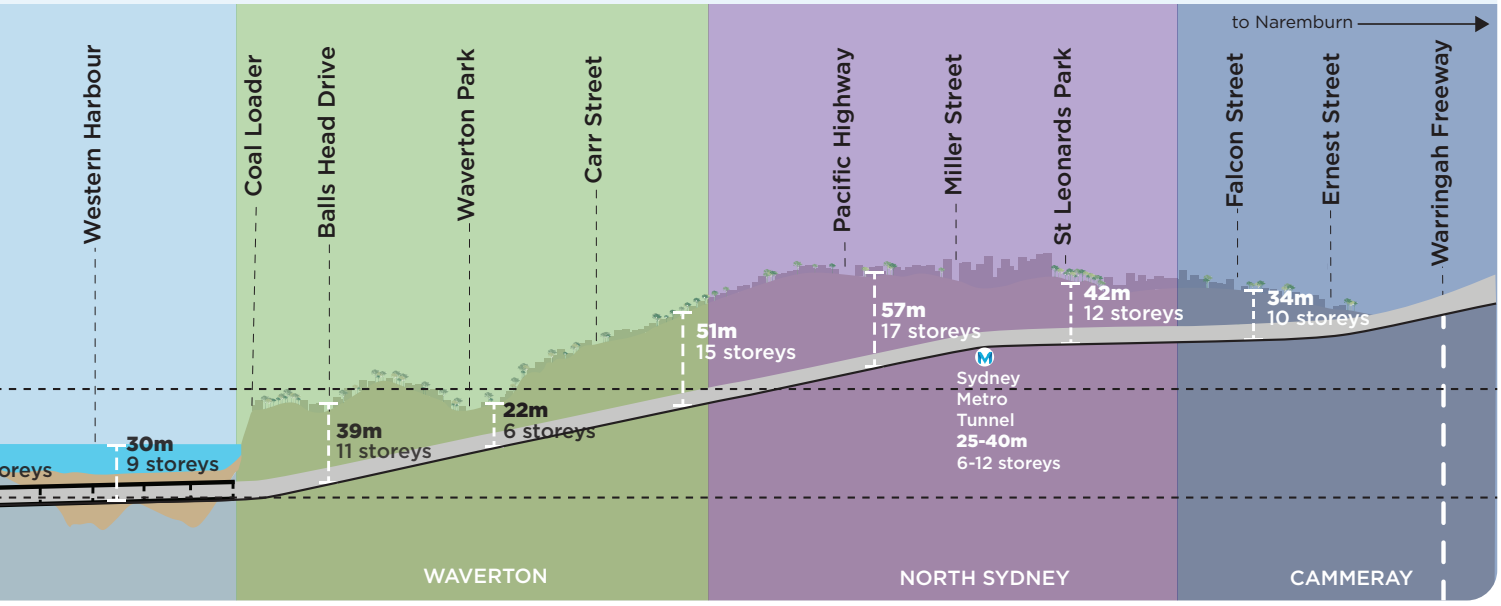
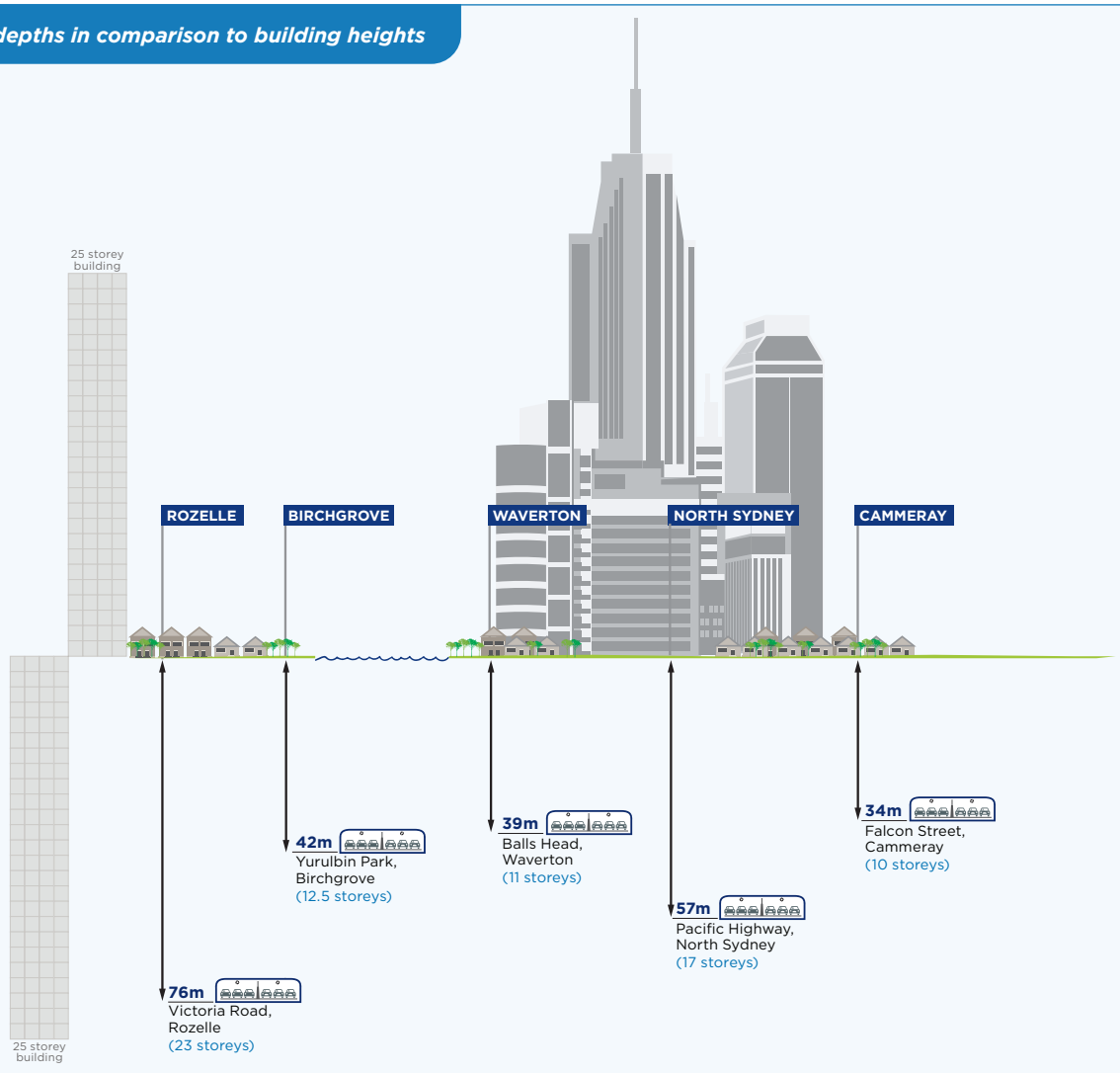


Tunnel depths in comparison to landmarks





Tunnel depths in comparison to building heights



About the Environmental Impact Statement (EIS)

The EIS assesses the potential environmental and social impacts of the Western Harbour Tunnel and Warringah Freeway Upgrade.

The EIS is now on display and you have the opportunity to review the assessments and provide feedback on our findings. Your submissions will go to the Department of Planning, Industry and Environment (DPIE). Once the public exhibition period has closed, DPIE will provide us with a copy of your submissions so we can prepare a submissions report to respond to your feedback.

The report will be submitted to DPIE, which helps to inform the Minister for Planning and Public Spaces decision on the project.

Subject to approval by the Minister, the project will be built and operated in accordance with the mitigation measures described in the EIS, and the Conditions of Approval.

The plans proposed in the EIS may evolve depending on several factors including community feedback, and the construction methodologies developed by the contractor/s once appointed. If a change to the project is proposed, which is not consistent with the planning approval, an application will be made to the Minister to modify the approval.

What's included in the Western Harbour Tunnel EIS?

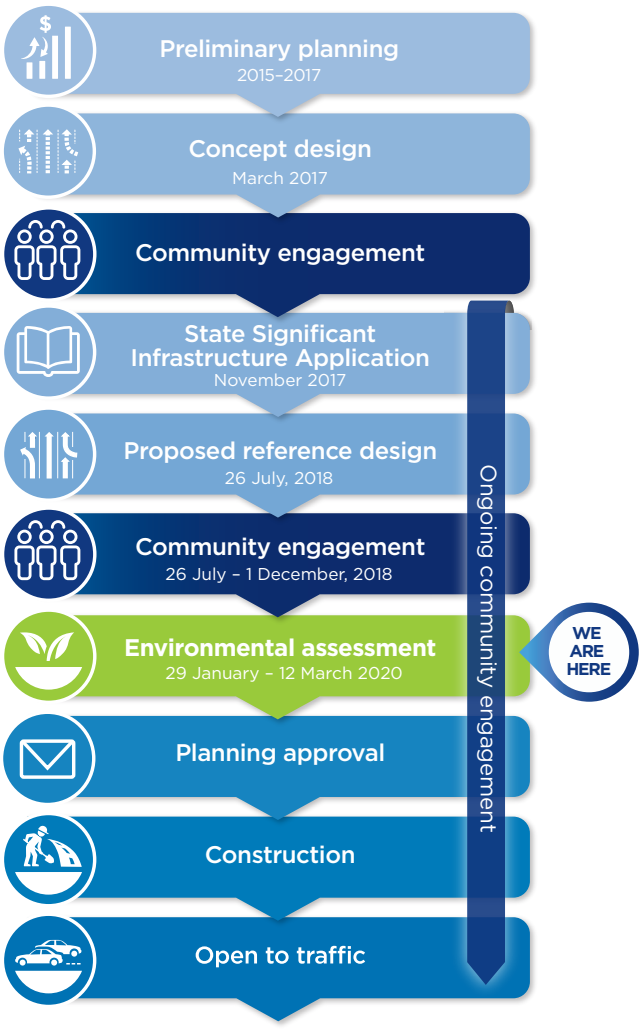
The *Environmental Planning and Assessment Act 1979* and *Environmental Planning and Assessment Regulation 2000* outline the requirements for EISs for State Significant Infrastructure projects in NSW. These pieces of legislation specify the project is issued Secretary's Environmental Assessment Requirements (SEARs). You can view the projects SEARs on DPIE's Major Projects portal at www.planningportal.nsw.gov.au/major-projects/project/10451.

As part of the SEARs, we have assessed and provided information on topics such as:

- project description
- strategic context
- stakeholder and community consultation
- construction work
- traffic and transport
- noise and vibration
- air quality
- human health
- aboriginal and non-aboriginal heritage
- biodiversity
- geology, soils and groundwater
- socio-economic
- urban design and visual
- cumulative impacts

The EIS also includes strategies to avoid, mitigate and manage the potential impact of the project.

Consultation and engagement has been carried out with the community and stakeholders during the design development process and environmental assessment to ensure key potential impacts have been identified at an early stage, and where possible, avoided, or appropriate mitigation measures developed.



Our approach

The approach we have presented in the EIS reflects our Proposed Reference Design and construction methodology.

We have used a conservative approach with investigation and assessment of potential impacts based on worse-case scenarios. For example, when we assess construction noise, we have assumed all machinery and equipment is used at the same time, at its loudest and in the location on site where it would have the highest impact on residents. This scenario is unlikely to occur as we always place machinery and equipment as far away from residents as possible to shield loud equipment and activities with other buildings or stockpiles, wherever possible.

The final design presented by our construction contractor will need to be consistent with any environmental management measures and Conditions of Approval from DPIE.

We have developed the Western Harbour Tunnel and Warringah Freeway Upgrade along with its companion project, Beaches Link. We are preparing a separate EIS for Beaches Link which is expected to be placed on public exhibition from mid-2020.

Assessing our impact

We assessed the potential environmental and social impact of our project. In general our assessments looked at:

- the existing situation
- how the project may change this
- what is predicted in the future without the project
- what is predicted in the future with the project
- how we propose to manage or mitigate any potential impacts.

We understand the community will want to see the cumulative impact of the Western Harbour Tunnel, Warringah Freeway Upgrade and Beaches Link program, particularly the people in and around Cammeray and North Sydney and we are aware of the community's concerns around the cumulative construction impact in the Rozelle area.

The Western Harbour Tunnel and Warringah Freeway Upgrade EIS cumulative scenario presents the impact of the Western Harbour Tunnel, Rozelle Interchange, M4-M5 Link and Beaches Link. It does not present the cumulative impact of the new Sydney Metro West as the details were not finalised when preparing our EIS.

We have been collaborating with the Sydney Metro West team for over a year to understand the impacts of both projects and how we can align our work to minimise impact on you. We continue to work closely throughout the planning and delivery of our projects, along with our industry partners, to achieve this outcome.

Aerial of North Sydney

Section 2

Building the project

Artist's impression from Jefferson Jackson Reserve

When planning our work we have made reducing the impact of our project, and ensuring safety, to you and our workers our priority.

We will be using roadheader technology similar to the WestConnex and NorthConnex tunnel projects currently under construction. Our crossing of Sydney Harbour will use an immersed tube tunnel, which was the same process used for the existing Sydney Harbour Tunnel built between 1988 and 1992. This method is commonly used around the world and is a well understood and safe way to build a tunnel. For more information on how we will build the project please see our portal or Section 4 of this document.

Our EIS describes the proposed approach to construction of our project and our timeline, footprint, methodology, working hours, materials, equipment, traffic management, site access routes, and temporary construction sites.

You may see some minor change, once our selected construction contractor carries out detailed planning and design. Any changes will be assessed for consistency with the assessment made in the EIS and if not consistent, a planning modification will be submitted to DPIE for their consideration and approval.

This section provides details of our construction work. If you are interested in additional technical information, we encourage you to read the EIS and visit our interactive portal.

Interactive portal

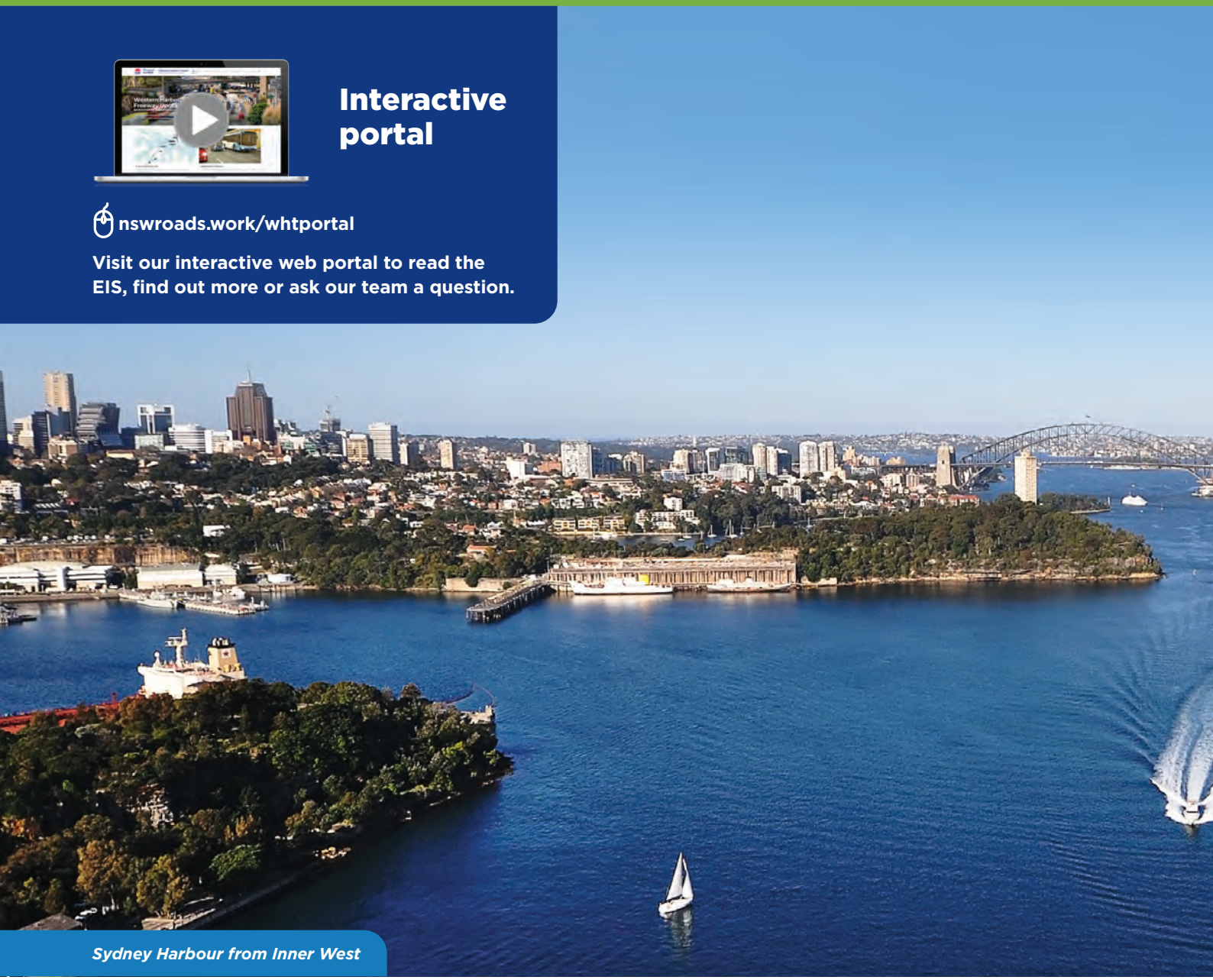
nswroads.work/whtportal

For more information about the location and operation of each construction site, please refer to Chapter 5: Project description, Chapter 6: Construction work and Chapter 8: Construction traffic and transport in the EIS.

Interactive portal

nswroads.work/whtportal

Visit our interactive web portal to read the EIS, find out more or ask our team a question.



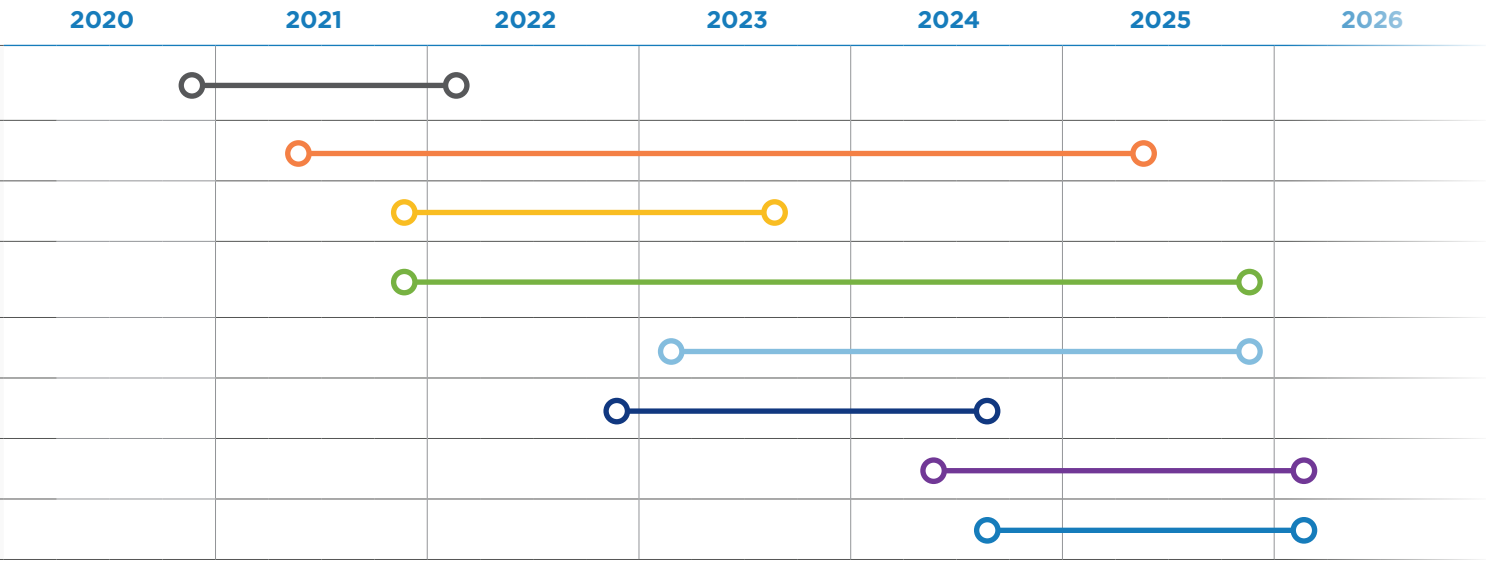
Sydney Harbour from Inner West

Timing

Subject to planning approval, work is planned to start on both the Western Harbour Tunnel and the Warringah Freeway Upgrade in late 2020 and be finished by 2026. Building has different stages and the impact will change depending on the type of work being completed at the time. Timing will vary depending on where you live. For more information on how long we will be working near you please read about our construction sites in this section.

Western Harbour Tunnel and Warringah Freeway Upgrade indicative construction program:

- Early work and site establishment
- Construction of the Warringah Freeway Upgrade component
- Construction of tunnels (tunnels under land)
- Immersed tube tunnel preparatory work, construction, installation, fitout and reinstatement work
- Tunnel fitout and finishing
- Construction of operational facilities
- Testing and commissioning
- Site clean-up and demobilisation



Indicative timing only

Construction stages

Construction stage	Construction activities
 **Early work and setting up our construction sites**	• Moving and changing electricity, water, gas and communications services • preparing sites for heritage and conservation work • setting up sites with safety, property and environmental controls • working with the owners of the MV Cape Don and Baragoola to relocate the vessels to a suitable location nearby before we start work • moving swing moorings • building the construction sites.
 **Surface road work**	• Building retaining walls and storm water drains • making bridge changes and carrying out earthworks • upgrading surface roads by making them wider and marking new lines • installing road furniture, lighting, signage and noise barriers.
 **Major construction work to build the Western Harbour Tunnel**	• Excavating and building tunnels • building on and off ramps • building two cofferdams in Sydney Harbour • building the immersed tube tunnel units • preparing the seabed to lay the immersed tube tunnel • installing the immersed tube tunnel units • building the motorway facilities • fitting out the tunnel, including lighting, fans, safety system and signage.
 **Testing, finishing and post completion work**	• Testing the tunnel and equipment • joining the new roads and tunnels to the existing road network • removing all temporary building equipment and support sites • rehabilitating temporary sites.

When we will be working

Our standard construction hours will be:

Monday to Friday	7am to 6pm
Saturday	8am until 1pm

- generally no work on Sundays or public holidays
- seabed profiling, excavation, some barge movements, worker transport and deliveries will need to be carried out outside of standard construction hours
- to keep people moving on the busy Warringah Freeway during peak travelling times, a lot of our work will need to be carried out at night. We will work closely with affected residents to minimise the impact of our work
- underground tunnelling will be 24 hours per day, seven days a week. We will generally be tunnelling deep underground with access to the surface enclosed within an acoustic shed designed to minimise noise, dust and light. This will allow us to continue tunnelling at night, with less impact to you. Please see pages 24 and 25 for more detail on how deep the tunnel will be in your local area
- spoil transport will only occur within standard construction hours
- we will notify affected residents before starting any work outside of standard construction hours.

Managing noise and vibration

We know our work can be noisy which is why we will use a range of measures to reduce the impact of our work when we are close to communities.

We will work with you to help minimise the impact of our work. This includes developing a Construction Noise and Vibration Management Plan to identify the potential impacts and set out a suitable approach to mitigate and manage the potential impact on you.

We encourage you to read our noise and vibration section on page 70, which explains how we measure noise and what you may experience, depending on which parts of our work you are near.

For more information about how we will be managing noise and vibration, please refer to Chapter 10: Construction noise and vibration in the EIS.

For more information on traffic during construction please see Section 3 of this document, or Chapter 8: Construction traffic and transport in the EIS.

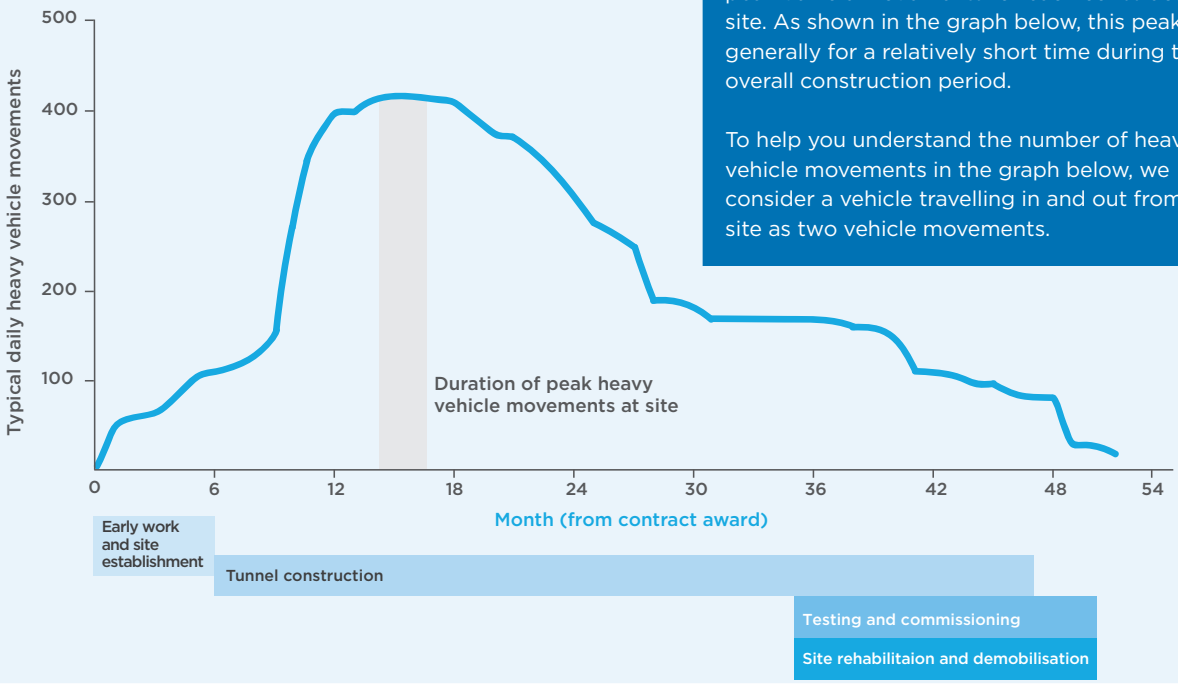
Managing traffic

You can expect to see a variety of vehicles including heavy vehicles like trucks and light vehicles like cars and utes around our work. For planning purposes, a vehicle travelling in and out from the site is considered as two vehicle movements.

We will manage the potential impact of our construction traffic on the road network by:

- locating our construction sites with direct access to main roads
- continuing to consult with Transport, the Sydney Coordination Office, the Port Authority of NSW, local councils, emergency services and bus operators to minimise traffic and transport impacts
- notifying you in advance of any proposed changes or maritime restrictions
- managing traffic to minimise movements during peak periods
- managing vehicle access to and from construction sites to ensure pedestrian, cyclist and motorist safety
- providing signage and line marking to direct and guide road users, cyclists and pedestrians past our construction sites and around the local road network
- minimising potential truck queueing near our construction sites, where possible
- carrying out partial or full road closures outside of peak periods or at night to minimise the impact for road users, and for the safety of our workers and the public, where possible
- working closely with councils and local residents if we need to impact parking spaces or property access.

Typical daily heavy vehicle movements (Victoria Road site)



Throughout this section we have outlined the peak vehicle movements for each construction site. As shown in the graph below, this peak is generally for a relatively short time during the overall construction period.

To help you understand the number of heavy vehicle movements in the graph below, we consider a vehicle travelling in and out from the site as two vehicle movements.

Managing air quality

We know how important it is to manage the potential impact of air quality during construction for your health and the health of everyone working on site. We will have measures in place to minimise this impact and will monitor your air quality every day.

As with any building work, creating dust is unavoidable. We will have an experienced construction team who will work to minimise dust. They will use leading dust suppression methods including stabilising loose material and watering the site and trucks.

Most of the material we excavate will be clean, crushed sandstone. This will be removed in covered trucks to prevent dust or sandstone falling from trucks.

We will also manage potential odours from our excavation work by having experienced construction contractors treat any of those materials and then remove them from site in sealed trucks.

You can be assured that air quality monitoring will be carried out at all stages of the Western Harbour Tunnel project, including once it is operational.

The tunnels will be built to meet strict air quality standards using state-of-the-art ventilation and tunnel design. You may be interested to know the independent NSW Chief Scientist and Engineer has recently released a report in relation to road tunnel air quality. The report found that emissions from well-designed road tunnels cause a negligible change to surrounding air quality, and as such, there is little to no health benefit for surrounding communities in installing filtration and air treatment systems in such tunnels. Further information is available at www.chiefscientist.nsw.gov.au

Managing spoil and waste

We will be using trucks to transport most of the spoil from the tunnel sites to other development sites or, if it is not suitable for reuse, to licensed waste facilities for disposal. We will load the trucks inside the acoustic shed. Spoil removed from Berrys Bay and Yurulbin Point will transported via barge to Glebe Island and then transported by truck.

Acoustic sheds will be installed at our tunnelling sites to manage the potential impacts of noise and dust. We will be stockpiling tunnel spoil inside the shed and will only transport spoil during standard construction hours.

Before these materials leave the site, they will be classified in line with the NSW and Australian standards and guidelines. We anticipate most of this material will be re-used at development construction and remediation sites across Greater Sydney. Any materials not suitable for re-use will be taken to a licenced waste facility.

For more information on spoil removal please see our Resource use and waste management section on page 90 or Chapter 24 in the EIS.

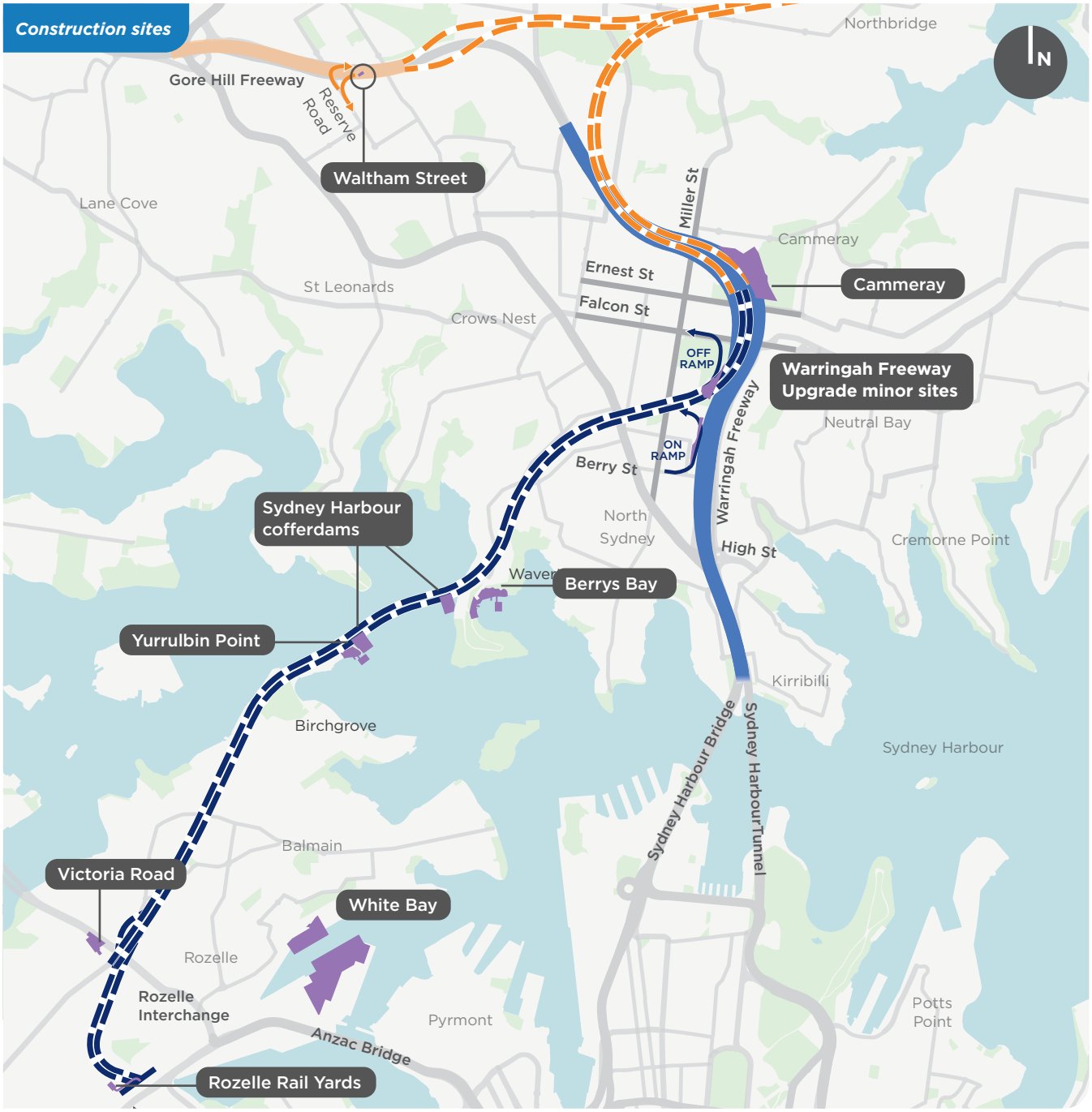
For more information on air quality please see Section 3 of this document or Chapter 12: Air quality in the EIS.

Construction sites

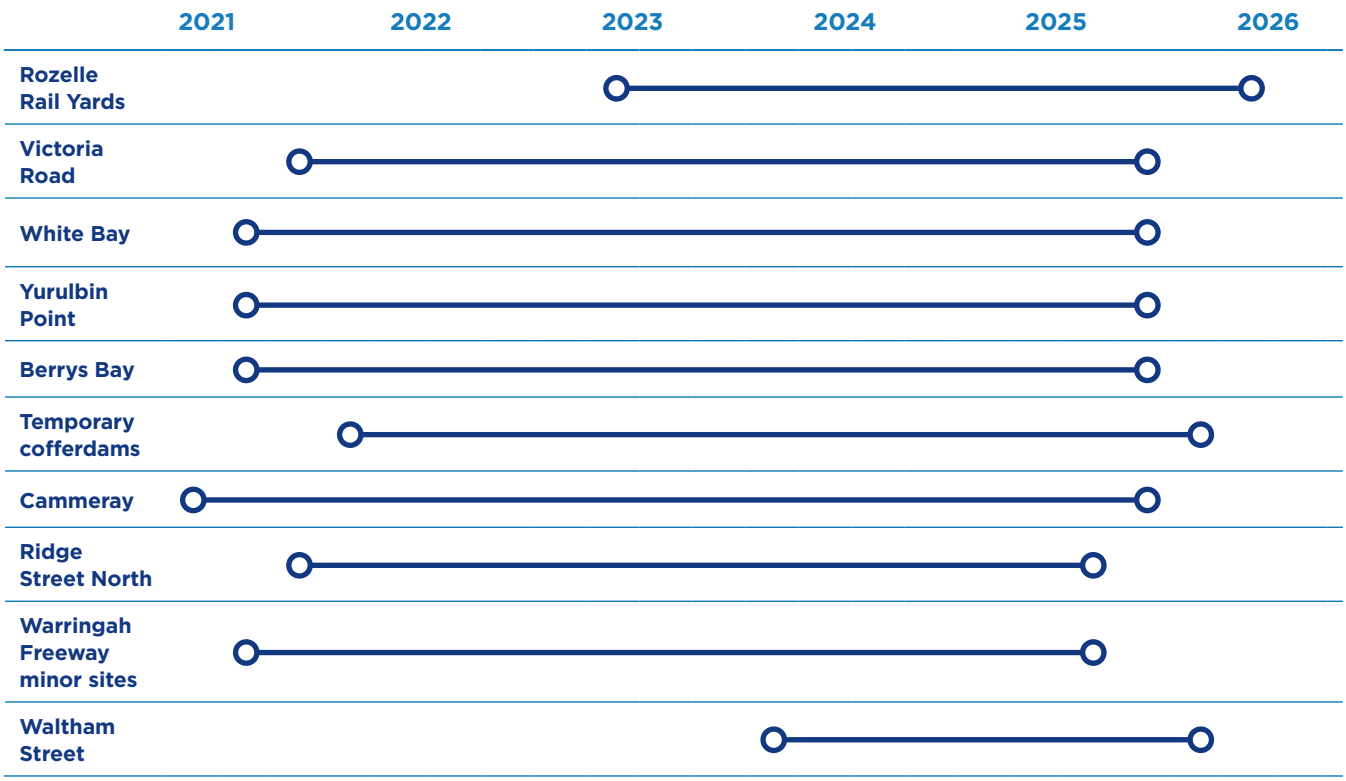
We have carefully selected each of our temporary construction sites to limit our impact on you while we are working and to keep your neighbourhoods and streets safe during construction.

Our sites:

- have direct access to main roads so our vehicles will not be travelling on your local streets
- reduce the amount of private property we need to acquire
- are mindful of not intruding on open space, where possible
- have acoustic sheds for when we will be tunnelling
- maintain access to public facilities, where possible.



Indicative timeframes for when our sites will be active:



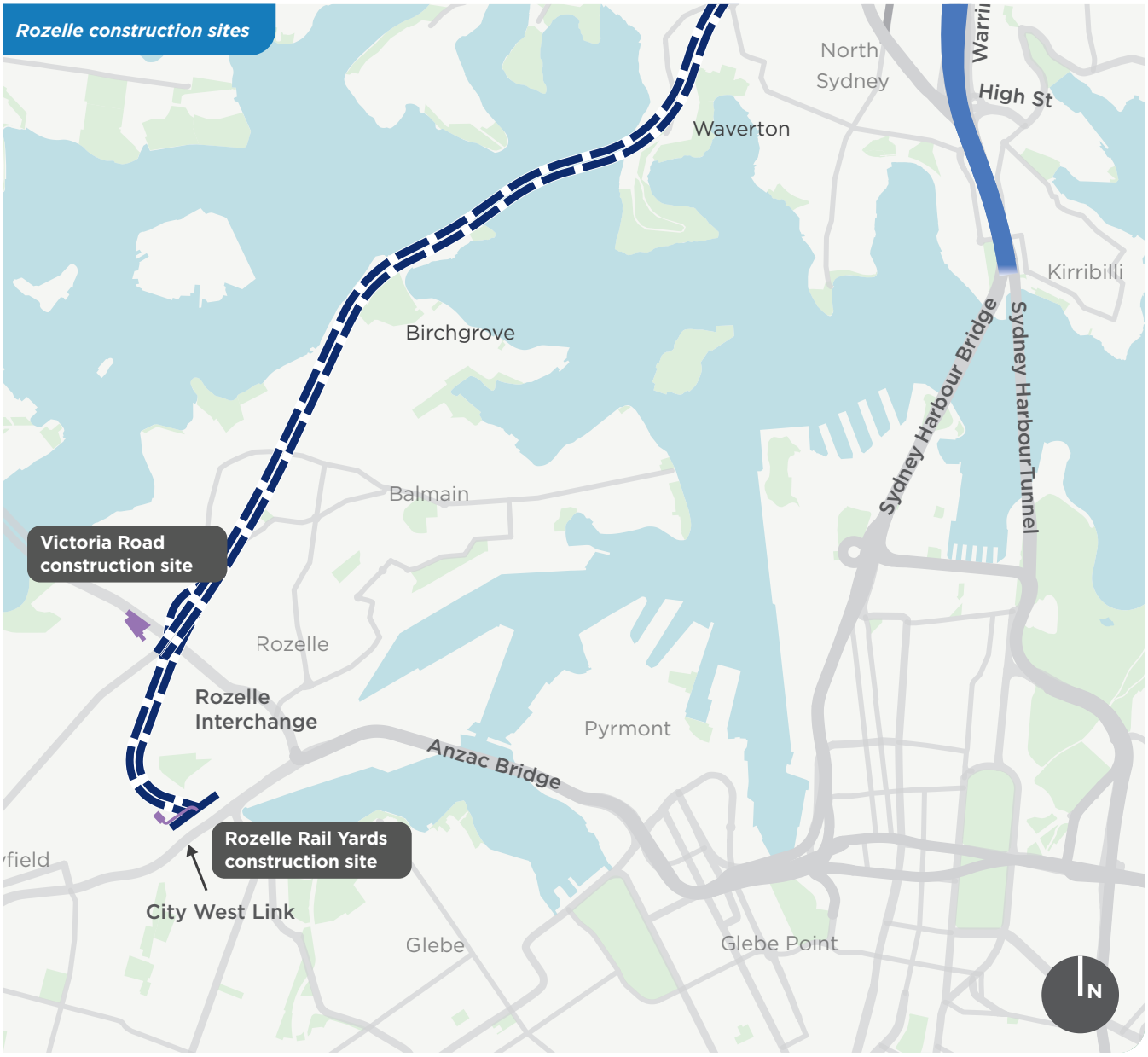
Indicative timing only

Underground tunnel excavation

Rozelle

We will be limiting the construction impacts to the local community by:

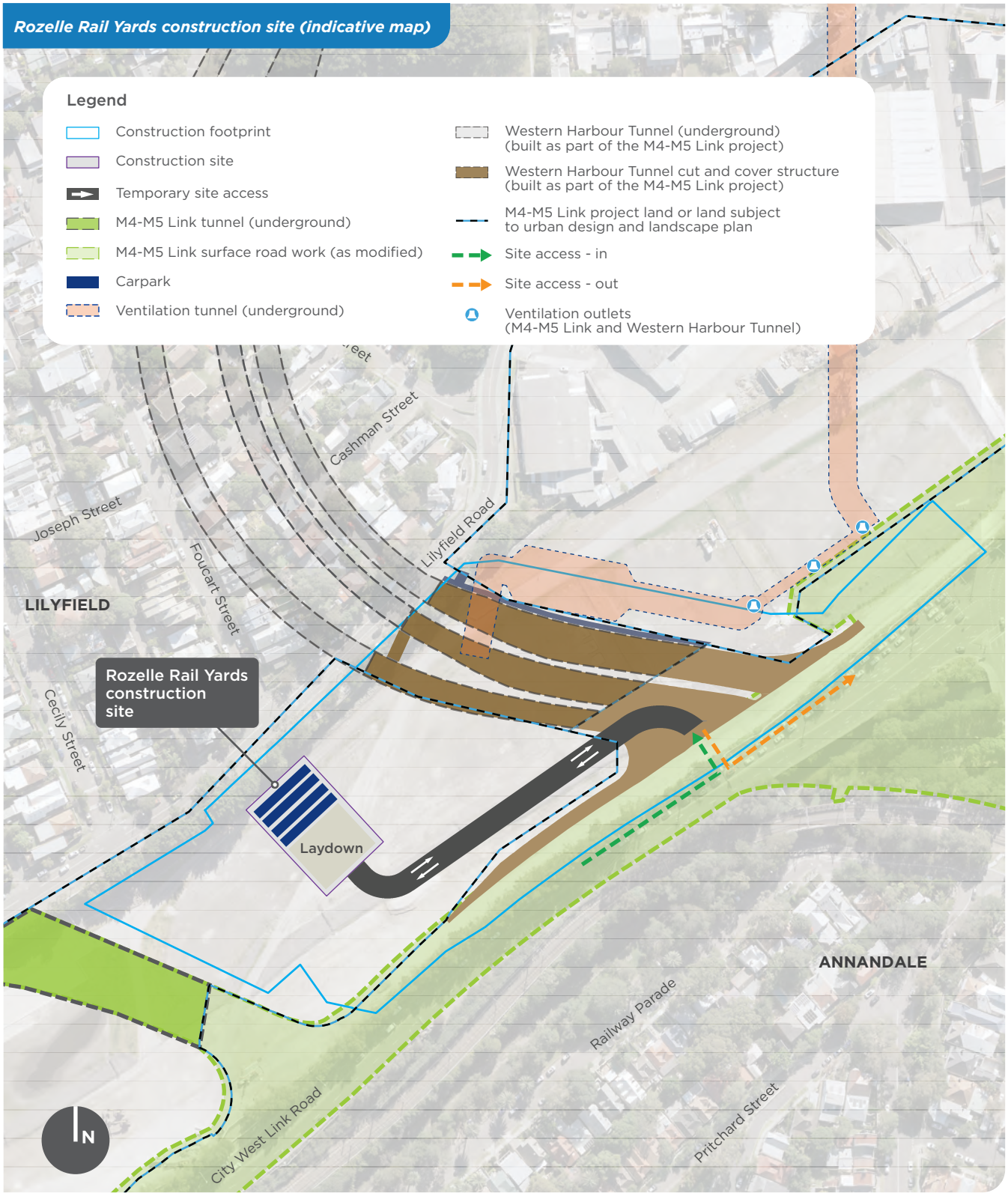
- minimising direct impact to private property
- using construction sites that provide direct access to main roads keeping trucks off local streets
- selecting and designing the size and location of the construction sites, allowing for tunneling to be completed safely and efficiently
- delivering some of our work for Western Harbour Tunnel as part of the Rozelle Interchange construction work to improve efficiency, and reduce the overall duration of our construction.

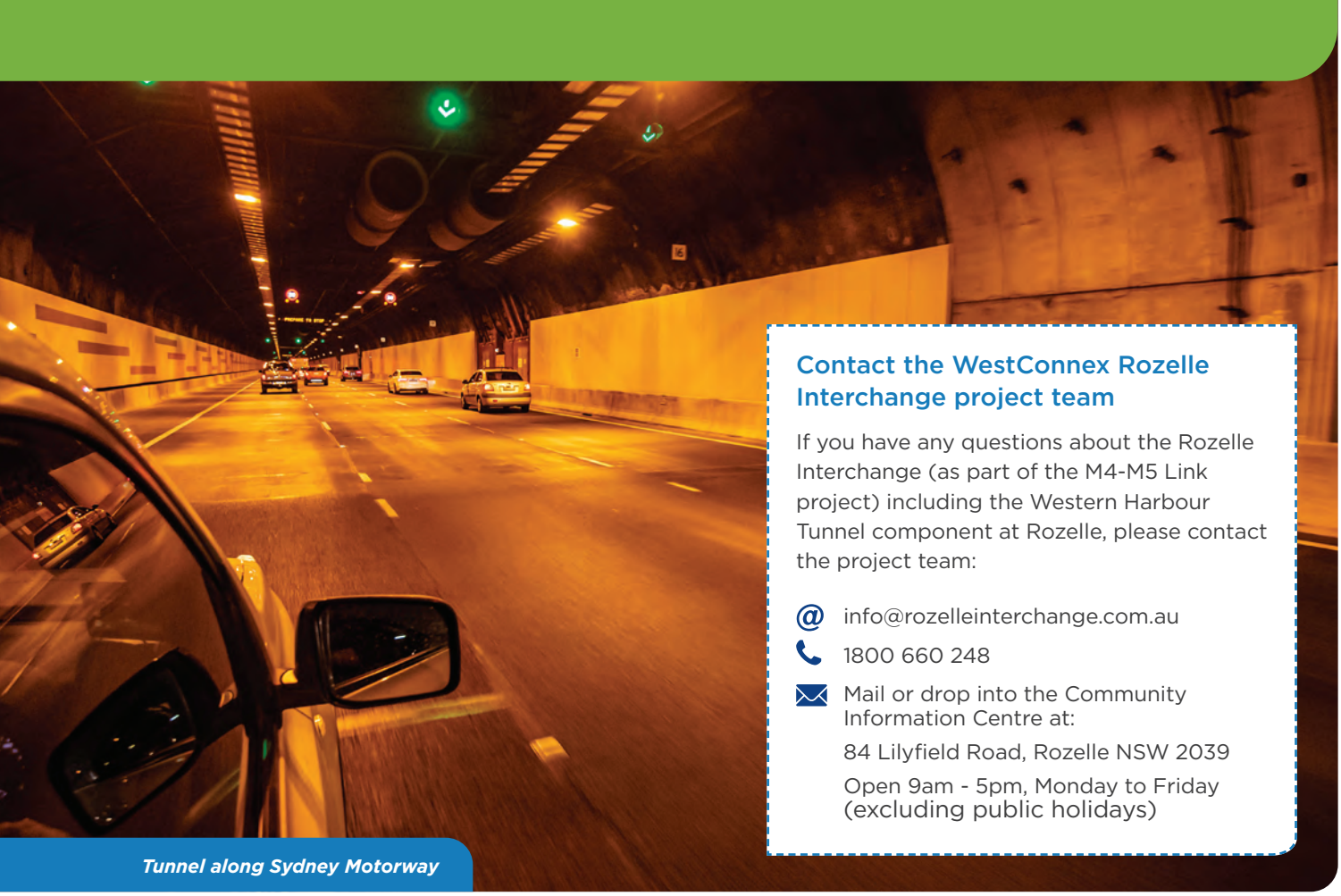


Our work at the Rozelle Rail Yards site may overlap with construction of the M4-M5 Link and Rozelle Interchange. We will be working closely with these teams to minimise our impact on you.

Rozelle Rail Yards

Our work at this temporary construction site will support the mechanical and electrical fitout and construction of the motorway facilities for Western Harbour Tunnel. It will also support the fitout of the ventilation outlet and minor integration work to connect the on and off ramps to City West Link.





Tunnel along Sydney Motorway

Contact the WestConnex Rozelle Interchange project team

If you have any questions about the Rozelle Interchange (as part of the M4-M5 Link project) including the Western Harbour Tunnel component at Rozelle, please contact the project team:

@ info@rozelleinterchange.com.au

1800 660 248

Mail or drop into the Community Information Centre at:

84 Lilyfield Road, Rozelle NSW 2039

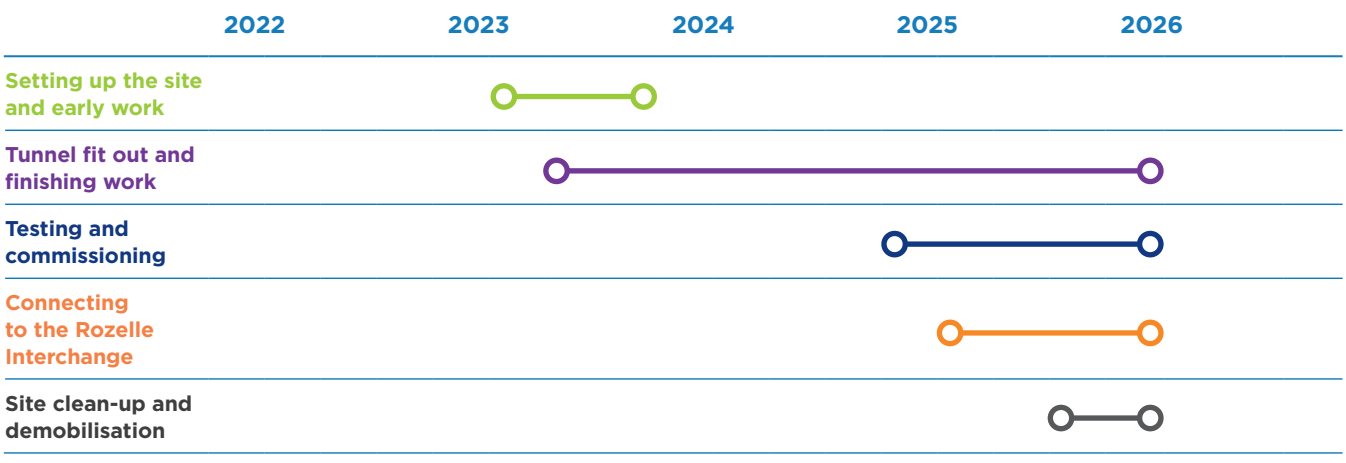
Open 9am - 5pm, Monday to Friday (excluding public holidays)

Our key activities include:

- building and fitting out the Western Harbour Tunnel motorway facilities at the Rozelle Interchange
- fitting out and commissioning the ventilation facilities (built as part of the WestConnex M4-M5 Link project)
- completing the mechanical and electrical fitout of the Western Harbour Tunnel
- treating wastewater from construction activities
- connecting the Western Harbour Tunnel on and off ramps to City West Link.

We are working with the Rozelle Interchange project team on the final location of this compound to minimise the impact.

Indicative construction timeframe for work at the Western harbour Tunnel Rozelle Rail Yards site



Indicative timing only

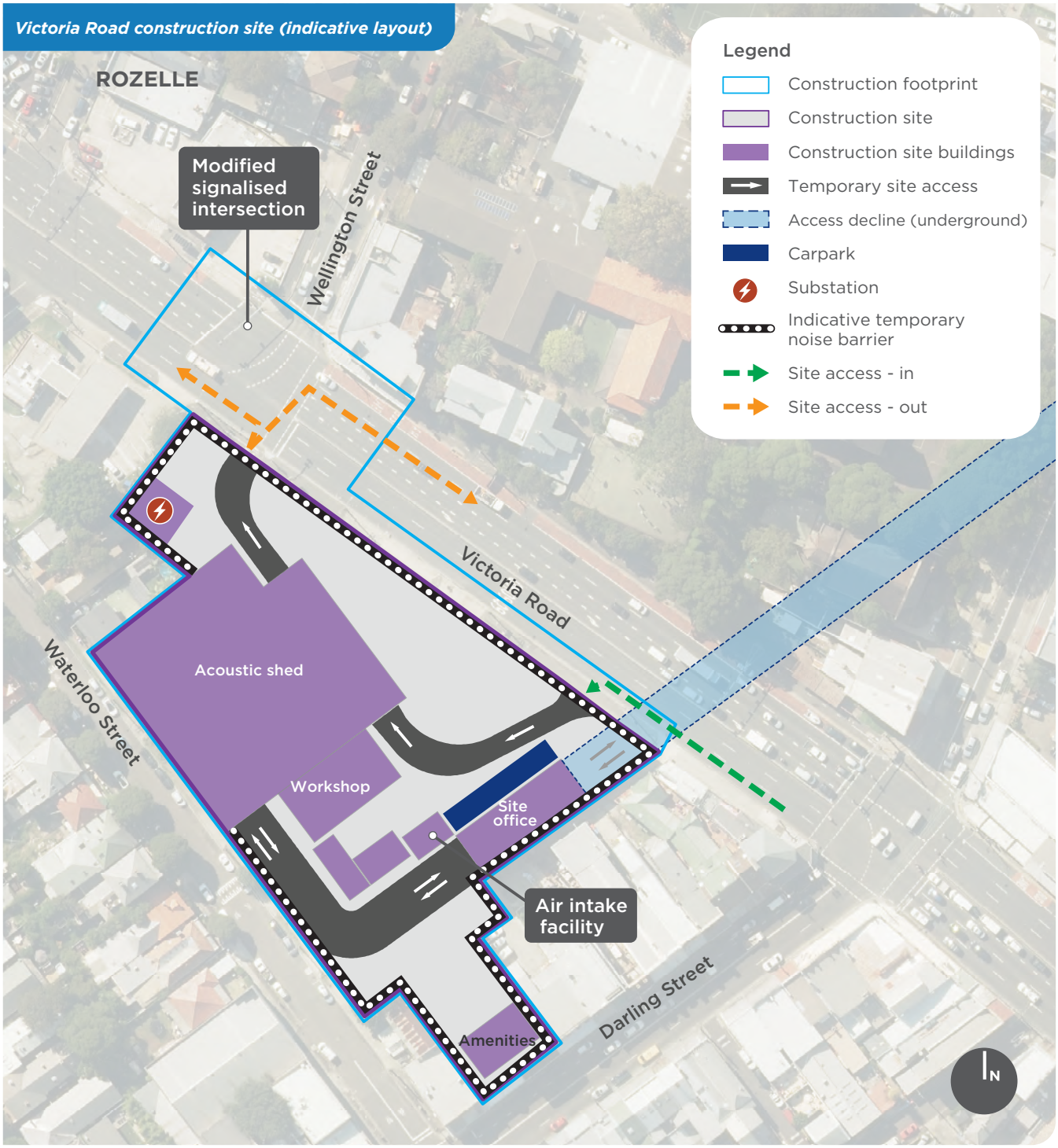
Victoria Road

Our work at this temporary construction site will support the excavation and fitout of the tunnels, both north towards Sydney Harbour and south towards Rozelle Rail Yards.

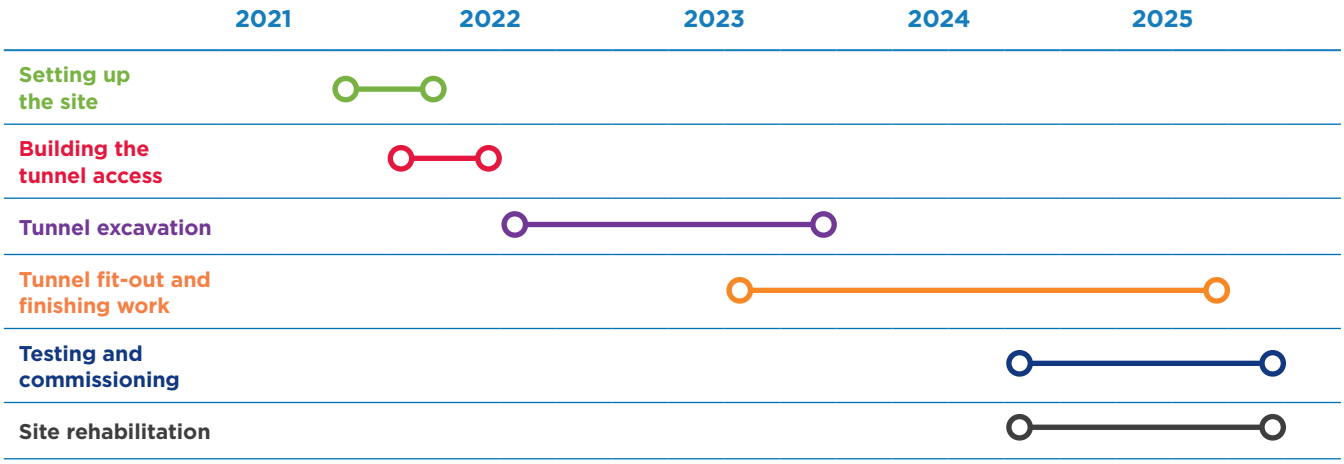
Access for plant and equipment down into the tunnel will be via an access tunnel decline built in the southeast corner of the construction site.

Key activities include:

- removing existing buildings
- setting up the site for construction
- excavating the tunnel access
- excavation and civil fitout of the tunnel
- excavating, handling and stockpiling tunnel spoil (within an acoustic shed)
- treating wastewater from tunnelling activities
- finishing work on the tunnel including mechanical and electrical fitout.



Indicative construction timeframe for Victoria Road



Indicative timing only

Duration

You may see us in this area for around four and a half years as we setup, carry out our work, then demobilise the site and prepare it to be returned to the land owner.

The construction peak at this site will be during tunnelling work.

Hours of work

Our general site activities and spoil haulage will be carried out during standard construction hours.

We will be tunnelling 24 hours a day, seven days a week. Once we are tunnelling, the majority of the work will take place underground and activity on the surface will reduce. Based on typical tunnelling rates we expect the impact from tunnelling to be minimal for residents as we will only be working under each property for about one week.

When tunnelling, our work will be as deep as 76 metres (23 storeys) at Victoria Road. Please see pages 24 and 25 for more detail on the depth of tunnel in your local area.

The majority of our work on the surface takes place inside the acoustic shed, which manages the potential impacts of noise, dust and light. These sheds are also closed at night to further reduce noise. There may be occasional deliveries and some light vehicle movements outside of standard construction hours.

Traffic/vehicle movements

Access in and out of the site will be via Victoria Road.

At our construction peak, there will be around 420 heavy vehicle movements and 230 light vehicle movements per day (a vehicle travelling in and out of the site is counted as two movements). Please see page 33 for information about peak vehicle movements during construction.

Victoria Road currently carries around 68,000 vehicles each day.

Sydney Harbour

Building under the harbour and using government owned land minimises the impact to private properties. We will be using water-based transport where possible to reduce construction traffic on local roads.

Water based transport reducing impact on local streets

Our construction vessels will include:

- barges for delivering material and removing tunnel spoil and material from seabed profiling
- tugboats for manoeuvring barges
- transport vessels for workers.

Our peak time for marine traffic will be when we build the interface structures of the immersed tube tunnel within the cofferdams.

Our vessel movements will not interfere with port operations or the navigation of vessels within Sydney Harbour, unless approved by the Harbour Master. The movement of spoil barges will be controlled by the Port Authority of NSW's Vessel Traffic Service.

We will have maritime speed restrictions of four knots in place around construction equipment to ensure the safety of our workers and you.

Our construction activities will impact some navigation in the inner harbour. We will install the immersed tube tunnel during a series of partial closures of Sydney Harbour between Birchgrove and Waverton for up to two days per immersed tube tunnel unit.

Please see individual construction site sections for more information about the boat movements planned for each site.

Temporary cofferdams and harbour crossing

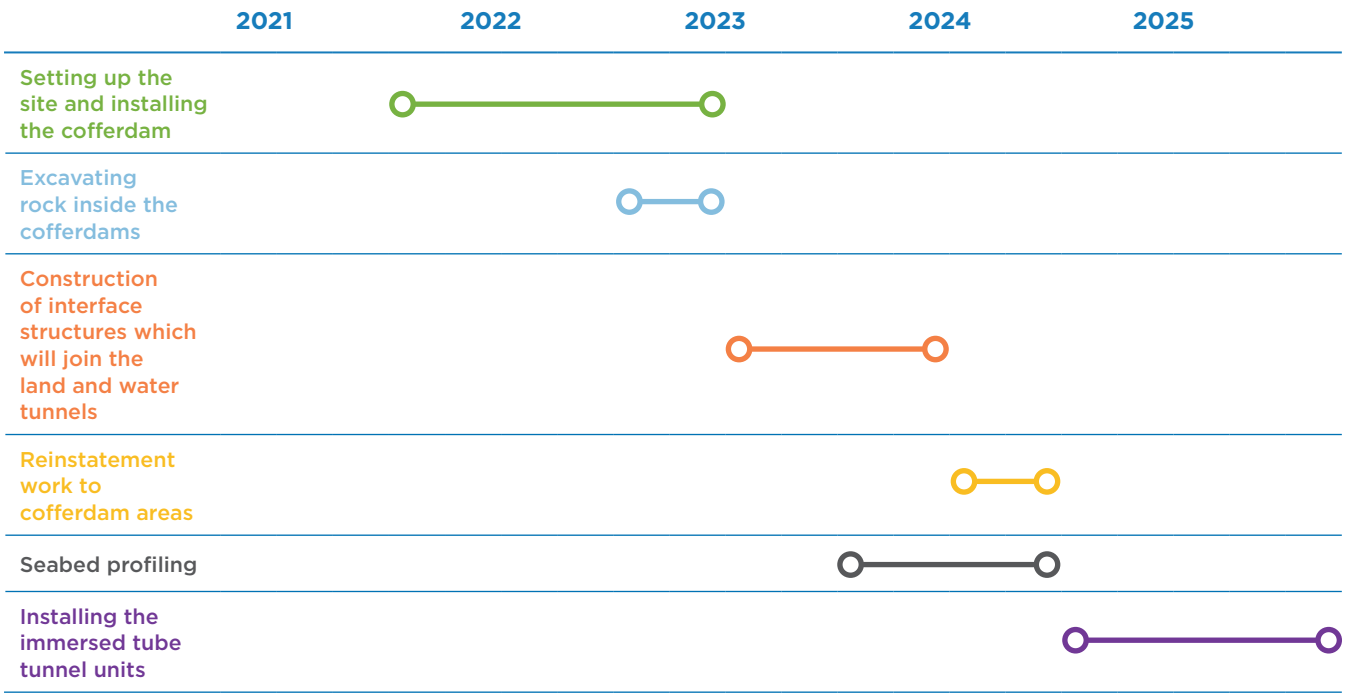
We will be building temporary cofferdams on the harbour to support our tunnelling work. These cofferdams will be temporary and help connect the land tunnels with the immersed tube tunnel, under the harbour.

These sites will be water based, serviced by barges from the White Bay site.

Our key activities include:

- building the temporary cofferdams including ground treatment, piling and removing the water from inside the cofferdam so we can work in dry conditions
- excavating rock within the cofferdam to reach the level of the tunnel
- building the interface structure (the connection between the tunnels built underground and the immersed tube tunnels)
- removing the cofferdam
- seabed profiling to form the trench for the immersed tube tunnel
- placing the gravel bed for the immersed tube tunnel units to sit on
- installing the immersed tube tunnel units
- backfilling around and over the immersed tube tunnel units
- rehabilitation of the area.

Indicative construction timeframe and work activities for the temporary cofferdams

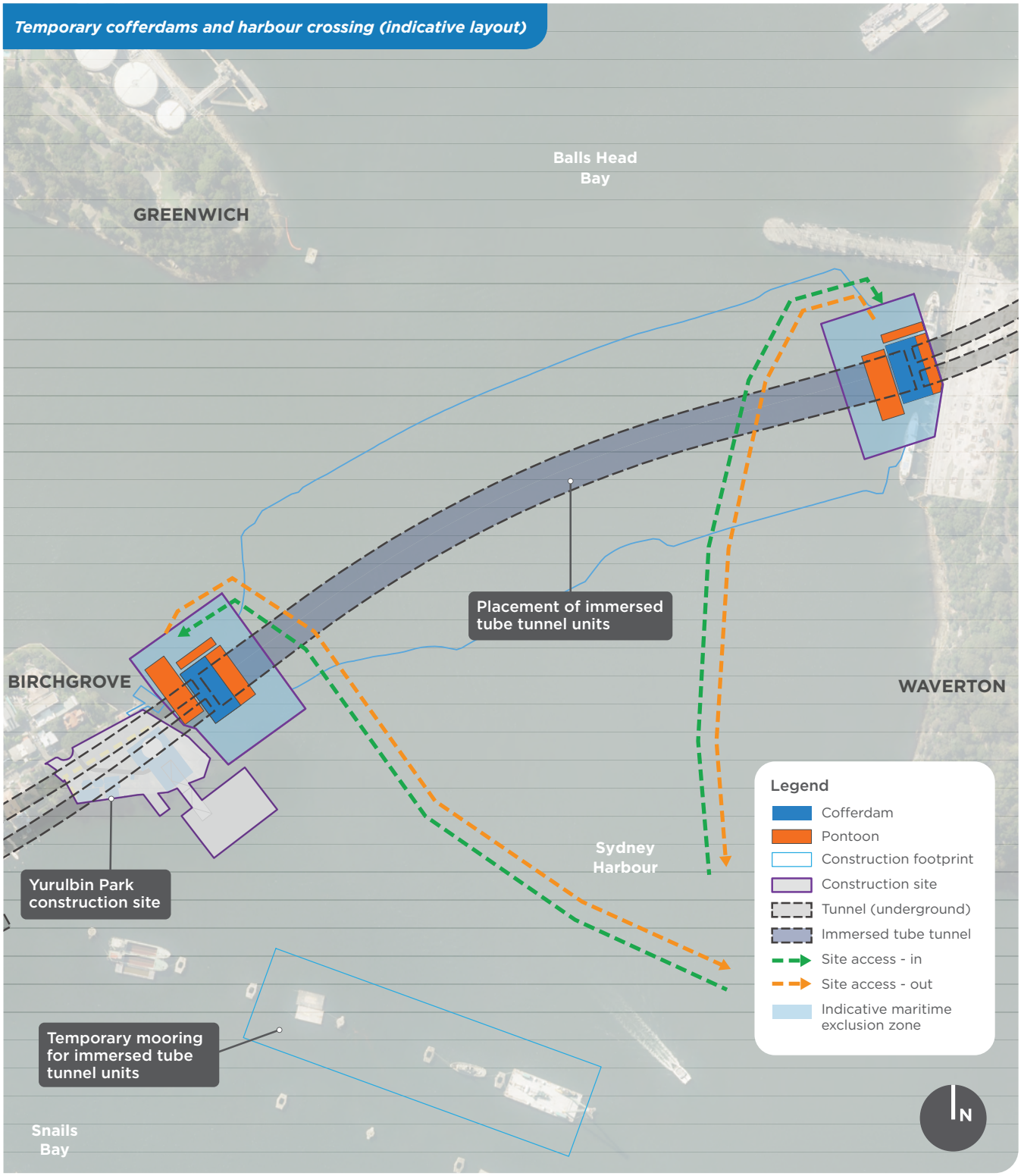


Indicative timing only

Birchgrove Wharf temporary closure during construction

We will need to temporarily close Birchgrove Wharf for the duration of construction on the harbour. Before we close the wharf we will work with local residents to understand how it is used and investigate how we can best help users continue to get to their destination while we are building. For example this could include relocating the wharf or providing transport services to another nearby wharf. Before work starts we will inform wharf users of the proposed alternative travel arrangements.

Temporary cofferdams and harbour crossing (indicative layout)



Temporary changes to navigational channels

We will be placing exclusion zones around the sites, for the safety of you and our workers when on the water.

We will have maritime speed restrictions of four knots in place around construction equipment. This will result in increased travel time of up to five minutes, based on a worst-case scenario.

Duration 	You may see us in your area for around four and a half years as we setup, carry out our construction work and then demobilise and rehabilitate the site. We will be working in the cofferdams for around two years.
Hours of work 	Our general site activities will be carried out during standard construction hours. Some activities may take place outside of standard construction hours including: • dewatering the cofferdams • seabed profiling work • removal of the cofferdam structures • installation of the immersed tube tunnel.
Traffic / vehicle movements 	Access to the site will be via Sydney Harbour only.
Vessel movements on the water 	• Eight small boats movements (about the size of a water taxi) to ferry our workers from White Bay to the site during the day and night to meet shift changes • six barge movements for transportation of spoil to the designated offshore disposal site or White Bay will be required. Transport to White Bay will only be carried out during standard construction hours, however, transport to the offshore disposal site may be carried out outside of standard construction hours • sixteen barge movements for deliveries, which could take place outside of standard construction hours. One boat or barge travelling into and out of site is counted as two movements.
Relocating ships 	We will be working with the owners of the MV Cape Don and MV Baragoola to relocate these vessels locally before work starts to allow us to build the northern cofferdam without damaging these vessels.
Balls Head Coal Loader Facility and Wharf 	We will not be impacting the Balls Head Coal Loader Facility and wharf. Our tunnelling will pass around 39 metres (11 storeys) below the facility and our work methods have been adjusted to reflect the sensitivity of this site. Please see pages 24 and 25 for more detail on the depth of tunnel in your local area. An exclusion zone will be in place around the Balls Head Coal Loader Wharf.

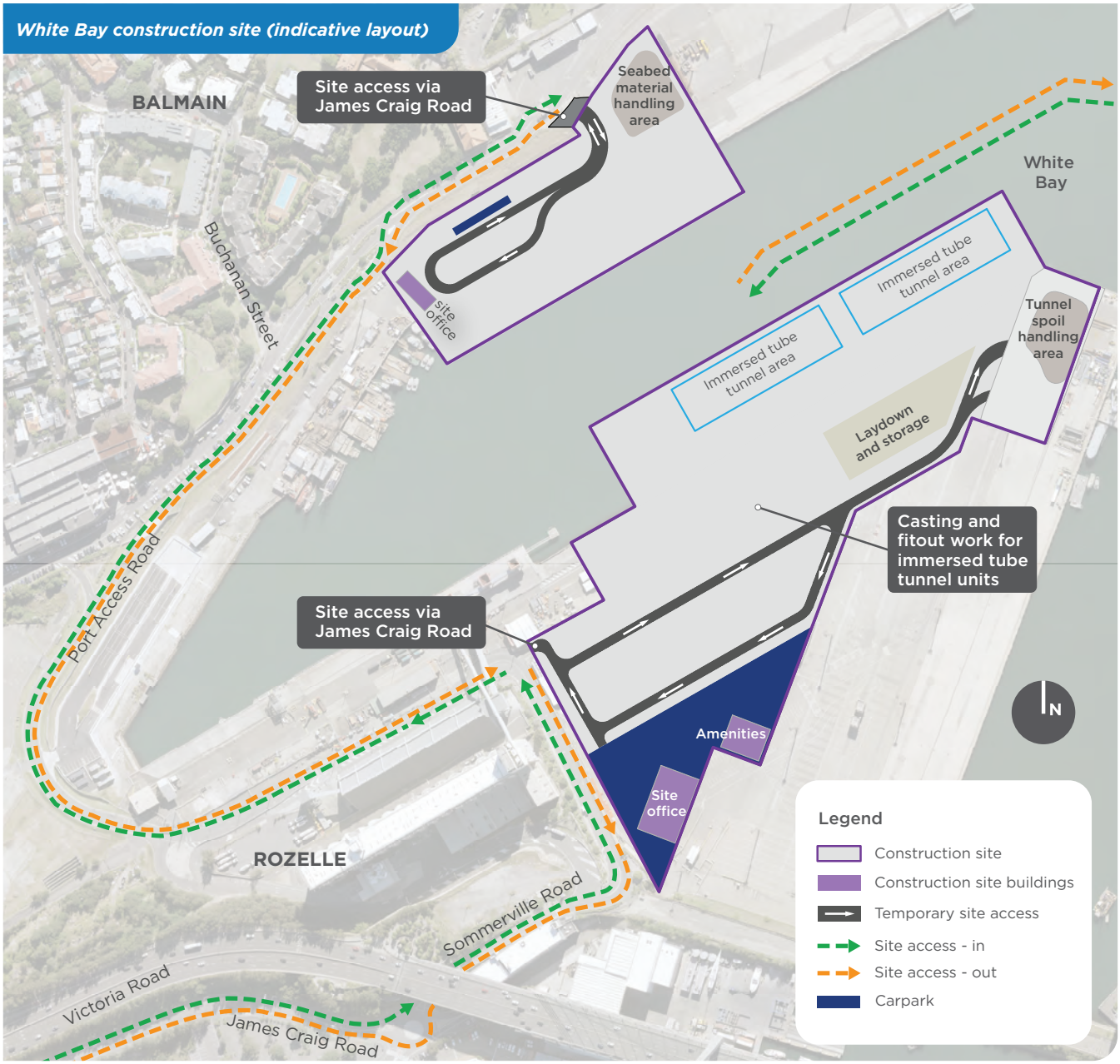
White Bay

We will be using a temporary construction site at White Bay to support our work in the harbour. The site will be built on land and we will use the existing wharf areas to house our marine vessels.

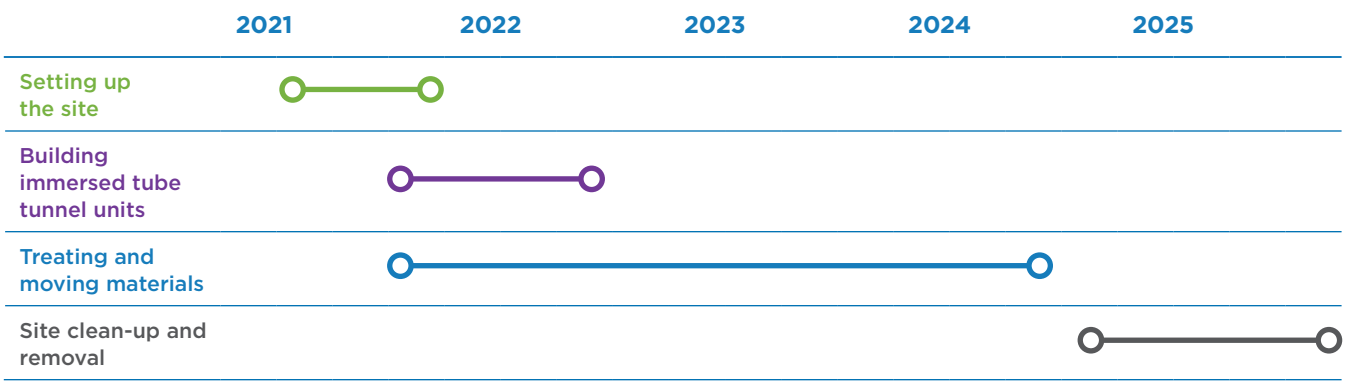
Our key activities include:

- setting up the site, including removing some structures and building a new temporary wharf, moorings, a casting and fitout facility and setting up a treatment area for seabed materials
- construction and fitout of the immersed tube tunnel units
- transporting the immersed tube tunnel units to Snails Bay (near Birchgrove) for temporary storage before they are placed in position
- treating and transferring materials removed from the seabed during seabed profiling which are not suitable for offshore disposal
- handling and transferring tunnel spoil on barges from the Yurulbin Point and Berrys Bay sites direct to trucks for haulage on to arterial roads
- storage and transport of equipment, plant and personnel for Yurulbin Point and Berrys Bay construction sites and the two cofferdams
- providing support facilities for the Rozelle Rail Yards construction site like worker parking and storage areas.

This site is key to reducing truck haulage through local streets.



Indicative construction timeframe and work activities for White Bay



Indicative timing only

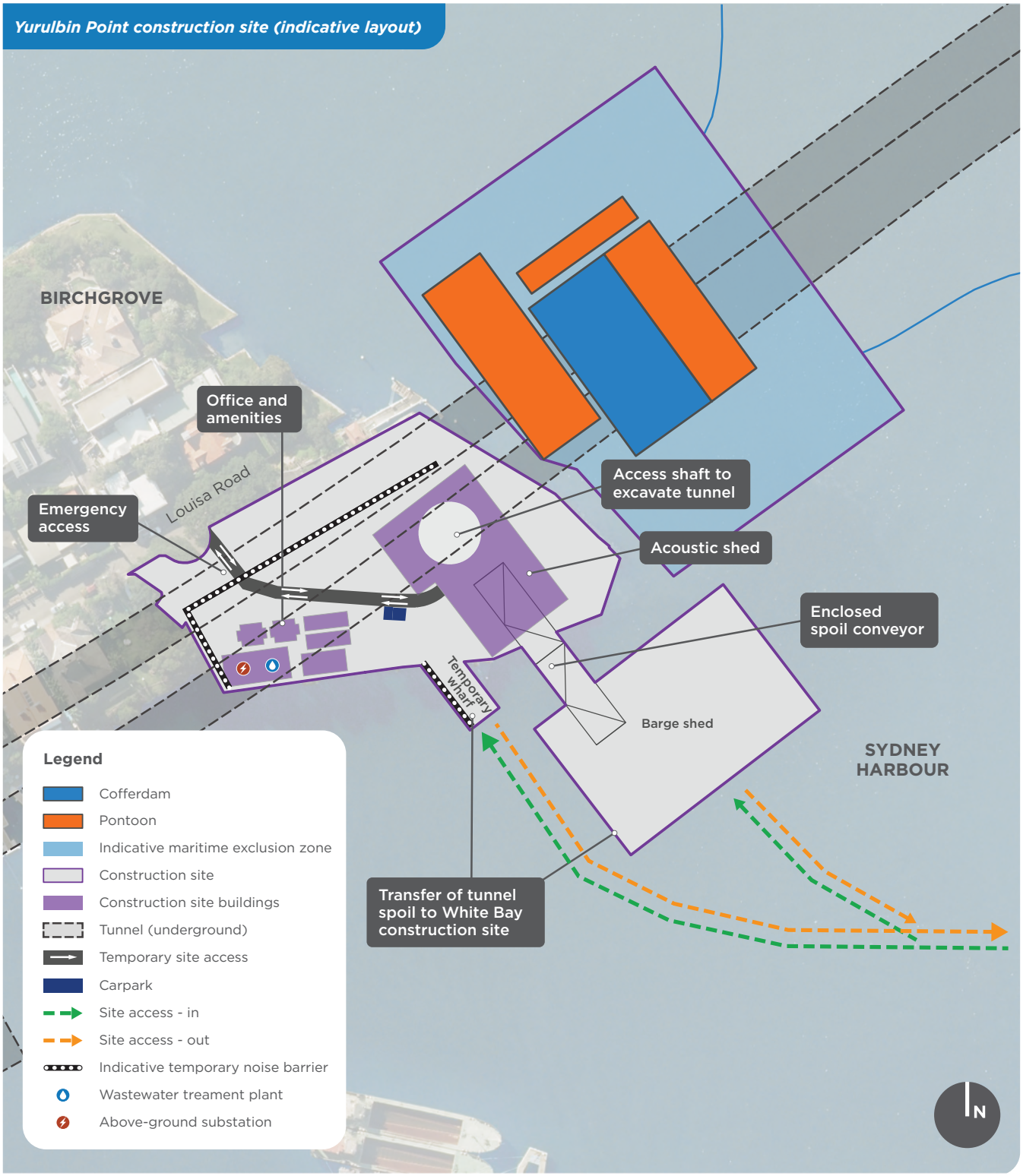
Duration	You may see us in this area over a period of around four and a half years as we setup, carry out our construction work, then demobilise the site and prepare it for its future use. The construction peak at this site will be when we are treating and moving materials for tunnelling work.
Hours of work	Our general site activities and spoil haulage will be carried out during standard construction hours. There may be occasional deliveries and some light vehicle movements outside of standard construction hours to support shift changes on the other water based sites.
Traffic / vehicle movements	Access in and out of the site will be via James Craig Road. James Craig Road provides access to the harbour and generally has low volumes of traffic. At our construction peak, there will be around 700 heavy vehicle movements and 530 light vehicle movements per day (a vehicle travelling in and out of the site is counted as two movements). Please see page 33 for information about peak vehicle movements during construction.
Vessel movements on the water	• Twenty-two small boats movements (about the size of a water taxi) to ferry our workers to the other water based construction sites (Yurulbin Point, Sydney Harbour Cofferdams and Berrys Bay) during the day and night to meet shift changes • fourteen barge movements for transportation of spoil to White Bay during standard construction hours • thirty-four barge movements for deliveries, which could take place outside of standard construction hours. One boat or barge travelling into and out of site is counted as two movements.

Yurulbin Point

We will establish a temporary construction site at Yurulbin Point to support tunnelling work using roadheaders and tunnel fitout.

We will be using a combination of land and water areas for this site. The site will be supported by the White Bay construction site.

We have engaged the original landscape architect who designed Yurulbin Park to assist us with the site layout to protect key features of the park during construction. We are also working with him on the enhancement and refurbishment of the open space after our work has been completed, to realise his original vision for the park.

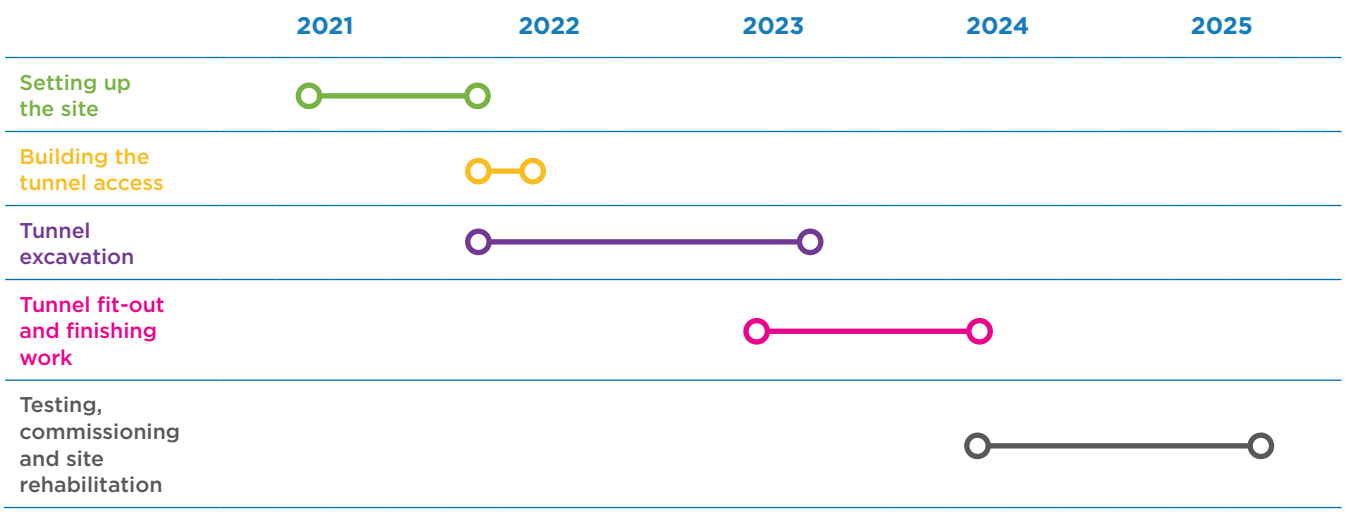


Artist's impression of Western Harbour Crossing and Yurulbin Point construction site

Our key activities include:

- removing some trees as part of early work and site establishment
- constructing temporary wharves for transport of tunnel spoil material by barge so we can avoid heavy vehicle movements on Louisa Road
- excavating the tunnel access
- tunnelling, including the main tunnels towards Rozelle, cross passages and breaking through to the cofferdam for connection to the immersed tube tunnel
- treating wastewater from tunnelling activities
- storing, handling and transporting materials via barge to the White Bay site
- accessing the tunnel underground to do finishing work on the tunnel, like electrical and mechanical fit out
- testing, commissioning and site rehabilitation.

Indicative construction timeframe and work activities for Yurulbin Point



Indicative timing only

Duration

You may see us in your area for around four and a half years as we setup, carry out our construction work, then demobilise the site and prepare it to be returned as a park for community use.

Hours of work

We will be tunnelling 24 hours a day, seven days a week. Once we are tunnelling, the majority of the work will take place underground and activity on the surface will reduce. Based on our planned tunnelling rate we expect the impact from tunnelling to be minimal for residents as we will only be working under each property for about one week.

When tunnelling, our work will be as deep as 42 metres (12 storeys) at Yurulbin Park. Please see pages 24 and 25 for more detail on the depth of tunnel in your local area.

The majority of our work on the surface takes place inside the acoustic shed, which manages the potential impacts of noise, dust and light. These sheds are also closed at night to further reduce noise. There may be occasional deliveries and some light vehicle movements outside of standard construction hours.

Spoil transport via barges will only take place during standard construction hours.

Traffic / vehicle movements

Access to the site will be via Sydney Harbour only.

We will only use Louisa Road, Birchgrove in an emergency.

Vessel movements on the water

- Eight small boat movements (about the size of a water taxi) to ferry our workers from White Bay to the site during the day and night to meet shift changes
- four spoil barge movements for transportation of spoil to White Bay during standard construction hours
- twelve barge movements for deliveries, which could take place outside of standard construction hours.

One boat or barge travelling into and out of the site is counted as two movements.

Impacts to the park

Yurulbin Park and the existing carpark will be temporarily closed during construction.

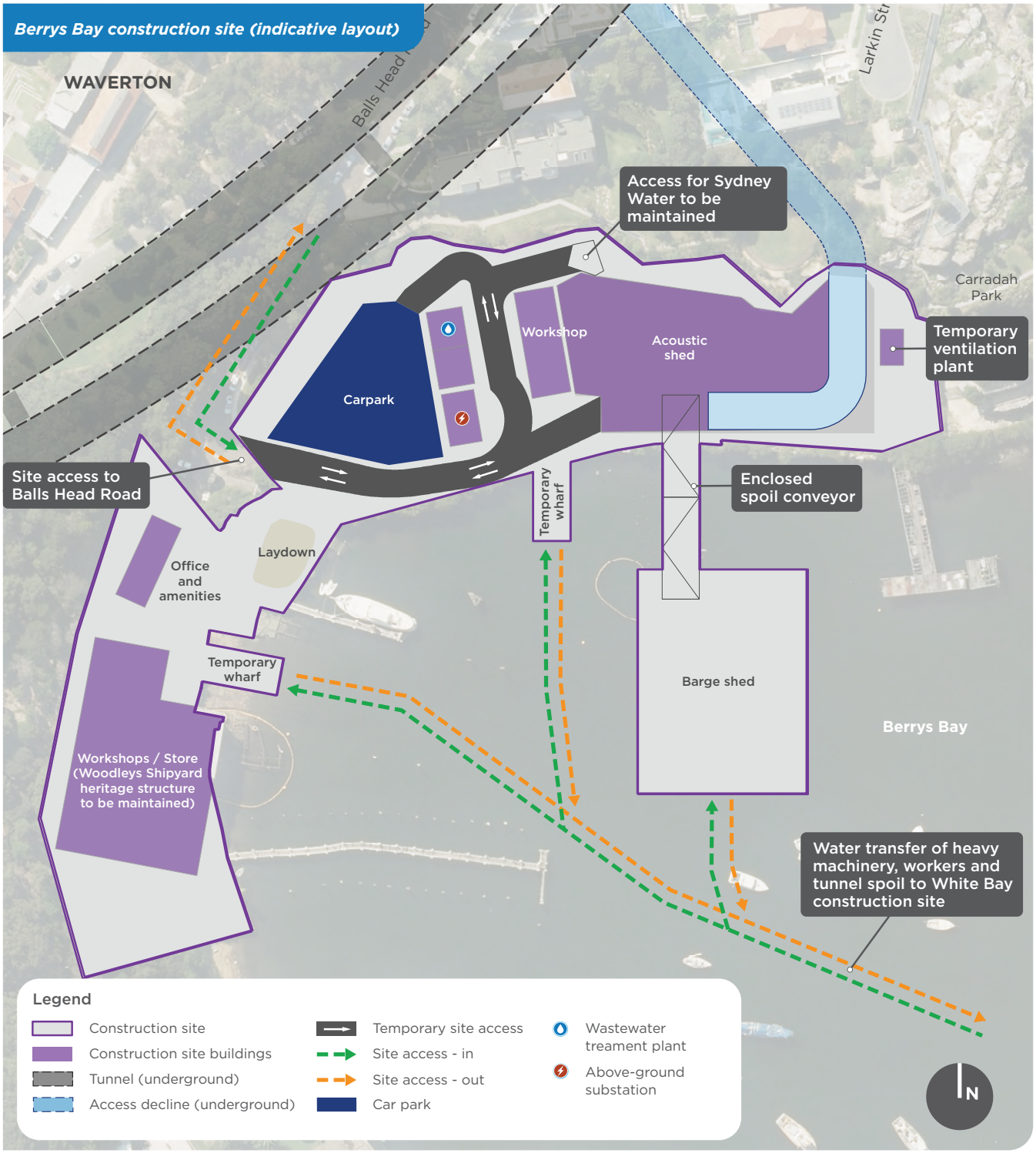
We have designed the site in consultation with the original landscape architect (Mr Bruce Mackenzie AM) to ensure it is sensitive to key features of the site.

We are continuing to work with Mr Mackenzie to bring the original vision of the park to life after our work is complete.

Berrys Bay

We will be using Berrys Bay as a temporary construction site to support our tunnelling work. The site will be built both on land and in the water.

We will use the construction site to establish and construct access for the excavation of the tunnels (including connecting the land tunnel to the immersed tube tunnel). The land tunnels will be excavated in both directions from this site, towards the harbour and back towards the Warringah Freeway.



Our key activities include:

- setting up the site, including removing some structures and building a new wharf and acoustic shed. We will retain and reuse as many of the structures as possible, including the Woodley's boatshed
- building temporary wharves to support transporting workers and materials via the water and reduce the numbers of trucks needed on local roads
- building the tunnel access
- tunnelling, including the tunnels towards the Warringah Freeway, cross passages and breaking through to the cofferdam for connection to the immersed tube tunnel
- storing, handling and transporting materials via barge to the White Bay site
- finishing work on the tunnel like electrical fit out and lighting
- testing, commissioning and site rehabilitation.
- rehabilitating the site to provide new public open space.

Future use of Berrys Bay

We understand the importance of Berrys Bay as part of the Sydney Harbour foreshore. We will work closely with the community to design and shape the future of Berrys Bay after we have finished construction.

We will have a dedicated consultation period seeking your input on the future of Berrys Bay, which will be a separate process to this EIS.

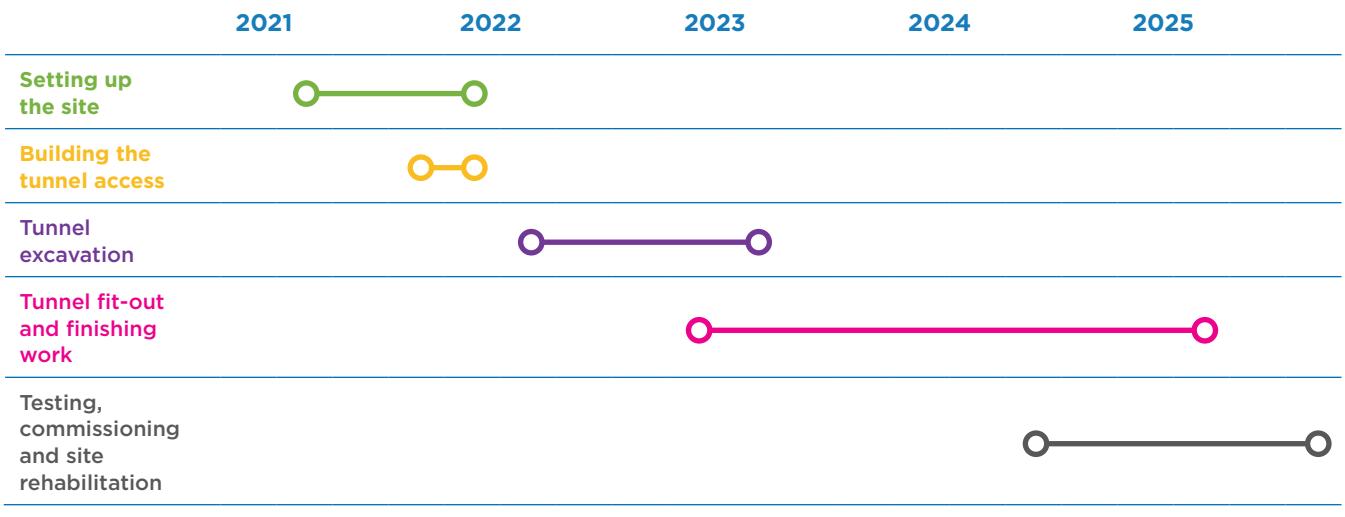
We are committed to working with the community and key stakeholders to understand their views, so we can provide facilities that consider the diverse needs of the community.

We plan to start engaging with you this year ahead of construction starting. We are committed to working with you to understand your views and deliver an area for all of the community to enjoy.

As part of this process, we will establish a reference group, with representative stakeholder groups, the community and independent experts, to support us with the development of the Berrys Bay open space.

To register your interest in the future use of Berrys Bay and be kept up to date please call us on **1800 931 189** or email **whtbl@transport.nsw.gov.au**.

Indicative construction timeframe for Berrys Bay



Indicative timing only

Duration 	You may see us in this area for around four and a half years as we setup, carry out our construction work, then demobilise the site and prepare it to be returned to the community. We will be working with the community and stakeholders to develop the design of the new open space.
Hours of work 	We will be tunnelling 24 hours a day, seven days a week. Once we are tunnelling, the majority of the work will take place underground and activity on the surface will reduce. Based on our planned tunnelling rate we expect the impact from tunnelling to be minimal for residents as we will only be working under each property for about one week. When tunnelling, our work will be as deep as 39 metres (11 storeys) at Balls Head Drive. Please see pages 24 and 25 for more detail on the depth of tunnel in your local area. The majority of our work on the surface takes place inside the acoustic shed, which manages the potential impacts of noise, dust and light. These sheds are also closed at night to further reduce noise. There may be occasional deliveries and some light vehicle movements outside of standard construction hours.
Traffic / vehicle movements 	We will be limiting the impact on local roads by accessing the site by water where possible. Marine vessels will use Sydney Harbour to transport spoil. Some construction traffic will need to access the site via Balls Head Road. The construction peak at this site will be during tunnelling work. At our construction peak, there will be around 55 heavy vehicle movements and 210 light vehicle movements per day (a vehicle travelling in and out of the site is counted as two movements). Please see page 33 for information about peak vehicle movements during construction.
Vessel movements on the water 	• Six small boat movements (about the size of a water taxi) to ferry our workers from White Bay to this site during the day and night to meet shift changes • six spoil barge movements for transportation of spoil to White Bay during standard construction hours • six barge movements for deliveries, which could take place outside of standard construction hours. One boat or barge travelling into and out of site is counted as two movements.
Moorings in Berrys Bay 	We will need to temporarily relocate some swing moorings during our work. If you have a boat moored here, we will be in contact with you before any work is carried out. All moorings will be relocated to an appropriate alternative site.
Woodley's boatshed 	Woodley's boatshed will be used as a temporary storage area during our work. Some minor structural work may be carried out to ensure the structure is safe. It will remain in place once we have finished our work.
Beach access 	We will improve access to the beach area next to the former quarantine station during construction. We will also work with North Sydney Council on providing boat and kayak storage racks at the beach.
Final form 	We understand the importance of the Berrys Bay area and we are committed to creating new public open space once our project is completed. We will have a dedicated consultation period seeking your input on the future of the Berrys Bay site, which will be a separate process to this EIS. We plan to start engaging with you this year ahead of construction starting. We are committed to working with you to understand your views and deliver an area for all of the local community to enjoy. As part of this process, we will establish a reference group, with representative stakeholder groups, the community and independent experts.

Warringah Freeway

We will be establishing a number of temporary construction sites along the Warringah Freeway. Most of these sites will be small support sites to store materials and equipment and include construction worker amenities.

We will locate larger sites at the Cammeray Golf Course and Ridge Street North.

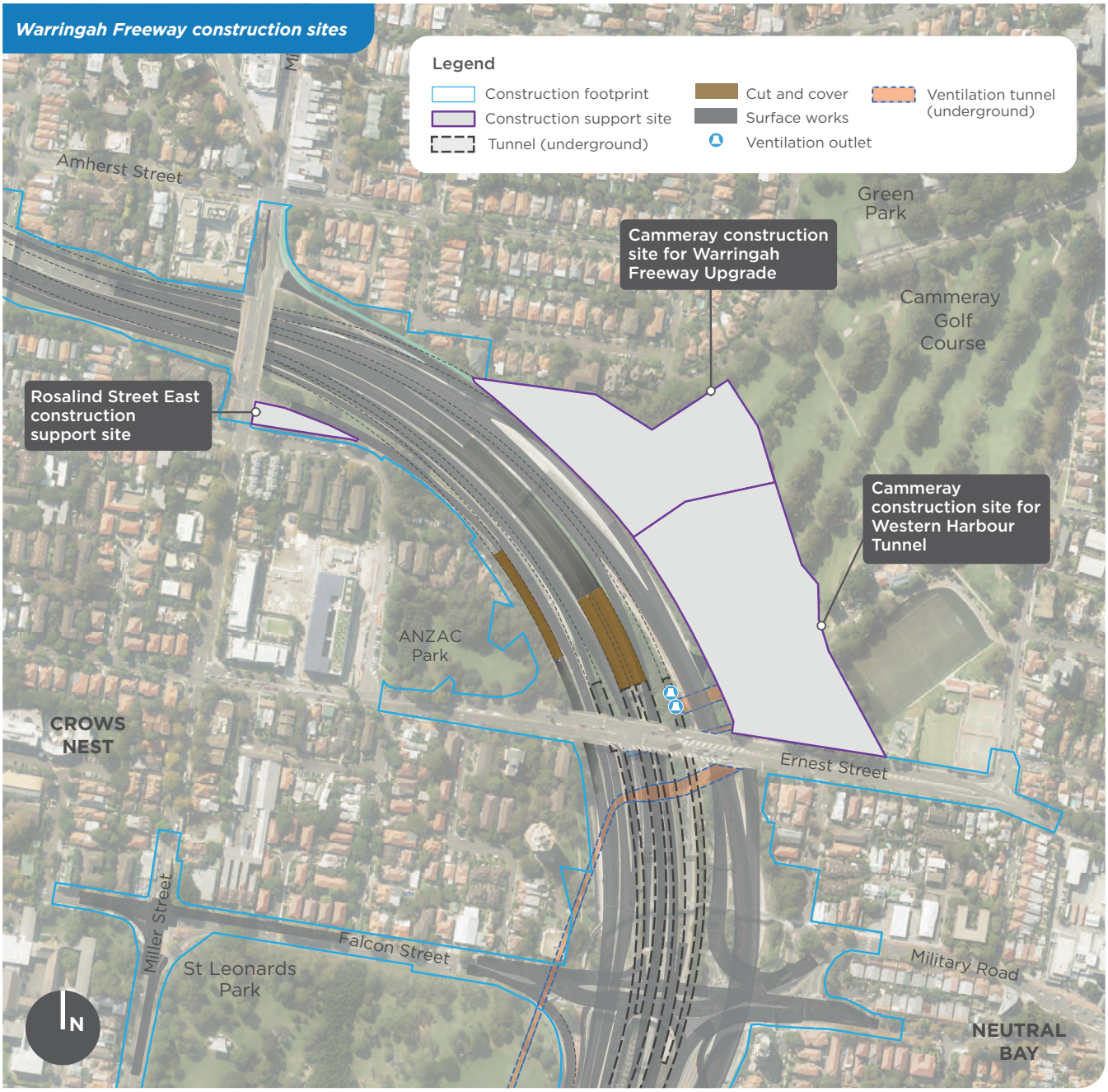
Our sites will provide support for:

- bridgework
- general road work including widening of existing roads and building new pavement
- upgrades to local roads and intersections.

Our set-up of these sites will vary slightly, and may include:

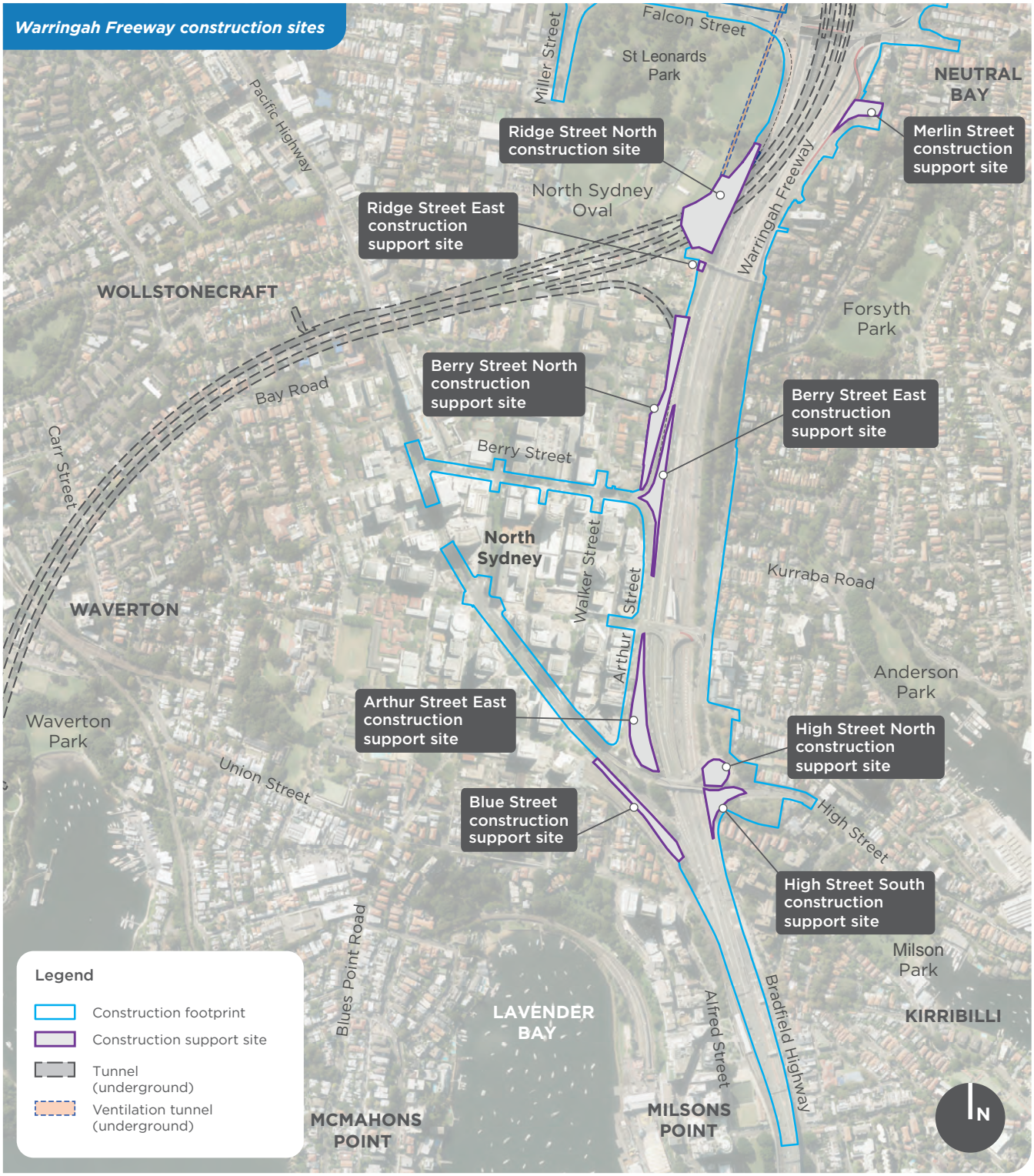
- site offices
- staff amenities
- car parking for construction vehicles
- laydown facilities
- space for storage of plant, materials and equipment.

Because a lot of the work along the Warringah Freeway will need to be carried out at night to minimise disruption to this critical transport link, these sites will be operational outside of standard construction hours.



We will:

- provide direct access to Warringah Freeway and main roads to reduce the impact on your local roads
- minimise the impact of the project footprint at the Ridge Street North construction site so you can continue to enjoy access and use of St Leonards Park
- minimise private property impacts
- continue to work with Cammeray Golf Club to keep the course open while we are building and after completion. We have included provisions for the golf course to remain open as a compliant nine hole course, if desired. We have also revised the design in this area to reduce the size of our construction and permanent footprint from the Proposed Reference Design released in 2018. The final layout of the course will be determined by the Cammeray Golf Club.



Cammeray

We will be setting up two temporary construction sites co-located at the Cammeray Golf Course, next to the Warringah Freeway. One site will be used to support the tunnelling activities for the Western Harbour Tunnel and the second for the Warringah Freeway Upgrade. This site may also be used by the Beaches Link contractor.

We will be using a portion of the Cammeray Golf Couse, next to the Warringah Freeway, during construction and for some permanent facilities. This has allowed us to minimise the number of residential properties we need to acquire for this project and to keep the Warringah Freeway flowing while we make it a little wider in this location.

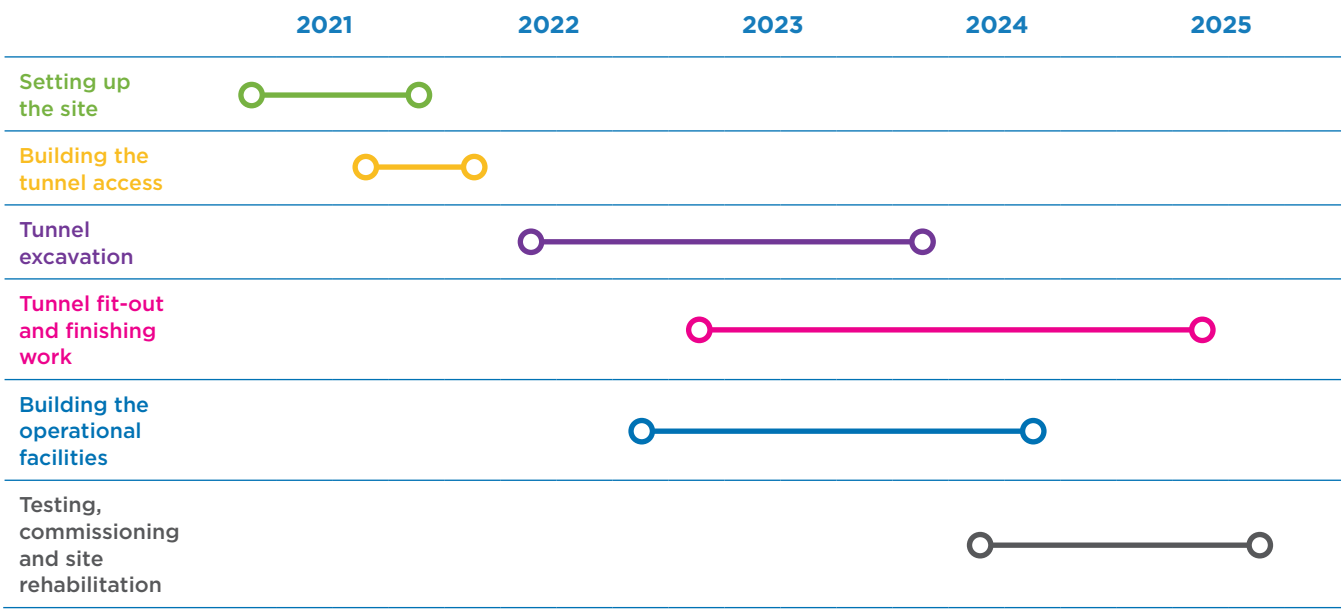
We have also changed the design by moving our motorway control centre from the site to the Artarmon Industrial area to minimise our footprint and leave as much open space as we can once the tunnel is operational.

We are continuing to work with the Cammeray Golf Club to minimise impact to the people using the course.

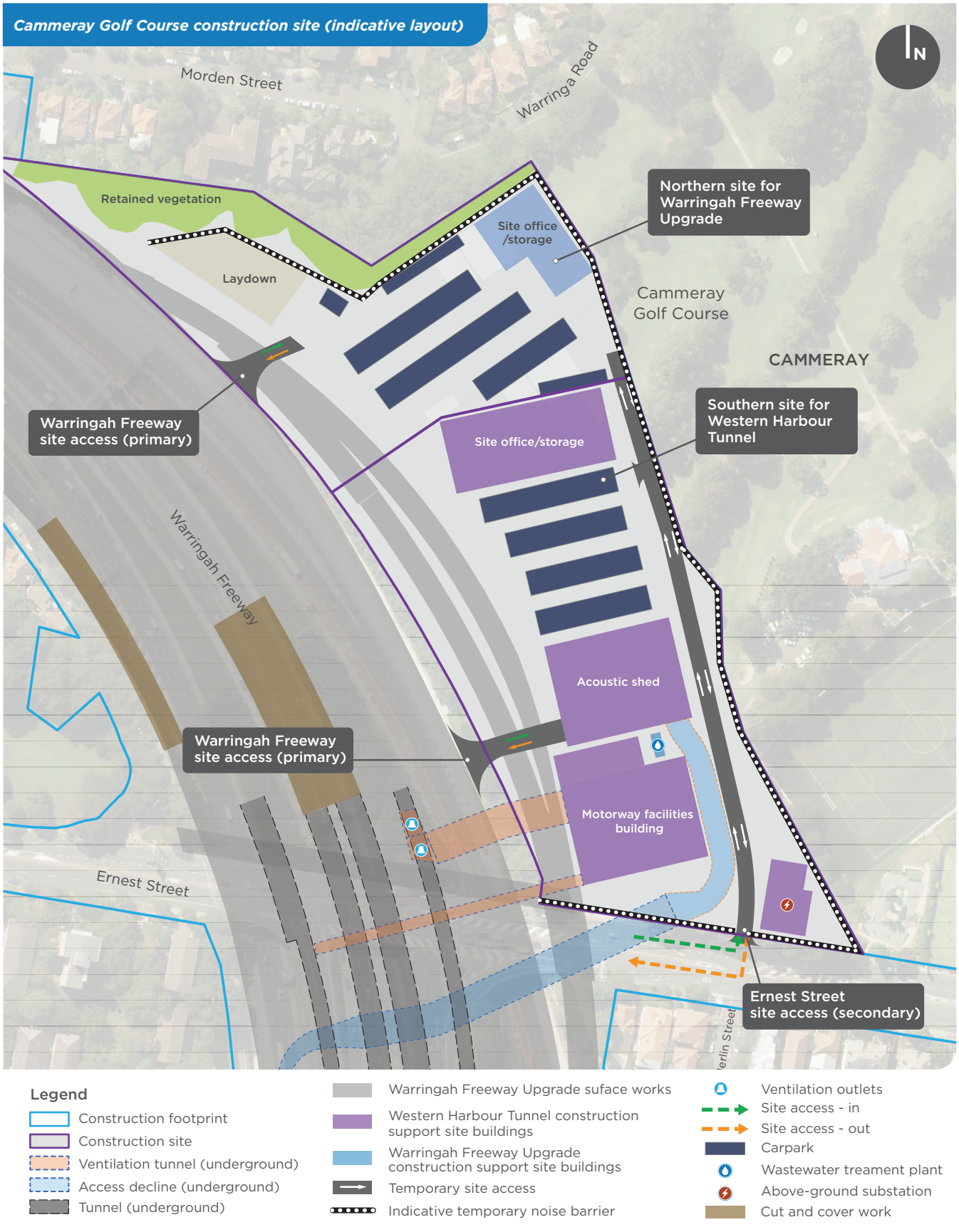
Our key activities include:

- setting up the site, including removing vegetation and carrying out earthworks
- constructing the acoustic shed for tunnelling work
- excavating the tunnel access
- tunnelling, including the main tunnel towards Waverton, ventilation tunnels, cross passages and ramps
- building the motorway facilities, including the electrical substation and fan rooms
- relocating utilities
- local widening of the Warringah Freeway to make space for the Western Harbour Tunnel and Beaches Link portals
- construction of cut and cover structures for the Western Harbour Tunnel and the Beaches Link (within the Warringah Freeway corridor). Beaches Link is subject to a separate environmental assessment and approval
- supporting construction of the Western Harbour Tunnel and the Beaches Link ventilation outlets within the Warringah Freeway corridor
- treating wastewater from tunnelling activities for reuse and disposal offsite
- storing, handling and transporting materials, including tunnel spoil
- finishing work on the tunnel like electrical and mechanical fit outs
- relocating the existing water harvesting dam within the Cammeray Golf Course, which forms part of the North Sydney Council stormwater harvesting scheme
- testing and commissioning of the tunnel and facilities and site rehabilitation for return to Cammeray Golf Club after construction.

Indicative construction timeframe for Cammeray



Indicative timing only


Cammeray Golf Course construction site (indicative layout)
N
Morden Street
Warringa Road
Retained vegetation
Laydown
Site office /storage
Northern site for Warringah Freeway Upgrade
Cammeray Golf Course
CAMMERAY
Warringah Freeway site access (primary)
Site office/storage
Southern site for Western Harbour Tunnel
Warringah Freeway
Acoustic shed
Warringah Freeway site access (primary)
Motorway facilities building
Ernest Street
Ernest Street site access (secondary)
Legend
Construction footprint
Construction site
Ventilation tunnel (underground)
Access decline (underground)
Tunnel (underground)
Warringah Freeway Upgrade suface works
Western Harbour Tunnel construction support site buildings
Warringah Freeway Upgrade construction support site buildings
Temporary site access
Indicative temporary noise barrier
Ventilation outlets
Site access - in
Site access - out
Carpark
Wastewater treament plant
Above-ground substation
Cut and cover work

Duration 	You may see us in this area for up to five years as we setup, carry out our construction work, then demobilise the site and prepare it for its future use. We have adjusted our sites and included provisions for the golf course to remain open as a compliant nine-hole course, which will be determined by the Cammeray Golf Club. The construction peak at the northern portion of this site will be during the cut and cover work and tunnelling work at the southern portion.
Hours of work 	We will be tunnelling 24 hours a day, seven days a week. Once we are tunnelling, the majority of the work will take place underground and activity on the surface will reduce. Based on our planned tunnelling rate we expect the impact from tunnelling to be minimal for residents as we will only be working under each property for about one week. The majority of the tunnelling work on the surface at this site takes place inside the acoustic shed, which manages the potential impacts of noise, dust and light. These sheds are also closed at night to further reduce noise. There may be occasional deliveries and some light vehicle movements outside of standard construction hours. To ensure we are working safely and keeping traffic moving during peak periods we will need to carry out a lot of work outside standard construction hours, during the evening and night.
Traffic / vehicle movements 	Access to the site will be mainly via the Warringah Freeway. Two dedicated construction vehicle only access points will be built to provide direct access to the motorway. We will also have an alternative access via Ernest Street, Cammeray. This will be at the Ernest Street/Merlin Street intersection, which will be upgraded. The upgrade of this intersection will mean the temporary removal of some car parking spaces during construction. At our construction peak, there will be around 485 heavy vehicle movements and 480 light vehicle movements per day (a vehicle travelling in and out of the site is counted as two movements). Please see page 33 for information about peak vehicle movements during construction. Warringah Freeway currently carries over 250,000 vehicles each day. Once construction is underway, trucks will be moving directly onto the Warringah Freeway.

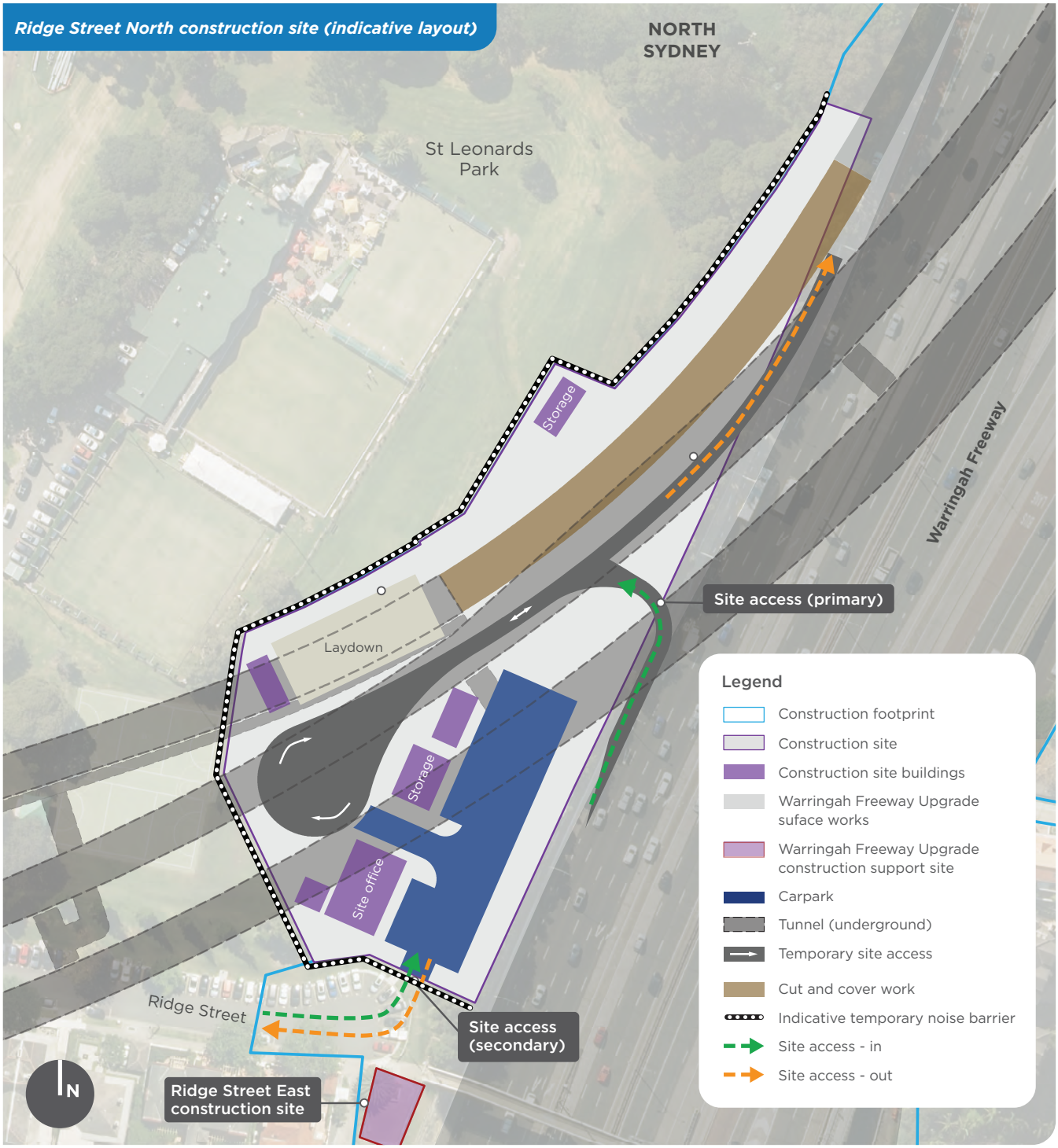
Warringah Freeway, Crows Nest

Ridge Street North

We will have a temporary construction site located at Ridge Street North. We will use this site to support the construction of the Western Harbour Tunnel off ramp to Falcon Street and the upgrade of the Ridge Street shared user bridge at St Leonards Park.

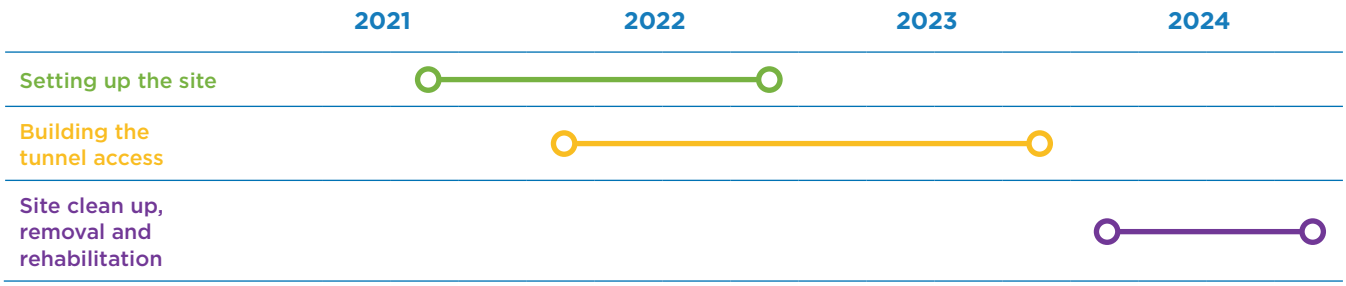
Our key activities include:

- building a Western Harbour Tunnel off ramp to Falcon Street. This is a cut and cover and trough structure we will be building by digging a rectangular hole and covering with with concrete or steel.
- surface work to integrate the Falcon Street off ramp
- supporting the upgrade of the Ridge Street shared user bridge.



Duration	You may see us in this area for around four years as we setup, carry out our construction work, then demobilise the site and prepare it to be returned as public open space.
Hours of work	Our general site activities including cut and cover work will be carried out during standard construction hours. There may be occasional activities, such as the connection of the new road works to the existing network, which occur outside of standard construction hours.
Traffic / vehicle movements	Access in and out of the site will be primarily via Warringah Freeway. Access to the site via Ridge Street will be provided for light vehicles and during site establishment. The upgrade of this access at the end of Ridge Street will mean the temporary removal of some car parking spaces during construction. The construction peak at this site will be during cut and cover work, as part of building the tunnel access. Please see page 33 for information about peak vehicle movements during construction.
Final form	We will be returning this site as public open space. We will work with North Sydney Council and the community as to what the future site will look like. We understand this area is an important space for the North Sydney community. We have worked to consolidate construction activity at the Cammeray Golf Course site to minimise impact at St Leonards Park and will not be impacting on The Greens, the War Memorial, basketball courts and playing fields.

Indicative construction timeframe for Ridge Street North



Indicative timing only

Warringah Freeway minor support sites

Duration

You may see us in this area for around five and a half years as we upgrade the Warringah Freeway and carry out Western Harbour Tunnel work. This will include our setup, carrying out our construction work, then as we demobilise the site and prepare it for its future use.

Hours of work

To ensure we are working safely and keeping traffic moving we will need to carry out a lot of work outside standard construction hours, during the evening and night.

Traffic / vehicle movements

We have outlined the predicted impacts for the different smaller sites. Please note:

- a vehicle travelling in and out of the site is counted as two movements
- light vehicles include cars and utes
- heavy vehicles include trucks, machinery and equipment.

Please see page 33 for information about peak vehicle movements during construction.

Blue Street

Access in and out of the site will be via Blue Street and the Pacific Highway. At our construction peak, there will be about 315 light vehicle movements and 10 heavy vehicles movements daily.

We will maintain access to the rail corridor for all Sydney Trains contractors during construction.

High Street South

Access in and out of the site will be via High Street to the west. At our construction peak, there will be about 80 light vehicle movements and 15 heavy vehicles movements daily.

High Street North

Access in and out of the site will be via High Street to the west. At our peak, there will be about 65 light vehicle movements and 10 heavy vehicles movements daily.

Our work will mean we will need to permanently remove around 100 parking spaces on Alfred Street North. After our work is complete, we will replace these with around 20 new parking spaces. We will work with North Sydney Council on the implementation of these traffics changes.

Arthur Street East

Access in and out of the site will be via Arthur Street to the west with pedestrian access for personnel provided from Arthur Street. At our construction peak, there will be about 135 light vehicle movements and 10 heavy vehicles movements daily.

Berry Street North

Access in and out of the site will be via Berry Street and out of the site via Warringah Freeway. At our construction peak, there will be about 30 light vehicle movements and 130 heavy vehicle movements daily.

Berry Street East

Access in and out of the site will be via Berry Street to the west and vehicles leaving the site will be able to travel north via an access onto the Warringah Freeway. At our construction peak, there will be about 30 light vehicle movements and 30 heavy vehicles movements daily.

Traffic / vehicle movements

Ridge Street East

Access in and out of the site will be via Ridge Street to the north. Pedestrian and cyclist access across the Warringah Freeway will be maintained via the old bridge, until the new crossing is completed. At our construction peak, there will be about 70 light vehicle movements and 20 heavy vehicles movements daily.

We need to provide suitable access to our support sites. This will mean the temporary removal of some car parking spaces along Ridge Street during construction.

Merlin Street

Access in and out of the site will be via Military Road and Merlin Street. Some work associated with building the new southbound bus lane bridge will result in temporary disruptions to private property access. We will work with closely with you to minimise this impact.

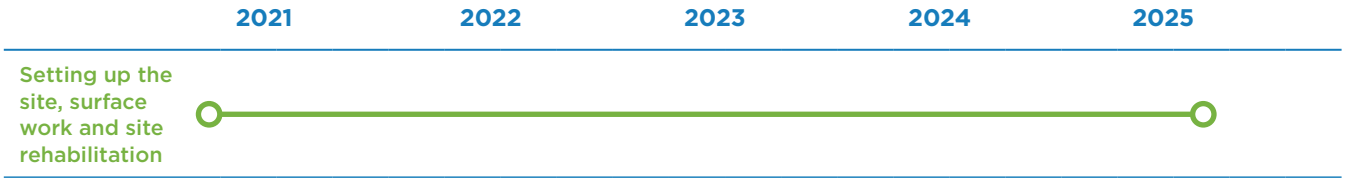
At our construction peak, there will be about 150 light vehicle movements and no heavy vehicle movements daily.

We need to provide suitable access to our support sites. This will mean the temporary removal of some car parking spaces along Merlin Street during construction.

Rosalind Street East

Access in and out of the site will be via Miller Street to the east and Rosalind Street to the south. No access will be permitted via Anzac Avenue. At our construction peak, there will be about 205 light vehicle movements and 15 heavy vehicles movements daily.

Indicative construction timeframe for Warringah Freeway minor support sites



Indicative timing only

Keeping the Warringah Freeway moving

The Warringah Freeway is one of Australia's busiest roads; currently carrying over 250,000 vehicles a day and over 100,000 bus passengers. Upgrading this vital road corridor presents us with some challenges.

We need to keep traffic moving while we work. To do this we will need to carry out a lot of work outside standard construction hours, during the evening and night.

Once the project is complete, you will enjoy a safer and more reliable journey.

For more information on how we will manage impacts during our night work please see section 3 on noise and vibration and traffic.

Artarmon

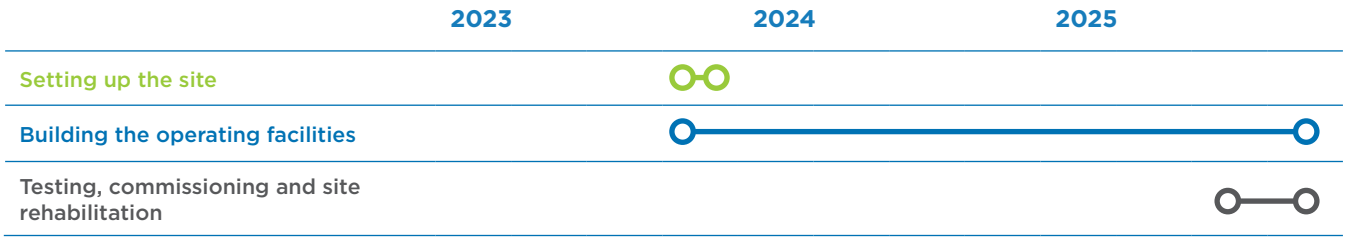
We will use the Waltham Street temporary construction site for building and housing the motorway control centre for the Western Harbour Tunnel. The motorway control centre will operate 24 hours a day and play a vital role in monitoring and responding to conditions in our tunnels and on surface roads.

While we are building the motorway control centre, the site will also be used for equipment laydown, car parking for our construction vehicles and temporary site office buildings.

Our key activities include:

- excavating and installing the footing and base concrete slab
- building concrete columns, deck and roof
- internal fitout of control rooms, computer rooms, offices and workshop and associated worker amenities
- installing security fencing
- landscaping and planting around the site.

Indicative construction timeframe for Waltham Street



Indicative timing only

Duration	You may see us in this area for around two and a half years as we set-up, carry out our construction work and then demobilise the site.
Hours of work	Our general site activities will be carried out during standard construction hours.
Traffic / vehicle movements	Access in and out of the site will be via Waltham Street. The construction peak at this site will be when we are building the operating facilities. At our construction peak, there will be around 65 heavy vehicle movements and 180 light vehicle movements per day (a vehicle travelling in and out of the site is counted as two movements). Please see page 33 for information about peak vehicle movements during construction. So we have suitable access to this site, we need to temporarily remove around 10 parking spaces on Dickson Avenue/Waltham Street.

Vehicles and public transport crossing the Sydney Harbour Bridge

Our assessments

Traffic and transport

By improving capacity, supporting public transport and providing new direct routes and reliability, this project will improve journey times for freight, public transport and motorists, and alleviate pressure on some of our city's most critical transport corridors.

Assessment

We have carried out a detailed traffic and transport assessment to help us make predictions about future traffic conditions. The traffic modelling considers future population growth, land use, and other major road network and public transport projects to anticipate the impact of the project on the transport network.

Our assessments looked at road traffic, local roads and parking, public transport, pedestrians and cyclists, and maritime traffic. In addition to the benefits the project will deliver, we also investigated and assessed the potential impact to the local and wider road network and to vessels on the harbour; both while we are building and when we are open to traffic.

Keep
trucks off
local streets

When we are building

Travel times

We are not expecting substantial changes to your travel times while we are working.

Some areas may temporarily experience minor short term delays due to:

- an increase of construction vehicles sharing the road
- temporary changes to local roads and temporary bus lane closures
- temporary changes to speed limits
- temporary changes to on street parking.

Our assessment shows we will have a limited impact on the public transport network around our projects, except at Birchgrove, where there will be a temporary impact to the wharf during construction. Please see page 44 for more information.

We will need to make some short-term changes to bus stop locations and routes. This may include temporarily moving bus stops by a few hundred metres while work is being carried out or temporarily changing routes to avoid construction work. This may cause some minor increases in bus travel times at certain phases of our work. You will be notified well in advance of any disruptions or changes.

Traffic changes near you

Shaping the future of our city is no small task and you may notice some changes to traffic and transport while we are working. We know our work can be disruptive and delays can be frustrating for you and we are committed to reducing our impact wherever we can.

Where possible, our construction sites have been located on motorways or main roads, to minimise the use of local streets for trucks moving materials to and from the sites.

We will continue working closely with the Transport for NSW Sydney Coordination Office, Port Authority of NSW, local councils, emergency services and bus operators to ensure we work together to minimise traffic and transport impact. This includes:

- working with other transport projects to coordinate our work
- minimising construction vehicle movements during peak traffic times
- minimising heavy vehicle movements on local roads
- managing vehicle access to construction sites to ensure pedestrian, cyclist and motorist safety
- using clear signage and line markings to make it easier for you to navigate around our construction sites
- carrying out partial or full road closures outside peak times or during the night where possible
- making information available to help you plan your journey.

Our priority during construction is to ensure you can move safely around the area.

For more information about where trucks will be moving around the sites, please see section two of this document.

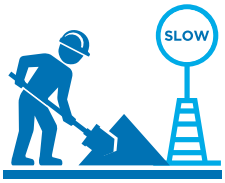
Worker parking

We know from our earlier engagement you are concerned about workers parking in local streets and community car parks.

We are providing dedicated parking at most of our sites to reduce the need for worker vehicles to park in local streets.

We may also provide a worker shuttle bus to and from some of our sites where parking is not available because of limited space.

While we will be encouraging our workers to use public transport to access the worksites, due the nature of their work and the tools they need to carry, some of them will still need to use vehicles for site access at times.



Clear signage around construction sites

Keeping you informed about traffic changes

We will continue to engage with you when we are building. This will include communication before the start of work to keep you informed of what we are doing in your area and on our roads, and any likely impact.

When we are open to traffic

Once open you will benefit from improved traffic conditions, improved travel times, less congestion, improved safety, as well as better pedestrian and cycle paths and open spaces.

Travel times

As well as helping motorists, the reduced congestion and travel times will improve travel times for bus commuters, providing you with more options to choose how you move around Sydney.

up to 20 minutes from Sydney Park to North Sydney

up to 20 minutes from Leichhardt to North Sydney

up to 15 minutes from North Sydney to Sydney Kingsford Smith Airport

Travel time savings

We will carry out a review of the operational road network about 12 months and again at five years after the project is open to confirm the operational impact of the project.

Sydney Harbour

Maritime movements

You will notice some increase in harbour maritime traffic when we are building the immersed tube tunnels for the harbour crossing.

We will manage our work to minimise interruptions to port operations and the navigation of ships and ferries within Sydney Harbour.

If you spend time on the water you may notice us:

- moving around on barges, tugboats and smaller sea vessels
- temporarily restricting maritime speeds around construction areas and our sites
- temporarily relocating swing moorings at Berrys Bay and using the mooring at Snails Bay for our immersed tube tunnel units
- establishing and operating construction sites at Yurulbin Point and Berrys Bay
- establishing two cofferdams, one off Yurulbin Point at Birchgrove and one off the Coal Loader at Waverton
- implementing exclusion zones around the north and south cofferdams at Birchgrove and Waverton – reducing navigational width
- seabed profiling activities in preparation for the installation of immersed tube tunnel units
- partially closing Sydney Harbour between Birchgrove and Waverton for a period of up to 48 hours at a time when we install the immersed tube tunnel units.

Reducing our impact

We will work closely with recreational users, community groups, cruise traffic, commercial enterprises, water taxis, ferry services, Royal Australian Navy, and other government agencies while we build on the water. We will:

- operate our vessels to minimise wash to areas of shoreline
- schedule our activities to avoid times and locations where there is high recreational marine traffic for example on weekends, Australia Day and New Year's Eve
- manage our vessel movements so they do not interfere with port operations or the navigation of seagoing ships and ferries
- carry out harbour closures scheduling in consultation with the Port Authority of NSW, Sydney Ferries and other relevant stakeholders
- temporarily relocate impacted moorings so everyone will still have access to a mooring while we work. No one will lose their mooring
- reinstate impacted moorings as close as possible to their current location when we are finished.

For more information please refer to Chapter 8: Construction traffic and transport and Chapter 9: Operational traffic and transport in the EIS

Noise and vibration

We have assessed the possible noise and vibration impact when we are building and when we are open to traffic. Once open to traffic some areas will benefit from less noise due to reduced traffic on the surface and the new noise walls and noise property treatments we will install.

Assessing noise and vibration

We know our work can be noisy which is why we will use a range of measures to reduce the impact of our work when we are close to communities.

We have carried out a thorough noise and vibration assessment examining the potential impact to you when we build and operate the tunnels.

The assessments involved identifying areas which may experience changed levels of noise or vibration as a result of our work, assessing the types and significance of the impact and how we will manage them.

Reducing the impact of our work

While we are building we will monitor noise and vibration to make sure it meets the appropriate guidelines. We will be using a range of measures to reduce the impact of our work including:

- providing additional notification and consultation about upcoming noisy work
- laying out our sites so the noisy equipment is shielded by other buildings and/or stockpiles
- using acoustic sheds for 24 hour tunnelling activities
- ensuring our equipment is serviced and maintained up to standard
- turning off machinery and equipment when not in use
- working within standard construction hours, wherever feasible
- managing construction activities to minimise major noise generating work being done at the same time at the same location
- Wherever possible, we will stage our work to avoid extended periods of consecutive night work in one area to manage our impact on our neighbours
- installing hoardings and temporary noise barriers, where required
- providing alternative accommodation, where appropriate.

All our work will be carried out in line with the project's Conditions of Approval, Environment Protection Licence and Construction Environmental Management Plan which are overseen by DPIE and NSW Environment Protection Authority (EPA).

We will also use noise and vibration monitoring to ensure our measures are effective in complying with our licence conditions, and help us identify if we need to make changes.

When we are building

Noise

If you live near where we are working you are likely to hear us. This may be when we are working on the road, delivering materials and removing spoil from tunnelling sites.

How noise is perceived is personal and can depend on the environment. Because of this, sound may also seem louder to you in some situations than others. For example a neighbour mowing the lawn in the middle of the night will seem louder than if they were mowing the lawn during the day. The information below explains how we measure noise and what this will mean for you depending on which parts of our work you are near to.

How we measure noise

We measure noise in decibels. Our ears generally do not notice changes of one to two decibels. We also do not hear changes in noise incrementally. We hear a change of 10 decibels as about half or double the previous noise. So for example a lawnmower is about 90 decibels and a motorcycle is about 100 decibels but a motorcycle is almost twice as loud to the ear as a lawnmower.

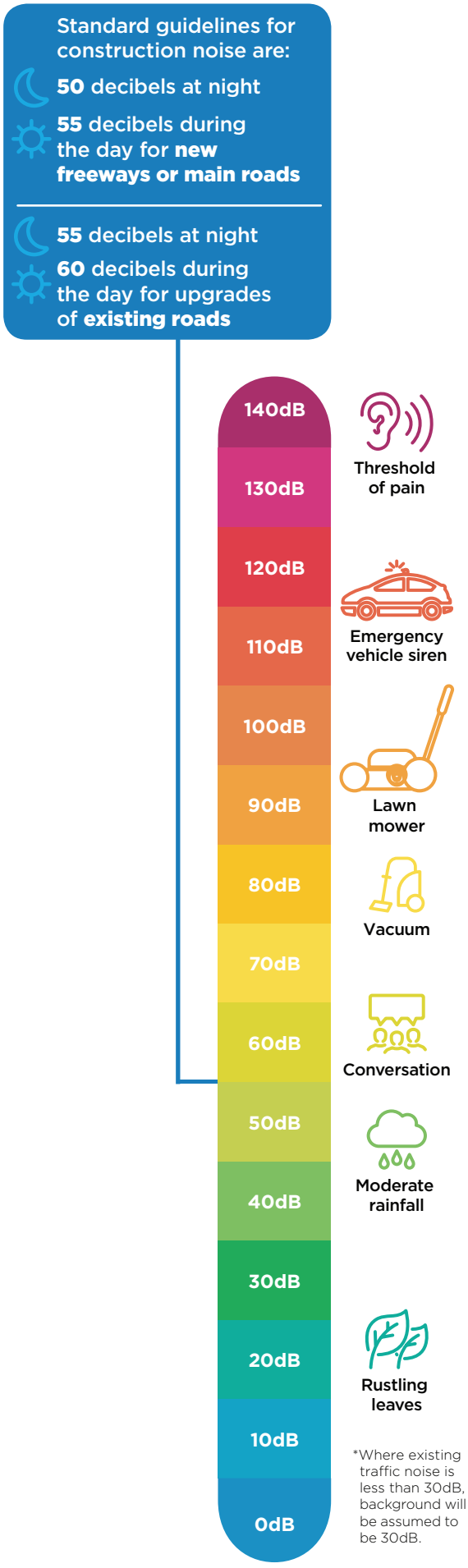
Noise is measured, predicted and assessed in accordance with the relevant legislative guidelines. When we predict you may experience noise levels over the guidelines, we will implement additional mitigation measures and monitor noise levels.

Our assessments are conservative and always assess the worst case scenario. We often find when we are working the noise generated is less than we predicted.

Day and night Noise Management Levels (NMLs)

We use NMLs to assess whether you will be impacted by noise from our work. The NML is equal to the current noise level at the quietest time of the day or night, plus 10 decibels during the day or five decibels at night. You are considered to be affected by noise if our work is predicted to be 10 decibels more than your current noise levels during the day and five decibels more at night.

There are different NMLs for non-residential properties which may be more sensitive to changes in noise levels. This includes hospitals, schools, places of worship, childcare centres and recreational areas. We will work closely with any sensitive receivers to manage the potential impact of our work.



Highly noise affected

You are considered to be highly noise affected when the noise levels are predicted to be over 75 decibels – which is comparable to the noise made by a vacuum cleaner. We will look at ways to further mitigate noise if you have been assessed as highly noise affected.

Sleep disturbance and awakening criteria

We know some of our work can be frustrating if you live nearby, particularly when we need to work at night. As a result, we also have "a sleep-disturbance criteria", which looks at whether we believe the noise from the work might keep you awake at night.

The criteria used to identify where there is the potential for sleep disturbance is 15 decibels above the current night time noise level, which is the background noise level without our construction work.

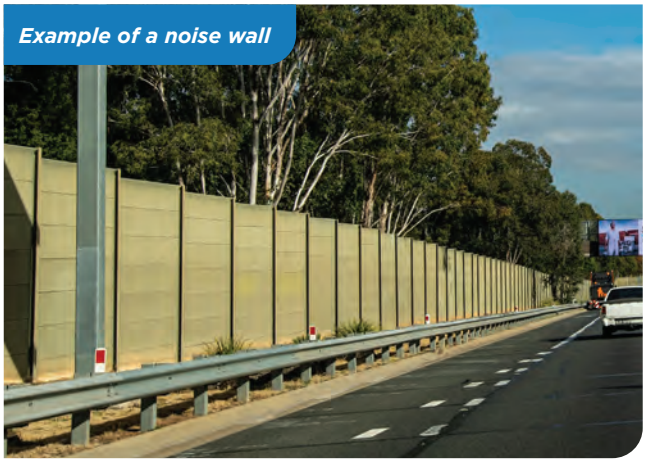
If we go above this criteria, we also look at an additional "awakening reaction level". These assessments help us to identify if we need to implement additional mitigation measures such as providing respite or alternative accommodation where applicable.

Noise from construction traffic

Our work will temporarily generate more trucks and light vehicles on the road. We expect the increase in road traffic noise will generally be less than two decibels, which is within our guidelines and you are not likely to notice any change. Some changes in traffic noise may be more noticeable if you live near the construction sites.

What does this mean for you?

The potential noise impact varies depending on the location and type of work we are doing in your area. The below provides you with a general overview of what work will be happening and when you may be able to hear us when you are next to one of our sites.



Example of a noise wall

If you live near a tunnelling construction site

We will be tunnelling underground 24 hours a day, seven days a week.

The majority of noisy activity at these sites will be when we are setting the site up, building the acoustic shed and getting ready for tunnelling. This can take about six months to complete, weather permitting.

Once we are tunnelling, the majority of the work is underground, with most of our work taking place inside the acoustic shed. The acoustic shed helps us manage noise, dust and light from our work.

We will only remove spoil from the site during standard construction hours.

There may be occasional deliveries and some movements outside of standard construction hours.

If you live above the tunnel

While we will be tunnelling underground 24 hours a day, seven days a week, we will only be under individual properties for about one week. This is based on our tunnelling equipment moving about 25-30 metres per week.

It is unlikely you will be able to hear the tunnelling equipment because it will be deep underground. However when we are tunnelling at shallower depths, or directly under your property, you may experience ground borne noise generated by our work. The depths of the tunnel will vary depending on where you live. Please see pages 24 and 25 for more detail on the depth of the tunnel in your local area.

Ground borne noise is a bit different to air borne noise in that you can sometimes feel it. Ground borne noise is sometimes mistaken for vibration. A good example of what ground borne noise sounds and feels like is an old refrigerator humming.

If you live near a minor construction site

We will have to build a number of minor construction sites to support our work during construction. These sites are generally used for storage of machinery, materials and equipment, worker amenities and parking. We have generally located these within the Warringah Freeway corridor.

The hours we work will vary depending on the type of work these sites are supporting, however, they are smaller and have less activity than our main sites.

Noise on site will generally be quite low, however, you may notice our teams coming and going, and storing materials.

Example of what an acoustic shed may look like

If you live near our surface work

Surface work will be required to connect the tunnel into the existing road network, carry out road upgrades, build new bridges, upgrade existing bridges and build the tunnel entry and exits. You will likely be able to hear some noise from these activities.

Work at these sites will be carried out in stages and some activities will be louder than others. For example a site set up and earthworks tend to be louder than paving, bridge building and finishing work like line marking and installing lights.

Please see below for information on how we will work to reduce the impact of our work.

If you live near the Warringah Freeway

The Warringah Freeway presents us with a challenge as we need to keep traffic moving while we work.

To do this safely and keep traffic moving we will need to carry out a lot of work during the evening and night.

The noise from this has the potential to be temporarily disruptive to you, particularly at night. An out-of-hours work protocol will be developed in consultation with DPIE and the EPA and will be followed throughout construction. This will outline appropriate noise management and mitigation measures and will include measures such as providing respite, installing temporary noise barriers and staging our work so we are not working near the same residents for large durations of time. Further details on measures that can be used to reduce noise are provided on page 70.

Due to the safety risks of working next to live traffic, we will need to partially close the Warringah Freeway and may need to fully close it for short periods at night to allow certain work to be carried out more effectively. These activities will include paving, installing bridge sections and removing kerbs and medians.

We will be working closely with you to help minimise these impacts.

Vibration

We are sensitive to vibration and can feel vibration at very low levels. This is why the vibration criteria we need to meet during our work to avoid annoyance to you is more stringent than the criteria to prevent damage to your property.

Our assessment considers the type of work we will be doing and whether there are any properties which may be at risk. Unlike noise, it is difficult to 'predict' vibration. There are many variables like soil type and conditions, the type of rock below the surface, building types and foundations, and the plant and equipment being used on site. Because of this, we take a conservative approach in estimating our impact.

We assessed the following types of vibration impact:

- disturbance to you in your property causing temporary discomfort
- potential damage to buildings (both cosmetic damage, like small cracks, and structural damage, like damage to foundations)
- potential damage to sensitive equipment in a building, such as electrical equipment or large internet servers.

Property damage

We understand there has been a lot of concern about the potential for vibration and settlement when we are tunnelling to cause damage to homes. Our objective is to ensure there are no buildings at risk of damage from vibration while we are building our tunnels.

We will offer you a property condition survey if you are located within 50 metres of our work. This will provide a clear record of your property's condition before our work starts.

We will establish an Independent Property Impact Assessment Panel (IPIAP) to verify building condition survey reports, resolve any property damage disputes and establish ongoing settlement monitoring requirements. Panel members will be highly qualified in the fields of structural, geotechnical and/or civil engineering and be independent of the government and project.

If any damage is found to be directly related to our project, the damage will be fixed at no cost to you.

When we are open to traffic

The project is predicted to reduce traffic noise for almost 60 per cent of properties near our surface roads.

We acknowledge there will be some parts of the community who live near our permanent facilities and surface road upgrades who may notice some more noise as a result of an increase in traffic going in and out of the tunnels.

We have identified and assessed all properties which may be affected by noise from the project when it is opened to traffic. A large number of properties near the Warringah Freeway already qualify for noise treatment without the project. The project will improve noise levels for many properties but they will remain above our thresholds. We will be offering noise treatment to anyone's property that is predicted to remain over the limit, even if noise is overall reduced by the project.

We always try to mitigate traffic noise at the source first, including installing low noise pavement. If this does not reduce the noise enough we then look at other options for you. This includes measures like building noise walls or providing your property with noise treatments.

If your property is potentially eligible for noise treatment we will be in contact with you soon. We want to start our noise treatment program as early as possible so you will benefit from reduced noise before we start construction.

You do not need to contact us as we will be in touch with you directly, if you are eligible.

Working with you

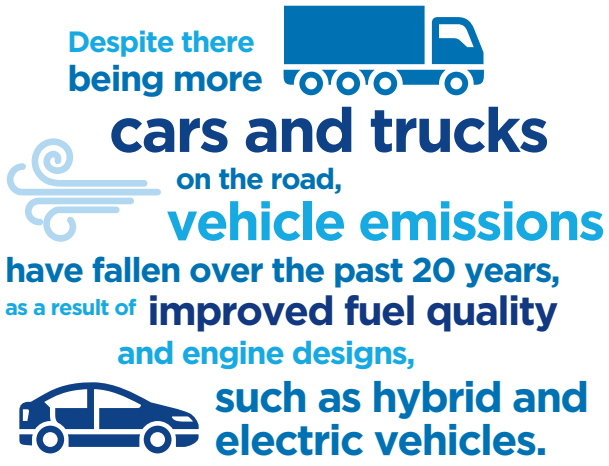
We know there will be some noise and vibration impact when we are working in your area. If you live above the tunnel you may also be able to hear and feel our work happening as our machinery passes below. We will be in contact with you about your individual concerns and needs throughout construction.

For more information please refer to Chapter 10: Construction noise and vibration, Chapter 11: Operational noise and vibration in the EIS

Air quality

We recognise that air quality is important to you. Our commitment is that the tunnels will be built and operated to meet strict air quality standards using modern ventilation and tunnel design. All ventilation systems will be built and operated to strictly comply with any conditions specified in DPIE's planning approval, and the Environment Protection Licence (EPL) to be issued by the EPA.

You may be interested to know the independent NSW Chief Scientist and Engineer has released a report in relation to road tunnel air quality. The report found emissions from well-designed road tunnels cause a negligible change to surrounding air quality, and as such, there is little to no health benefit for surrounding communities in installing filtration and air treatment systems in such tunnels. You can learn more about how we monitor air quality by visiting www.chiefscientist.nsw.gov.au.



Visit our interactive portal to see how Sydney's air quality compares with the world

nswroads.work/airquality

Assessing air quality

We have carried out a detailed assessment of air quality in consultation with independent specialist agencies including the EPA, Office of the independent NSW Chief Scientist and Engineer, Ministry of Health and the Advisory Committee on Tunnel Air Quality (ACTAQ) to ensure our project will meet regulatory requirements and manage the potential impacts on air quality. Our air quality assessment was subject to an independent review by international technical experts, coordinated by the NSW Chief Scientist and Engineer. It is now published on DPIE's website: planningportal.nsw.gov.au/major-projects/project/10451

How we regulate air quality from tunnels

In NSW, DPIE monitors, analyses and publishes information about air quality. The EPA regulates air quality and implements measures for managing and reporting air pollution.

We understand community concerns about air quality, which is why in 2018, the NSW Government announced stronger measures on emissions from motorway tunnels.

These measures include the EPA regulating the ventilation outlets for all current and future operating motorway tunnels to ensure they meet air quality limits. As part of these measures additional checks are required as part of the environmental assessment process. Before the EIS can go on public display the:

- ACTAQ coordinates a scientific review of the project's air emissions from ventilation outlets
- NSW Chief Health Officer releases a statement on the potential health impact of emissions from tunnel ventilation outlets.

Both documents for the Western Harbour Tunnel and Warringah Freeway Upgrade are available to view on DPIE's major projects website: planningportal.nsw.gov.au/major-projects/project/10451

When we are building

We know how important it is to protect air quality during construction for your health, and the health of everyone working on site. Dust matters, so we are putting a series of measures in place to suppress it and monitor your air quality every day.

Like any building work, dust is unavoidable. We will have an experienced construction team who will work to minimise dust. They will use dust suppression methods, including stabilising loose material and watering the site and trucks.

Most of the material we excavate will be clean, crushed sandstone. This will be removed in covered trucks to minimise dust falling from trucks.

We will manage potential odours from our excavation work by having experienced construction contractors treat any of those materials and then remove them from site in sealed trucks.

Construction activity at each site is carried out under an EPL, issued by the EPA, which will include limits relating to air quality and dust.

When we are building, we will be monitoring dust around the sites to ensure our methods are allowing us to meet the terms of our EPL and inform us if we need to make changes.

Odours at White Bay

We understand you have concerns about the potential smell when we transfer sea-bed materials to White Bay for treatment and transfer to landfill.

We will either load materials directly from barges into sealed and covered trucks or temporarily store material in a protected area before treatment, to reduce odour.

We have assessed the potential for odours at the White Bay site and as a result, we are not expecting odour levels to be detectable.

The Department of Defence has been carrying out the same activity at this site for over a year and have not received any complaints or concerns regarding odours.

When we are open to traffic

Surface air quality

Air quality in Sydney has improved over the last few decades due to initiatives which have reduced emissions from industry, motor vehicles, businesses and residences. Motor vehicle emissions are predicted to decrease significantly as a result of improvements in emission control and vehicle engine technology. Overall, traffic emissions in Sydney are predicted to be reduced by up to 50 per cent by 2027 and up to 65 per cent by 2037, when compared to 2016.

You will experience an improvement in air quality along the Western Distributor, Sydney Harbour Bridge and Warringah Freeway as the result of more vehicles using the Western Harbour Tunnel, reducing traffic on these roads.

Our studies have shown there will be a small impact on the local air quality along some of the surface roads we are building and upgrading, as well as some existing roads due to increased local traffic.

Our ventilation facilities use elevated outlets to eject tunnel emissions high into the atmosphere where they mix with the surrounding air, dispersing hundreds of times, quickly becoming indistinguishable from background levels.

Our studies have also shown emissions the ventilation outlets for the project will only have a minimal impact on the surrounding air quality. This impact is negligible and will be generally undetectable. The ventilation outlets will be continuously monitored. The EPA regulates the ventilation outlets for all current and future operating motorway tunnels to ensure they meet air quality limits.

You will see our ventilation facilities at the following locations:

- Rozelle Interchange (approved as part of the WestConnex M4-M5 Link)
- in the Warringah Freeway Corridor, north of Ernest Street.

Our ventilation system is also designed to ensure there are zero emissions from the tunnel exits.

In-tunnel air quality

While motor vehicle emissions are a source of air pollution, modern tunnel ventilation design ensures sufficient air flows within the tunnel to meet strict air quality requirements.

We have carried out modelling on in-tunnel air quality based on:

- expected traffic volumes
- maximum traffic volumes
- breakdown or major incidents in the tunnels.

The results of our modelling show the ventilation system installed in the tunnel will be able to manage the tunnel air to meet the air quality criteria in all of these situations.

For more information please refer to Chapter 12: Air quality in the EIS

Future air quality monitoring

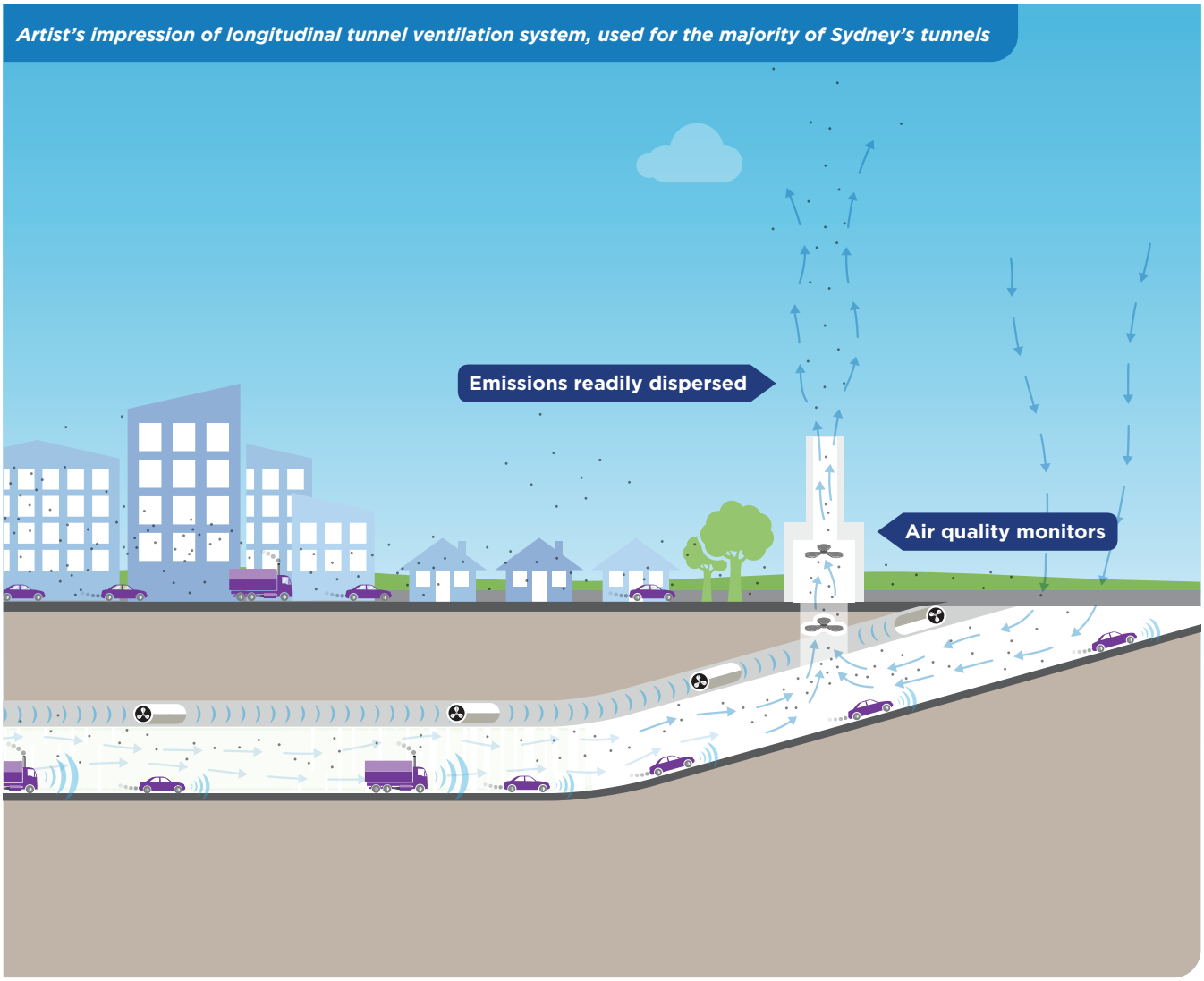
We will continue monitoring air quality within the ventilation outlets and tunnel 24 hours a day during operation and use real-time data to ensure we are meeting strict air quality criteria.

In addition, ambient air quality monitoring will also be carried out for 12 months before, and a set period of time, likely at least 24 months, after the tunnel opens to ensure we are meeting air quality standards.

The location of these monitoring stations and duration of monitoring will be determined by the Air Quality Community Consultative Committee (AQCCC), which will comprise of representatives from the tunnel operator, local council and local community. Air quality information will also be available on the tunnel operator's website.

The AQCCC will be independently chaired by a chairperson appointed in consultation with DPIE.

Artist's impression of longitudinal tunnel ventilation system, used for the majority of Sydney's tunnels



Human health

We have heard your concerns about the potential health impacts of the project. We want to assure you the health and safety of our communities and stakeholders is our priority.

Assessing human health

The human health chapter looks at the assessments carried out on air quality; construction and operational noise and vibration; socio-economic factors; construction and operational traffic and transport; land use and property; urban design and visual amenity; and cumulative impacts. These assessments and their findings identify the potential risks and impacts of the project to human health.

Reducing the impact of our work

Your health and safety is important to us. We will have a number of measures in place to manage and minimise the potential impact to your health while we build and operate our project. We considered our impact to your health by incorporating the key design elements into our project including:

- designing the tunnel ventilation system to meet the in-tunnel air quality criteria so there are minimal effects on local air quality and no emissions from the tunnel exit
- noise mitigation measures (road pavement treatments, noise barriers and/or architectural treatments where necessary) to address operational noise
- using construction sites with direct access to the motorway or main road networks so our trucks do not need to travel on local roads, where possible
- using water based transport to reduce construction vehicles on local roads
- improving pedestrian and cycleway connections to make it easier for you to get around
- refining the construction site layout and permanent facilities at Cammeray Golf Course with the objective of keeping the golf course open during construction and operation
- using Yurulbin Park as a construction support site to avoid impact to Birchgrove Oval and its sporting activities
- minimising the permanent impact on St Leonards Park from the Ridge Street North construction site
- working closely with our construction contractors to ensure the safety of our workers and community and compliance with all relevant work health and safety requirements.

For more information on how we will manage potential impacts like dust, noise and vibration please section 2 and 3 of this document.

For more information please refer to Chapter 13: Human health in the EIS

Whale Rock at Waverton

Heritage

Sydney has a rich blend of Aboriginal and non-Aboriginal cultural heritage. We know there are significant heritage items along the project corridor and are committed to preserving this heritage as a legacy for future generations.

Assessing Aboriginal heritage

The boundaries of the project are within the lands of the Cammeraygal people (also known as the Gamaraigal and Kameragal) in the Waverton to Cammeray area and the Darug language group in the Rozelle to Birchgrove area.

We have engaged with local Aboriginal parties throughout development of our design and assessments. We held two Aboriginal focus groups to seek input. This input has been invaluable to the development of our management measures.

What we found

Our studies confirm evidence of Aboriginal occupation along and around the project area, particularly relating to historical areas of plentiful food resources, movement pathways, and meeting and camping sites located near locations such as Berrys Bay, Yurulbin Park and the Sydney Harbour foreshore.

Nine sites were identified near the project construction footprint including:

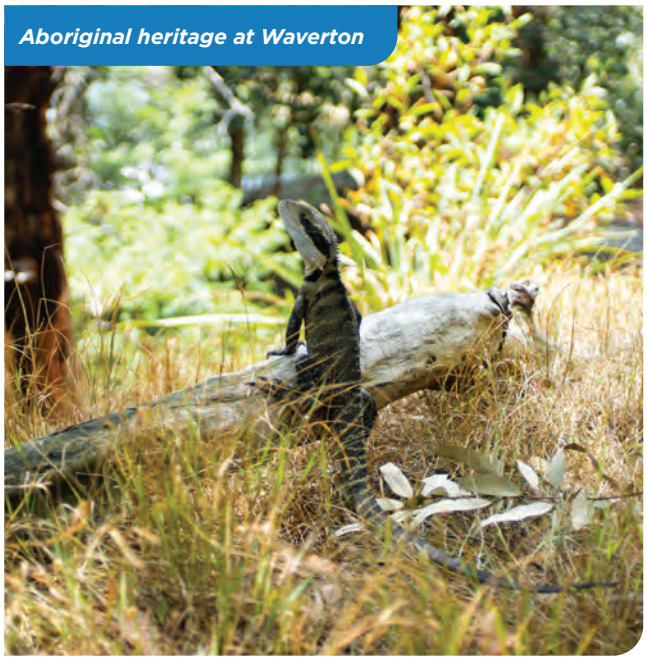
- seven rock shelters (with middens and engravings) including Waverton Park Cave
- one midden site
- one art site (engravings).

Reducing the impact of our work

We are committed to understanding and mitigating any impact to Aboriginal cultural heritage and will continue to work with Aboriginal stakeholders throughout the life of our project. While no sites are directly impacted by our project we will ensure to protect vulnerable sites, by:

- adjusting our work methods to prevent damage at Aboriginal sites
- carrying out monitoring during vibration intensive work near Aboriginal Heritage Information Management System (AHIMS) sites to ensure we are effectively protecting the sites.
- using photographic and digital technologies, including 3D capture technology to create archival recordings of key sites to ensure they are recorded for future generations
- managing unexpected discoveries of potential Aboriginal archaeological or heritage items in accordance with the *Standard Management Procedure: Unexpected Heritage Items (Roads and Maritime Services 2015)*
- ensuring all of our staff take part in cultural and heritage induction before work starts.

Foreshore Midden



Aboriginal heritage at Waverton

For more information, please refer to Chapter 15: Aboriginal Heritage in the EIS

Aboriginal heritage at Waverton

Assessing non-Aboriginal heritage

We know there are also many important non-Aboriginal archeological and historical sites along the project alignment.

We identified 247 non-Aboriginal heritage items within the study area including one of world heritage significance (Sydney Opera House buffer zone), one of national heritage significance, 10 of state heritage significance, and the remainder of local heritage significance. We also identified potential heritage items such as Anzac Park, which was assessed as having social value due to the war memorial and connection to the former North Sydney Tramway Depot.

We have determined 134 of the items identified will either have no impact or a negligible impact from the project.

We have completed a Statement of Heritage Impact for each of the 113 heritage items and conservation areas which could potentially be impacted by our project.

What we found

Our project has been assessed as having a minor non-Aboriginal heritage impact. This is because we are building underground tunnels which avoid impacting heritage items above ground, and using existing road infrastructure.

During construction there will be a temporary impact on Yurulbin Point, Berrys Bay, southern corner of St Leonards Park and Cammeray Park (including a permanent impact on the golf course on land next to the Warringah Freeway) as we need to use these areas to support our construction work and minimise our impact on you.

We will ensure direct impacts are minimised and when we have finished we will ensure heritage preservation is considered as part of rehabilitation work.

Anzac Park

Reducing the impact of our work

We recognise heritage preservation goes beyond physical protection and we will be using photographic and digital technologies to capture archival recordings of key sites on the land and in the water for future generations. Other strategies we will have in place include:

- ensuring our design avoids impact with the Sydney Harbour Bridge and we minimise visual obstruction where possible
- establishing exclusion zones at Balls Head and providing owners and other stakeholders with reasonable time to relocate vessels to prevent our work impacting on historic vessels such as the MV Cape Don and Baragoola
- investigating the potential to place temporary wharves in locations where there will be the least chance of potential impact to maritime heritage at Berrys Bay
- managing potential archaeological or heritage items we find during construction in accordance with the standard procedures
- adjusting our work methods to prevent damage to heritage structures
- seeking advice from a heritage conservation architect if any at-property treatment is required at heritage listed properties
- carrying out building condition surveys for any heritage items at risk from vibration
- ensuring our staff take part in cultural and heritage induction before work starts.

For more information please refer to Chapter 14: Non-Aboriginal Heritage in the EIS

Artist's impression of Woodleys boatshed, Berrys Bay. Indicative layout only.

Urban design and visual amenity

We understand the character and visual amenity of your local area is important to you. We carried out an urban design, visual and landscape character assessment, which considered the potential for impact to the overall landscape, and visual amenity as a result of our project.

Our project has been designed to make the most of existing transport corridors and built-up urban areas and is largely built underground to minimise impacts on the surface. This is so our project can blend into the surrounding environment and reduce the character and visual impact in local areas, where possible.

Due to the large scale of our project, there will be some permanent impact to the local landscape and visual amenity.

The most noticeable visual changes will relate to:

- landscape changes to open space in Cammeray Golf Course. While we will need to remove some trees and plantings to allow for the construction of new permanent facilities like the motorway operations facilities, we are committed to minimising the number of trees required to be removed and keeping a green buffer between houses and our site.
- ventilation facility located within the Warringah Freeway and other motorway operations buildings next to the freeway.

Open space

We are committed to returning as much of the open space we use through construction to the community as we can. We will:

- engage with the community this year to deliver new public open space at Berrys Bay once the project is complete
- work with the original architect for Yurulbin Park to bring his original vision to life
- work with North Sydney Council on the future layout of the Ridge Street North construction site after we have finished our work
- continue to work with Cammeray Golf Club on ways to minimise our impact to users of the golf course.

Future investments in shared user projects

The NSW Government recognises that more people than ever before are walking or cycling to work or for leisure and fitness. This is why it recently committed to investing a further $197 million into walking and cycling infrastructure over the next four years. This will bring the NSW Government's total investment to over $600 million, the largest commitment in the State's history.

The NSW Government is committed to continuing to encourage people to walk and cycle as part of their everyday commute. Not only does it help relieve pressure on roads and public transport systems, but walking and cycling are healthy, active ways to travel. Continuing to invest in new walking and cycling infrastructure keeps people safe while encouraging more people to take up these modes of travel.

For more information please refer to Chapter 22: Urban design and visual amenity in the EIS

In addition to public open space, and as part of the NSW Government's commitment, we will also be providing new and improved cycleways and shared user paths. We will be:

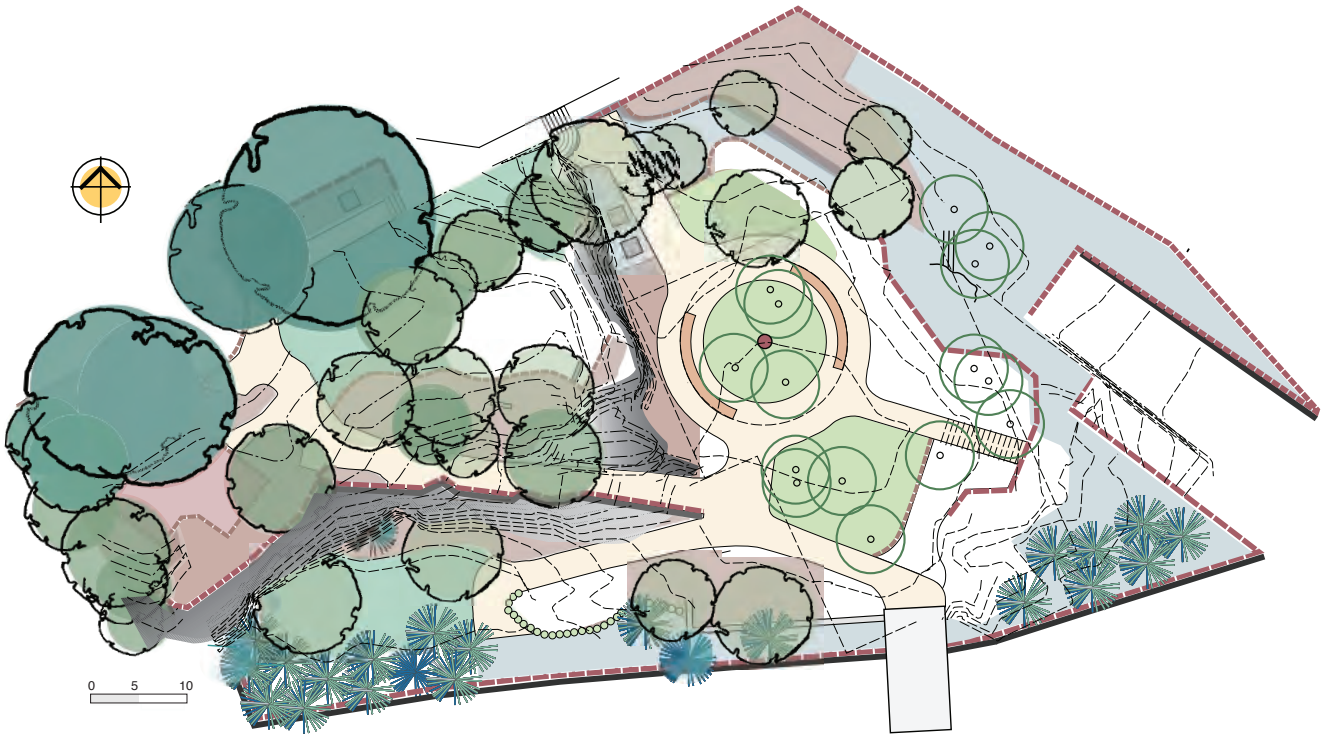
- building a dedicated cycleway between Miller and Falcon Streets at Cammeray
- upgrading the Ernest Street Bridge across the Warringah Freeway to link Cammeray Golf Course with Anzac Park; including a new shared user path
- rebuilding the Ridge Street Bridge at North Sydney to provide more room for cyclists and pedestrians
- upgrading the High Street Bridge at North Sydney to provide more room for cyclists and pedestrians.

We will be further developing the urban design as part of the detailed design with the construction contractor. We will seek your important input to ensure our project integrates with the unique character of your surrounding land and creates spaces which match the aspirations of local communities.

We will be inviting you to take part in a range of opportunities to provide input and feedback on the urban design and landscaping as the project progresses.

Artist's impression of new shared user path on Ernest Street Bridge

Yurrulbin Park sketch. Indicative layout only - subject to consultation.



Open space and community precincts

We know open space is important to you, which is why we will be returning the sites we temporarily use for construction as new areas for you to enjoy. We will work with councils, communities and stakeholders to ensure the best possible use of this space once we have finished our work, and will be seeking your valuable input to help design these legacy projects.

For more information please refer to Chapter 20: Land use and property and Chapter 22: Urban design and visual amenity in the EIS

Given the importance of open space and heritage items to your local community we have developed a design which has no impact to:

- Birchgrove Park and Birchgrove Oval
- Balls Head Reserve, the Coal Loader facility, Carradah Park in Waverton and the beach next to the quarantine building at Berrys Bay
- the football pitch, skate park, croquet club and tennis courts at Cammeray Park
- the majority of St Leonards Park, including no impact on the war memorial, ovals, bowling greens, netball courts or gardens and only a temporary impact to the southern corner.

Birchgrove

We have engaged the original landscape architect who designed Yurulbin Park to enhance and refurbish the open space after our project is completed. We plan to restore the park to his original vision, which could not be fully achieved at the time.

Waverton

We understand the importance of Berrys Bay and we are committed to transforming the area to public open space once the Western Harbour Tunnel project is completed.

Later this year, we will have a dedicated consultation period seeking your input on the future of Berrys Bay, which will be a separate process to this EIS. We are committed to working with you to understand your views and making this an area for all the local community to enjoy. We will establish a reference group, with representative stakeholder groups, the community and independent experts, to support us with the development of the final layout for the site.

We will also be working with owners and other stakeholders to provide reasonable time for the relocation of the MV Cape Don and MV Baragoola to ensure they are not affected by our nearby construction activities.

Cammeray and North Sydney

To minimise the number of private properties we need for the project, we will be using part of the Cammeray Golf Course, which is on land leased from the NSW Government, during construction and for some permanent facilities.

There will still be some permanent impacts to the golf course, near the Warringah Freeway, to accommodate widening for the new Western Harbour Tunnel and Beaches Link ramps and our motorway facilities.

In the Proposed Reference Design, released in 2018, we had planned to build the motorway control centre on the golf course land. We have carried out further investigations and re-designed the use of this space so we can return more of the open space to the golf course. This re-design includes relocating the Western Harbour Tunnel motorway control centre to an industrial site at Waltham Street, Artarmon.

We are working closely with the Cammeray Golf Club to develop a strategy that will minimise our impact to the people who use the course. We have adjusted our sites and included provisions for the golf course to remain open as a compliant nine-hole course, if desired by the golf club.

Ridge Street North construction site

We have worked to minimise our impact to St Leonards Park though construction and operation. The community will continue to have access to The Greens, basketball courts, North Sydney Oval and the Anzac war memorial during the work.

Anzac Park

There will be no permanent impact to Anzac Park at Cammeray, however we will be temporarily using a small section of the park during construction. This impact is minor and relates to upgrading stormwater drainage. All of the park will be returned as open space once we have finished construction.

St Leonards Park

Biodiversity

Sydney has a rich biodiversity with a multitude of native plants and animals that form thriving ecosystems both on land and in the water. We are committed to minimising the project's impact, protecting the local plant and animal life and implementing monitoring programs.

Assessing biodiversity

We have carried out extensive surveys in the study area and a detailed Biodiversity Development Assessment Report to understand the biodiversity impact of the project.

What we found on the land

Most of our project is working within an area which has been changed by people over the years and contains exotic species, weeds and planted native or non-indigenous species. As a result our field studies found only one native vegetation community within or near our study area, the *Smooth-barked Apple – Coast Banksia/Cheese Tree* open forest at Berrys Bay.

We identified three threatened flora species; however we will not have a significant impact on any of these species. We will use biodiversity offsets for the impact to the individual Sunshine Wattle *(Acacia terminalis)* tree located near the Warringah Freeway.

We found the following threatened animals within or near the study area:

- Eastern Bentwing-Bat *(Miniopterus schreibersii)* at Waverton
- Grey-headed Flying-fox *(Pteropus poliocephalus)* at Berrys Bay
- White-bellied Sea Eagles *(Haliaeetus leucogaster)* flying over Sydney Harbour near Balls Head and flying above Goat Island.

In addition to the above, there is the possibility of other threatened species within the project area including Eastern Freetail-Bats, Little Bentwing-Bats, Powerful Owls, Southern Myotis', Eastern Ospreys and Little Penguins.

What we found in the fresh water

We assessed four fresh waterways as part of the project at:

- Whites Creek, Annandale
- Willoughby Creek, Cremorne
- Flat Rock Creek, Naremburn and Northbridge
- Quarry Creek, Naremburn.

No threatened freshwater fauna, flora species, ecological communities, endangered populations or freshwater migratory species were found to be likely to live within the study area for the project.

Biodiversity assessments in Sydney Harbour

What we found in the sea

We carried out an assessment in Sydney Harbour between:

- Gladesville Bridge, Huntleys Point to the west and Garden Island
- Potts Point and Robertson Point, Cremorne.

Our assessment found the likelihood of threatened marine ecological communities occurring within the study area is negligible.

Reducing the impact of our work

We understand the importance of the natural environment and are committed to minimising our impact, protecting the local plant and animal life and implementing monitoring programs.

On the land

Most of the sites we will use for our construction have either already been disturbed or contain trees and plantings which have been planted by people (ie, they are not remnant). We will not be removing any remnant native trees and we will re-establish trees and plantings as appropriate.

We will need to remove around seven hectares of vegetation including native plants, planted medians, non-native species and weeds across the project's whole alignment. Most of the trees and plants we need to remove are located within the Warringah Freeway corridor and at the Cammeray Golf Course construction site. We will be protecting the *Smooth-barked Apple – Coast Banksia/Cheese Tree* at Berrys Bay so none of these trees will be impacted. We have done our best to minimise the number of trees requiring removal.

There is potential for noise and vibration impact on roosting Eastern Bentwing-Bats within the coal loader tunnels at Waverton during construction.

We will develop management strategies in consultation with the Office of Environment and Heritage, Department of Primary Industries and/or an appropriately qualified expert.

In the water

Our seabed profiling methodology has been designed to minimise impact on the marine environment and includes the use of a closed environmental bucket to avoid the spread of potentially contaminated material, and the use of silt curtains. Please see section 4 for more information on how we safely remove materials from the seabed.

We will rehabilitate and restore subtidal rocky reef and intertidal rocky shore habitats.

Before we start building a detailed Construction Environment Management Plan (CEMP) will be developed to detail how the project will preserve, protect and manage any potential impact to the local environment. The CEMP will need to be approved by DPIE before we can start any major construction work.

We will continue to have a dedicated team of environmental specialists who oversee this process.

For more information please refer to Chapter 19: Biodiversity in the EIS

Waverton, Sydney

Other assessments

Assessment	Summary
Socio-economic 	**We know a project of this scale will change the local community during construction and operation. We expect the project to support up to 7500 full-time-equivalent jobs during construction.** We will avoid, minimise or manage social and economic impacts as a result of the project by: • minimising the permanent impact on open spaces throughout design • returning open spaces for community use after construction • continuing to engage with local schools, places of worship, child care, aged care, health and medical facilities about the timing and duration of construction work and management of potential impacts • continuing to engage with businesses potentially impacted by construction to identify specific impacts and reduce or manage these throughout construction • maintaining business access, visibility and parking where possible. Additional management measures are outlined in other sections of this overview, including traffic and transport, noise and vibration, air quality, human health, open space, and urban design and visual amenity. ***For more information please refer to Chapter 21: Socio-economics in the EIS***
Geology and soils 	**Our design has carefully considered the diverse local conditions which traverse our project, from the iconic Hawkesbury sandstone of our Harbour to the Ashfield Shale of North Sydney's hills, to ensure we safeguard existing geology, groundwater and soil landscapes.** The majority of our tunnelling will be through Hawkesbury Sandstone, which has a long proven history of supporting excellent, structurally sound, tunnels with minimal surface level impacts. We have carried out detailed assessments into possible impacts from erosion, sedimentation, acid sulfate soils, and urban soil salinity, and looked at the potential impacts on groundwater while we are building as well as during the first 100 years of the tunnel being open. The impact from our project is expected to be minimal. ***For more information please refer to Chapter 16: Geology soils and groundwater in the EIS***
Hydrodynamics and water quality 	**Our assessments considered how the project may impact on hydrodynamics, such as tidal and current movements within Sydney Harbour, and water quality in waterways and marine environments.** Site investigations and hydrodynamic modelling has been completed to assess and refine our approach to building the immersed tube tunnels on the bed of Sydney Harbour. Our proposed methodology is similar to the Sydney Harbour Tunnel when it was built between 1988 and 1992 and leverages experience from that project and many others constructed since that time. The assessments show our proposed management controls and procedures will prevent major impact on hydrodynamics and water quality while we are building and operating the tunnel. ***For more information please refer to Chapter 17: Hydrodynamics and Water Quality in the EIS***
Assessment	**Summary**

Flooding

Our assessment considered the potential impact to flooding as a result of the project both when we are building and open to traffic.

We will manage any potential impact during construction. A strategy for flood management will be developed before work starts which will be provided to DPIE and relevant councils for approval.

Overall the project will generally have neutral or beneficial change to flooding behaviour as a result of the project up to and including the 1 in 100 storm event.

For more information please refer to Chapter 18: Flooding in the EIS

Land use and property

The property and land use assessment identifies the potential impact of the project on affected properties and open space.

We have designed the project to minimise the need for private property acquisition. The need to reduce impact has been balanced with temporary and permanent impact to areas of open space.

We have located temporary construction sites in areas where we can rehabilitate, and where possible, return the land to the community as open space. We are working with councils, communities and stakeholders to ensure the best possible use of the open space after construction.

We will use space efficiently and make the most out of our work areas, enabling us to reduce the overall temporary and permanent operational footprint of our project. We will also need to acquire or temporarily lease a number of properties along the project alignment. These are a mixture of residential, commercial and open space.

We will need to acquire land below the surface to build the tunnels. This process is known as 'subsurface acquisition'. The surface area and any dwellings or other structures on a property will not be affected by subsurface acquisition and in most cases will not prevent future development of the surface above like building a swimming pool or a basement garage.

We are managing the property acquisition process in accordance with legislative requirements and reforms. Generally no financial compensation is provided for subsurface acquisition.

For more information please refer to Chapter 20: Land use and property in the EIS

Assessment	Summary
Hazards and risks 	**We understand there are concerns about the removal, transportation and storage of hazardous materials. We are prioritising your safety and health and the welfare of our workers while protecting the environment.** Our hazard and risk assessment considers the potential hazards arising from incidents during construction and operation that could pose a risk to public safety, the surrounding community or the environment. This includes hazards and risk relating to issues such as: • the storage, transportation, handling and use of dangerous goods and hazardous substances • traffic incidents relating to the construction or operation of the project on land or on the water • ground movements and geological conditions • damage or disruption to underground utilities • bushfires. We will carry out associated work in accordance with the relevant legislation and guidelines to ensure the safety of communities, workers, and the environment while we are building and after the project opens to traffic. ***For more information please refer to Chapter 23: Hazards and risks in the EIS***
Resource use and waste management 	**Building infrastructure to transform a city requires large amounts of materials and energy. Where possible we will recycle our resources and seek efficient ways of working to minimise the amount of waste generated.** Most of our waste will take the form of spoil (about 2.1 million cubic metres) from tunnelling work on the land. In general, we will re-use this spoil on site or transport it by truck to other developments to be recycled, or, if not suitable for re-use, dispose of it at licensed locations. We will also be removing materials from the seabed to make a slot for the immersed tube tunnels under Sydney Harbour. We are investigating disposing around 80-90 per cent of this material at an approved offshore offshore disposal site. In this circumstance the remaining material which is unsuitable for disposal offshore, will be transported and treated at White Bay and then disposed of at a licensed facility. ***For more information please refer to Chapter 24: Resource use and waste management in the EIS***
Climate change and greenhouse gasses 	**An assessment has been carried out to understand the vulnerability of the project in relation to climate change and its contribution to future climate change as a result of the construction and operation.** Our assessment showed greenhouse gas emissions from traffic volumes on the road network will be reduced once the tunnel is open, due to less congestion and stop-start driving. Average speeds will increase due to the efficiency of the tunnels. Greenhouse gas emissions will be managed and minimised during construction as part of the Sustainability Management Plan, which will be developed once we have appointed a construction contractor. Energy efficiency will be considered during further design development with energy efficient systems installed where reasonable and practicable. ***For more information please refer to Chapter 26: Climate change risk and greenhouse gas in the EIS***

Assessment	Summary

Sustainability

The project is part of the *Future Transport Strategy 2056* and is designed to contribute to long term environmental, social and economic outcomes while being committed to the NSW Government's target to achieve net-zero emissions by 2050.

We have developed a sustainability framework which provides the overarching vision, objectives, targets and implementation approaches for the project. The vision commits us to achieving excellence in sustainability and builds sustainability thinking into all stages of design and delivery.

We will implement a Sustainability Management Plan to manage and minimise the potential impact of the project as well as enhance the natural environment and local heritage. Our project will contribute to better liveable local communities, ease congestion and provide opportunities to revitalise urban areas.

It will provide faster connections to other communities and contribute to Sydney's long-term transport goals while improving land use.

For more information please refer to Chapter 25: Sustainability in the EIS

Cumulative impacts

We know there are a range of construction projects happening across Sydney and we want to minimise the cumulative impact of our work as much as possible.

The potential temporary cumulative impact for our project is focused around:

- Rozelle and White Bay due to interactions with the WestConnex M4-M5 Link (including Rozelle Interchange) and other projects at White Bay like the new Sydney Metro West, Glebe Island multi-user facility and Port Authority of NSW Cruise Terminal
- North Sydney and Cammeray due to interactions with the Beaches Link and new Sydney Metro City & Southwest sites at Victoria Cross and Crows Nest.

As several of these projects will overlap with our project we want to minimise the construction fatigue for people living nearby.

There is the potential for increased and longer term construction traffic on the local road network, increased construction noise and visual impact for residents and businesses due to the cumulative impact. We acknowledge this impact and are committed to working with the other project teams to mitigate.

We have considered the other projects in the area in the design and timing of our projects to reduce the cumulative impact on our community, where possible. We will continue to collaborate with the relevant teams on nearby projects and work with local councils on any potential cumulative impact of projects that emerge as part of their future planning.

For more information please refer to Chapter 27: Cumulative impacts in the EIS

Warringah Freeway

How we build the project

Artist's impression of cofferdam construction in Sydney Harbour

Interactive portal

nswroads.work/whtportal

Visit our interactive portal to see how we will build and use the cofferdams to construct the tunnel in Sydney Harbour

Building across the harbour

We will be using immersed tube tunnels to cross the Sydney Harbour. These types of tunnels have been built many times before and we will be using techniques similar to when the Sydney Harbour Tunnel was built.

Cofferdams

We will be building a cofferdam at each end of the harbour crossing to connect the land tunnel to the immersed tube tunnels. These cofferdams will each be about the shape and size of an Olympic sized pool. They are temporary and we will remove them once the work is finished.

Cofferdams are made up of interlocking piles (like round hollow metal pipes) to form an enclosed wall. Each pile will be driven into the sandstone below the harbour floor until it is secure and cannot move. Piling will take place from a barge using a crane fitted with a hydraulic vibrating hammer, offshore pile driving hammer and/or a similar piece of construction equipment.

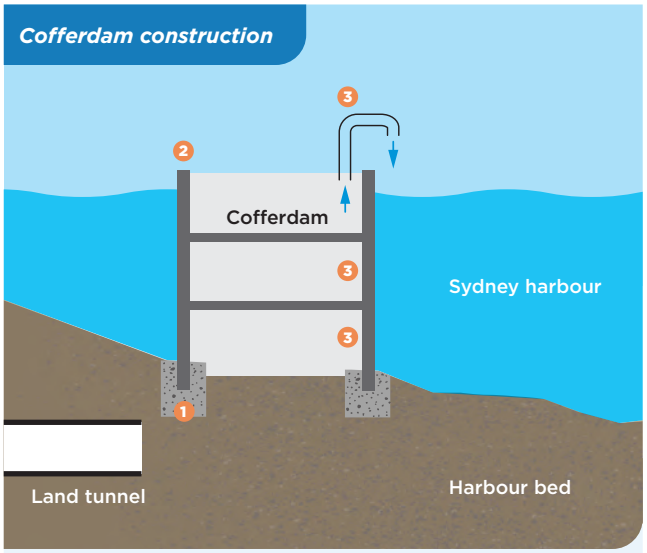
Once the cofferdams are in place, we will pump the water out of the cofferdam and install the structural steel to make it structurally sound and safe to work inside.

Building within the cofferdams

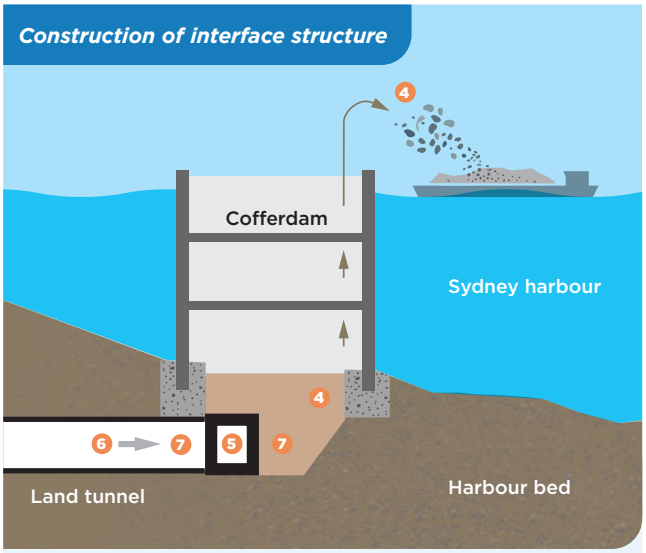
Once in place, we will build a concrete structure in each of the cofferdams known as an interface structure, which will connect the tunnel under the water to the tunnel under the land.

Removing the cofferdams

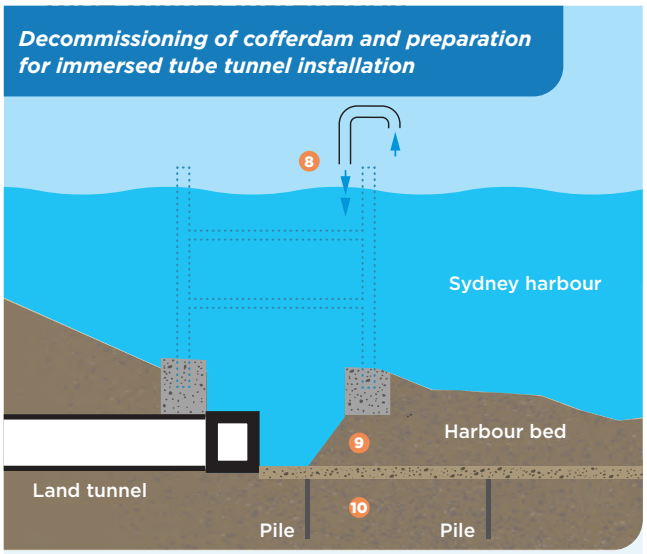
Once we have finished our work the cofferdams will be removed. This will include filling them with water to the same level as the water level outside and removing the piles. The marine environment will be rehabilitated as needed, for example restoring the seabed profile to the same levels as before construction.



1. Ground treatment to improve the strength of the ground surface
2. Pile installation to create the outer structure of the cofferdam
3. Dewatering and installation of the structure support



4. Excavation of rock within the cofferdam to final design level of the tunnel
5. In-situ construction of the tunnel interface structure
6. Breakthrough of land tunnel into interface structure using roadheaders
7. Installation of bulkhead structures at tunnel interface structure to provide a waterproof seal



8. Filling of cofferdam with water and removal of structure support
9. Dredging of the harbour bed to create a trench
10. Installation of a gravel bed and supporting piles within the trench in preperation for immersed tube tunnel installation

Seabed profiling

To get ready to place the immersed tube tunnels below the seafloor we will need to prepare the seabed. This will involve creating a slot for the immersed tube tunnel to lie in, so the top of the protective rock layer on top of the tunnel will be about level with the seafloor when completed.

How we do this will depend on what type of material we are removing, for example we use different equipment to remove rock and sand.

In planning our work and selecting our equipment, we have carried out marine ecology surveys, sediment testing and modelled water movements to ensure we have a strong understanding. We will be using a number of safeguards to manage the potential impacts to ecologically sensitive areas.

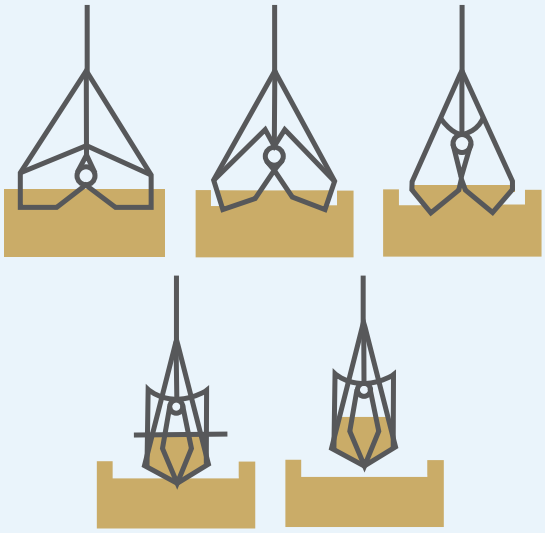
Removing materials from the seabed

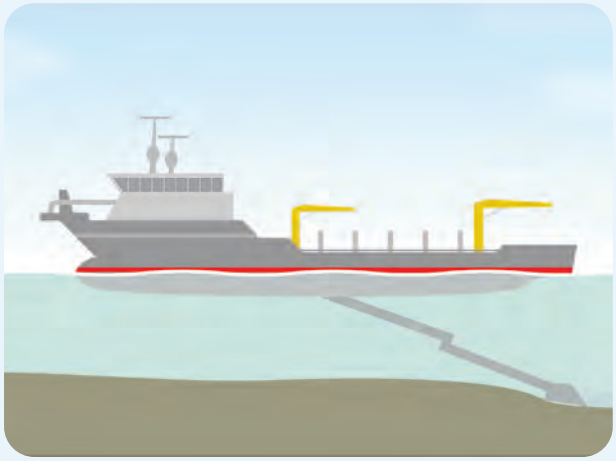
Backhoe dredge with closed environmental bucket

A closed environmental clamshell is a closed bucket attached to a backhoe dredger. This is used to avoid the spread of material into the water as it is being removed. Materials will be immediately loaded onto barges to be transported and treated at White Bay.

Type of material

Used to remove soft sediments which are not suitable for reuse or disposal offshore. They will be tested and treated before being disposed of in licensed facilities.





Trailer suction hopper dredger

This machine operates like a large vacuum cleaner. It uses suction tubes and a pump that vacuums up a mixture of sand, soil and water into the 'hopper' of the ship. Once full the ship will take the clean material to the offshore disposal site for disposal.

Type of material

Clean soft ground materials suitable for offshore disposal.

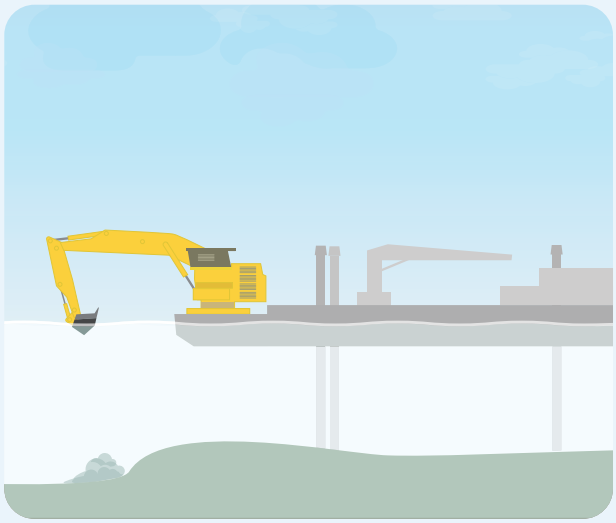
Cutter suction dredge and backhoe dredge

A cutter suction dredger uses rotating cutter head or drum cutters to cut and fragment rock underwater. After the material is cut using the cutter head, a backhoe will lift the materials from the water and load it into a barge.

This material will be transported by barge to the offshore disposal site for disposal.

Type of material

Rock suitable for offshore disposal.



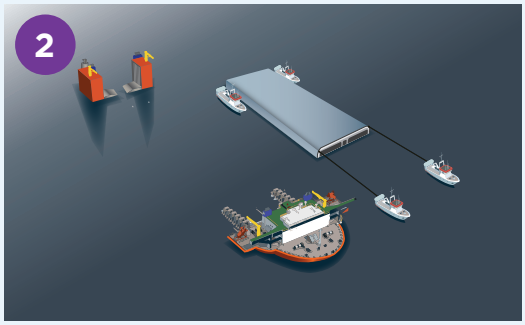
Traffic on Warringah Freeway, Sydney

Building the tunnel units

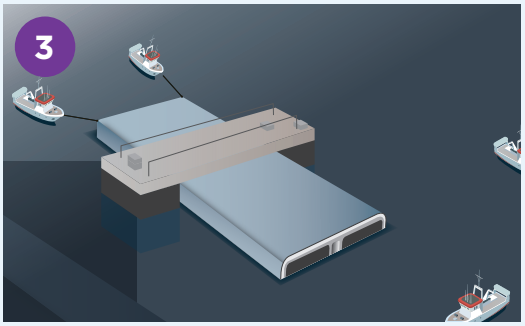
The immersed tube tunnel will be around 630 metres long and have five individual pieces, called units. These will be made locally at our construction site at White Bay. Once completed, each unit is sealed to keep the water out, allowing the unit to float. The units will be stored at Snails Bay in Sydney Harbour near Birchgrove. Once we have built the interface structures and completed the seabed profiling, we will move them via tugboat one piece at a time to their final destination.

Building the tunnel units

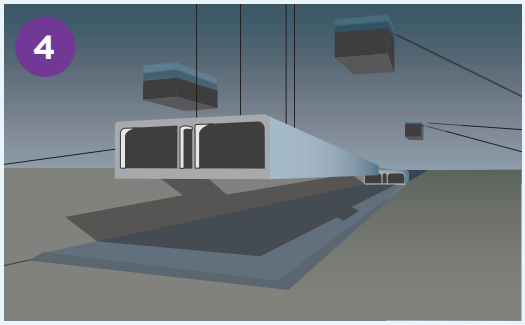
Construction and fitout of immersed tube tunnel units at White Bay



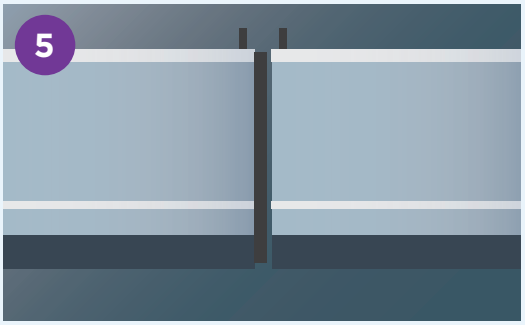
Tunnel unit floated in deep water in preparation for installation



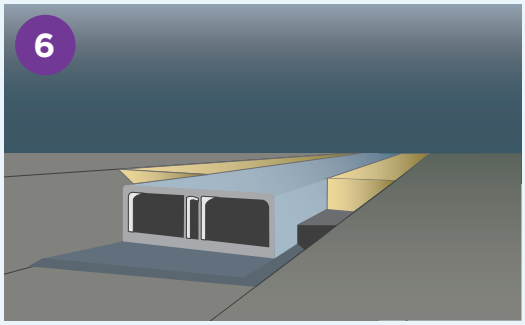
Tunnel unit transported to site by tug boats



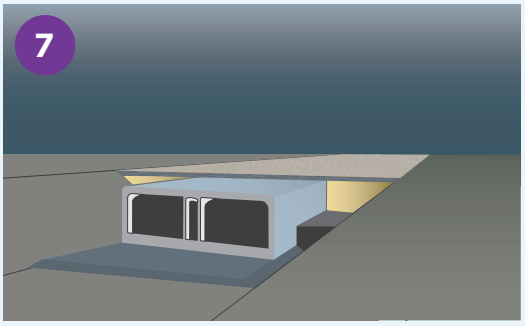
Immersion of tunnel unit



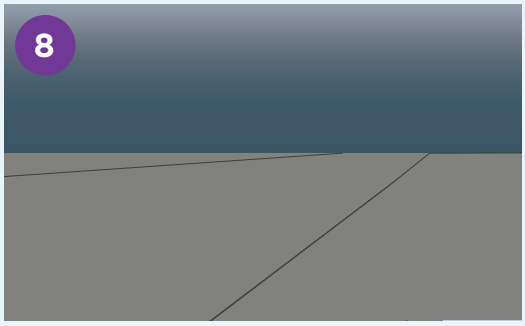
Water tight seal between tunnel units



Backfilling of trench



Rock armour placement over unit



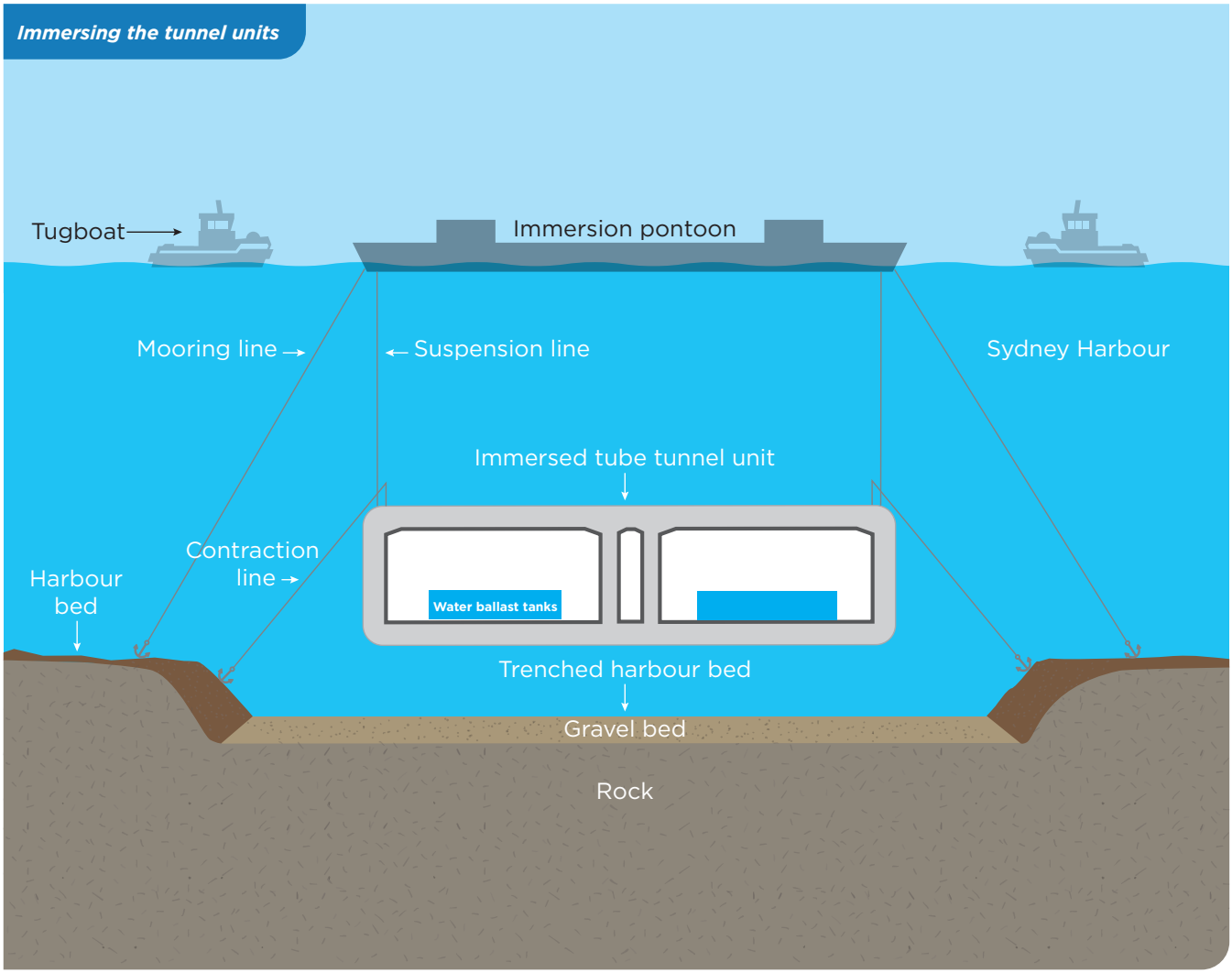
Seabed restored following completion of immersed tube tunnel

Immersing the tunnel units

We will be placing the immersed tube units using pontoons, tug boats and a guidance system. Each unit is immersed by remotely pumping water into tanks within the units – similar to a submarine. The units have large seals on each end to create a watertight joint with the adjacent unit.

After each unit is immersed, fill will be placed around the unit to lock it into place. This is followed by a rock protection layer to protect the tubes from situations such as falling or dragging anchors, during their lifetime.

We will be placing units one at a time. It will take around 24 to 48 hours to install each unit. There will be some localised harbour closures in the area when this is happening.

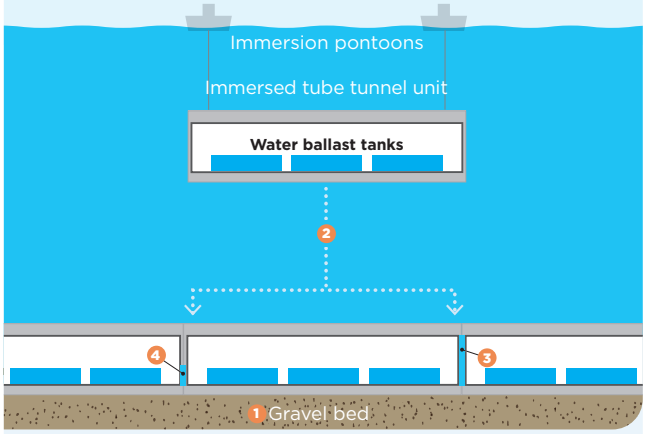


Managing spoil and waste when building in the water

We will be removing any materials from the seabed and immersed tube tunnel construction by using barges. Some dredged material associated with the construction of the crossing of Sydney Harbour will be eligible for disposal offshore. We will transport suitable dredged material to the offshore disposal site using barges. We have submitted an application to the Commonwealth Department of the Environment and Energy for offshore disposal of suitable dredged material.

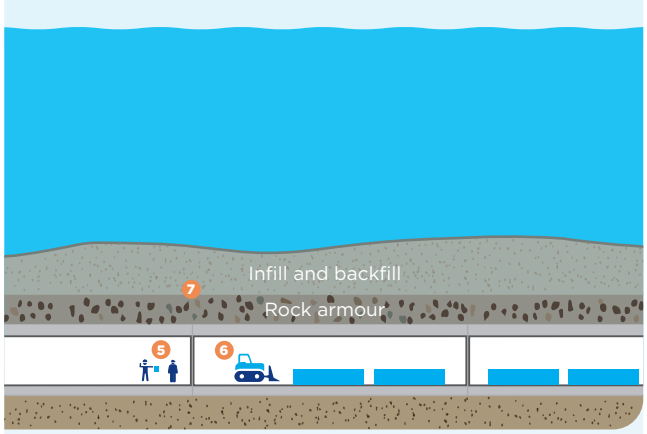
We will transport any dredged material not suitable for offshore disposal by barge to White Bay. We will stabilise this material and then dispose of it at a land-based, licensed facility. This is very similar to the process recently used for construction work at Garden Island.

Process for immersion of tube tunnel units



1. Intallation of gravel bed within trench
2. Lowering of immersed tube tunnel element against existing units
3. Connection of immersed tube tunnel unit with previous immersed tube tunnel unit or interface structure
4. Dewatering of immersion joint

Process for fitout and finishing work



5. Casting work of the immersion joint
6. Finishing work (casting internal wall and ballast concrete) and removal of water ballast tanks
7. Placement of infill, backfill and rock armour around immersed tube tunnel

Water ballast tanks

Building on land

Tunnelling

We will be tunnelling using roadheaders. Roadheaders are extremely powerful and advanced rock-cutting machines designed to continuously excavate roadways, tunnels and chambers.

The Beaches Link tunnel emerges within the Warringah Freeway, near the Ernest Street overbridge. We will be building the Beaches Link cut and covers now so we do not need to disrupt the local community by coming back later to complete this work. (Beaches Link is subject to a separate environmental assessment and planning approval.)

Underground tunnel construction

Roadheader tunnel excavation

Cut and cover

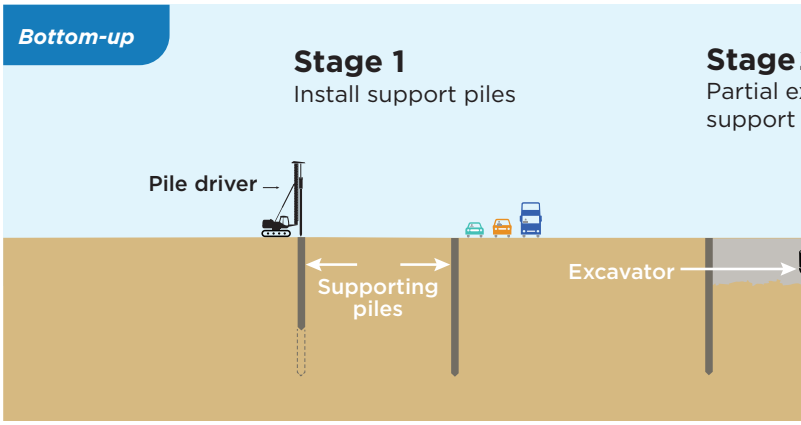
We will be building cut and cover tunnels when there is not enough rock cover to support the construction of the tunnels from underground. This is generally where the tunnels come to the surface.

Cut and cover is a tunnelling method generally involving excavating downwards from the surface of the ground, and installing a tunnel structure including a base, walls and a roof. Cut and cover can be built using a bottom-up or top-down method of construction. Once the roof is in place, the tunnels are generally covered with fill and re-vegetated.

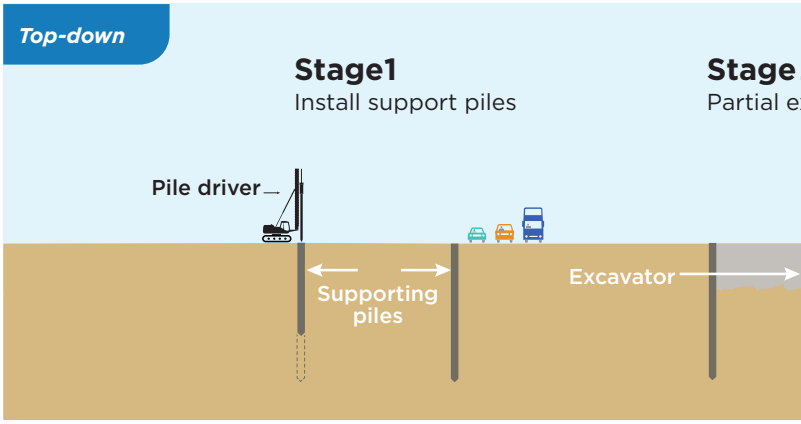
Cut and cover tunnels will be built where the Western Harbour Tunnel:

- emerges within the Warringah Freeway, to the north of the Ernest Street overbridge
- off ramp to Falcon Street emerges in the southeast corner of Ridge Street North
- on ramp from Berry Street dives into the Warringah Freeway corridor, near North Sydney.

Bottom-up



Top-down



Tunnelling stages

Stage 1. Excavation

We will be excavating road tunnels and delivering on ramps and off ramps.

The depth of the tunnels varies across the alignment (please see pages 24 and 25 for more detail on how deep the tunnel will be in your local area). At our deepest point we will be around 83 metres (25 storeys) underground and will come to surface for the on ramps and off ramps. We will also be starting to build the permanent operational facilities.

Stage 2. Finishing work

Once the tunnel is excavated, finishing work will include:

- installing drainage systems
- laying pavement
- line marking
- installing electrical pipes, road signage, street lighting and electrical panels.

Stage 3. Finishing and Fitout

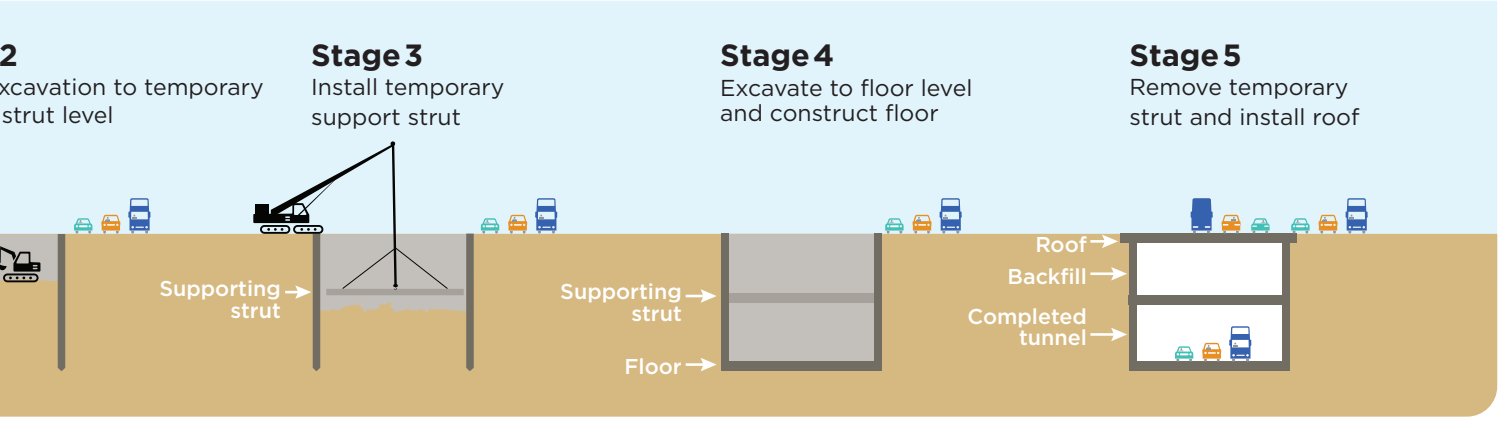
Once the tunnel is excavated, we will then carry out finishing and fitout work for the tunnels.

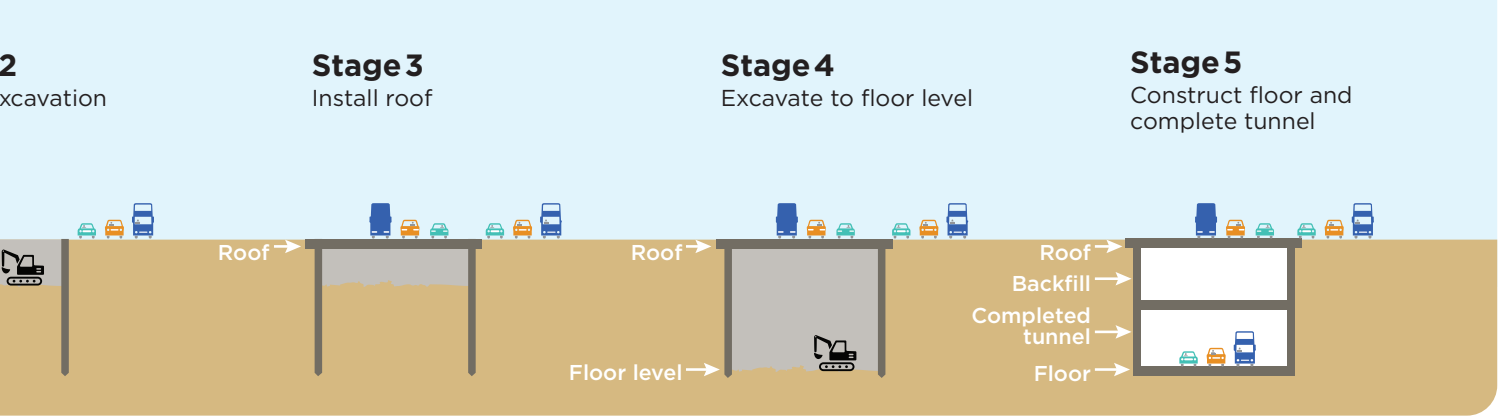
This will include pavement work which will connect to surface roads. This will involve:

- connecting power and lighting
- installing systems to support tunnel ventilation, fire safety, tolling and traffic controls
- constructing the operational facilities.

Stage 4. Testing and commissioning

We will carry out extensive testing before we open to traffic to make sure it is fully operational.





Surface roads

We will be building some new roads and upgrading a number of existing roads as part of the project. The main surface road work will take place on the Warringah Freeway.

Warringah Freeway

This work will involve:

- removing existing kerbs and pavement
- relocating and protecting services and utilities like power and water
- carrying out earthworks including excavation and preparing the foundations of the road by placing and compacting materials and rock
- building retaining walls to hold back soil and earth
- building and diverting drainage including adjusting existing and building new drains and pits, and installing pipes and culverts
- laying pavement, which generally includes a couple of layers of base foundations with a top of either asphalt or concrete
- carrying out finishing work (including line marking, installing signage and road furniture like lights and landscaping).

Bridges

We will be demolishing, building, upgrading and replacing a number of bridges across the project. Work will vary depending on the type of bridge being removed, but may include activities such as:

- relocating and protecting service and utilities like power and water
- relocating and managing traffic, pedestrian and cyclist lanes and installing traffic and environmental controls
- using cranes to place pre-built concrete pieces on the bridge
- building or upgrading the bridges
- laying asphalt or concrete on the top of the bridge
- marking lines, installing barriers, drainage and road furniture as required.

Cyclists on existing Ernest Street bridge

Coal Loader and Berrys Bay, Waverton

Aerial of Anzac Bridge and White Bay

Next steps

You can view the State Significant Infrastructure (SSI) Application, EIS and accompanying documents from **Wednesday 29 January 2020 until Thursday 12 March 2020.**

View a hard copy

Hard copies can be viewed during ordinary office or opening hours at the following locations:

Transport for NSW
20-44 Ennis Road, Milsons Point

Inner West Council
7-15 Wetherill Street, Leichhardt

North Sydney Council
200 Miller Street, North Sydney

Balmain Library
370 Darling Street, Balmain

Stanton Library, North Sydney
234 Miller Street, North Sydney

Willoughby Council
Level 4, 31 Victor Street, Chatswood

Chatswood Library
Lower Ground, The Concourse, 409 Victoria Avenue, Chatswood

Leichhardt Library
Piazza Level, Italian Forum, 23 Norton Street, Leichhardt

View an electronic copy

Electronic copies can be viewed at the following locations:

Department of Planning, Industry and Environment
4 Parramatta Square, 12 Darcy Street
Parramatta NSW 2150
planningportal.nsw.gov.au/major-projects/projects/on-exhibition

NSW Service Centres (various locations)
service.nsw.gov.au/service-centre/servicensw

Interactive portal

Visit our interactive web portal to read the EIS, find out more, watch our videos or ask the team a question.

nswroads.work/whtportal

Meet and talk with our team

Join us at one of our community information sessions. Drop in any time to meet the team, find out more about the project and learn more about the EIS.

Community pop-up sessions

We will also be attending a number of local community markets during February and March 2020 so please look out for the team.

Community information sessions

6 February 2020
Balmain
4pm – 7pm
Balmain Town Hall, 370 Darling Street, Balmain

8 February 2020
North Sydney
11am – 2pm
Fred Hutley Hall, 200 Miller Street, North Sydney

13 February 2020
North Sydney
4pm – 7pm
Fred Hutley Hall, 200 Miller Street, North Sydney

15 February 2020
Cammeray
11am – 2pm
Norths, 12 Abbott Street, Cammeray

20 February 2020
Cammeray
4pm – 7pm
Norths, 12 Abbott Street, Cammeray

22 February 2020
Balmain
11am – 2pm
Balmain Town Hall, 370 Darling Street, Balmain

How to make a submission

We welcome your submission on the Western Harbour Tunnel and Warringah Freeway Upgrade EIS. DPIE has placed the EIS on public exhibition from Wednesday 29 January until Thursday 12 March 2020.

During this time we encourage you to make a submission. Once the public exhibition period has closed, DPIE will provide us with a copy of all the submissions made. We will then prepare a submissions report to respond to the issues raised.

The report will be submitted to DPIE and available to view on their website. This report and the EIS help inform the Minister for Planning and Public Spaces' decision on the project. If the project is approved it will be built and operated in accordance with the plans described in the EIS and the Minister for Planning and Public Spaces' Conditions of Approval.

We are always looking for opportunities for innovation in our design and to further reduce the impact of our work. This means the plans proposed in the EIS may need to evolve further. Other factors which can influence the development of the design and how we build the project include community feedback received during exhibition and the construction methods developed by the construction contractor once they are appointed.

You may see some changes, once our selected construction contractor carries out detailed planning and design before the project starts. Any variances will be assessed for consistency with the assessment made in the EIS and if not consistent, a planning modification will have to be submitted to DPIE for their consideration and approval. You will have the opportunity to provide feedback on any modification.

How to make an online submission

1. Visit DPIE's Major Projects website at **planningportal.nsw.gov.au/major-projects**
2. Create a user account by clicking the 'Sign In' icon in the top right of the homepage or under the 'Services' tab and then click the 'Have Your Say' link
3. When you are logged in, find the Western Harbour Tunnel and Warringah Freeway Upgrade project, and click the 'Make a Submission' icon.

How to make a hard copy submission

You can submit a hard copy of your submission. If you want DPIE to delete your personal information before publication, please make this clear at the top of your letter.

You need to include:

1. your name and address, at the top of the letter only
2. the name of the application and application number: **SSI_8863**
3. a statement on whether you support or object to the proposal
4. the reasons why you support or object to the proposal
5. a declaration of any reportable political donations made in the previous two years.

You can hand deliver your submission to DPIE's office, located at:

4 Parramatta Square, 12 Darcy Street
Parramatta NSW 2150

You can post your submission to:

Attention: Director, Transport Assessments
Planning & Assessment, Department of Planning Industry and Environment
Locked Bag 5022
Parramatta NSW 2124

Donations and Gift Disclosure

Anyone lodging submissions must declare reportable political donations made in the previous two years. To find out what is reportable, and for a disclosure form, go to planning.nsw.gov.au/donationsandgiftdisclosure or phone 1300 305 695 for a copy.

Note: the disclosure requirements apply however a submission is made.

Privacy

Before making your submission, please read DPIE's Privacy Statement at planning.nsw.gov.au/privacy or phone 1300 305 695 for a copy. DPIE will publish your submission on its website in accordance with their Privacy Statement.

Submissions must be received by DPIE before midnight 12 March 2020.


TAXI

Contact the Western Harbour Tunnel team

whtbl@transport.nsw.gov.au

1800 931 189

Transport for NSW
Locked Bag 928,
North Sydney NSW 2059

nswroads.work/whtbl

131 450

If you need help understanding this information, please contact the Translating and Interpreting Service on **131 450** and ask them to call us on **1800 931 189.**

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