NSW GOVERNMENT

Transport for NSW

Beaches Link and Gore Hill Freeway Connection

Executive summary

transport.nsw.gov.au

DECEMBER 2020

Executive Summary

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Strategic context

The population of Sydney is forecast to grow from five million to eight million people over the next 40 years. To accommodate this growth, The Greater Sydney Commission's *Greater Sydney Region Plan – A Metropolis of Three Cities* (Greater Sydney Commission, 2018a) proposes a vision of three cities where most residents have convenient and easy access to jobs, education and health facilities and services.

The Beaches Link and Gore Hill Freeway Connection project is located within the North District (and the Eastern Economic Corridor) and the Northern Beaches of the Eastern Harbour City region as shown in Figure E-1. The North District supports 11 per cent of the population and 20 per cent of the jobs in Greater Sydney.

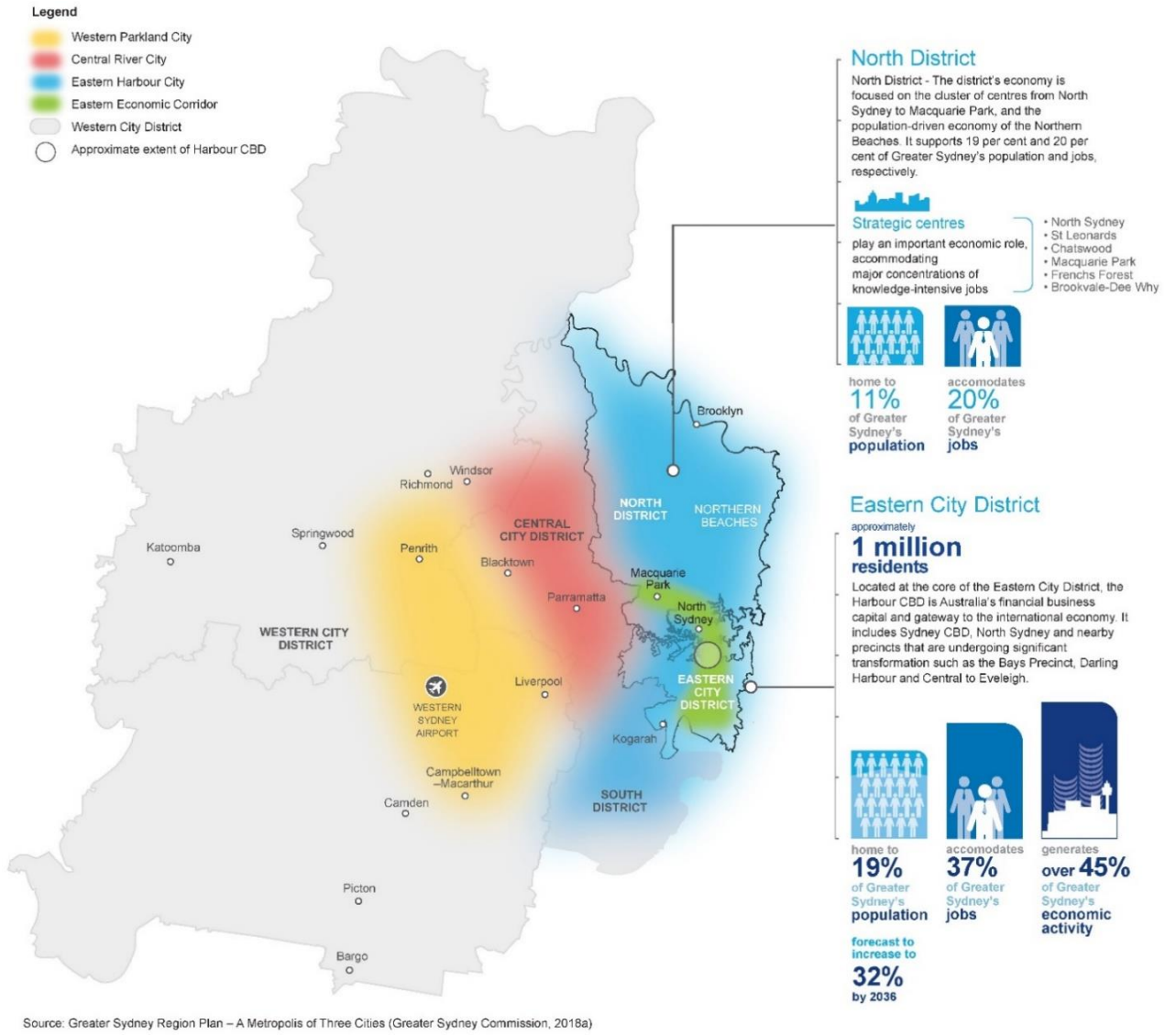

Figure E-1 Greater Sydney's Eastern City and North districts

Supporting the current needs and future growth of the North District, Eastern Harbour City and Eastern Economic Corridor through an efficient transport network is fundamental to maintaining the liveability, productivity and sustainability of Greater Sydney. Accordingly, the *Greater Sydney Region Plan* was prepared concurrently with the *Future Transport Strategy 2056* (NSW Government, 2018) and the *State Infrastructure Strategy 2018–2038* (Infrastructure NSW, 2018) to align land use, transport and infrastructure outcomes for Greater Sydney.

Project need

The Eastern Harbour City has the largest concentration of jobs in Greater Sydney, accommodates the most productive industries and is home to a highly skilled workforce. Accordingly, the eastern motorway crossings of Sydney Harbour are critical links in Sydney's motorway and arterial road network. These major transport corridors around the Harbour CBD are critical to the performance of the arterial network servicing the Northern Beaches, particularly for north-south trips and are some of the busiest in Greater Sydney and indeed in Australia. Key metrics for the Eastern Harbour City's road transport network are shown in Figure E-2.

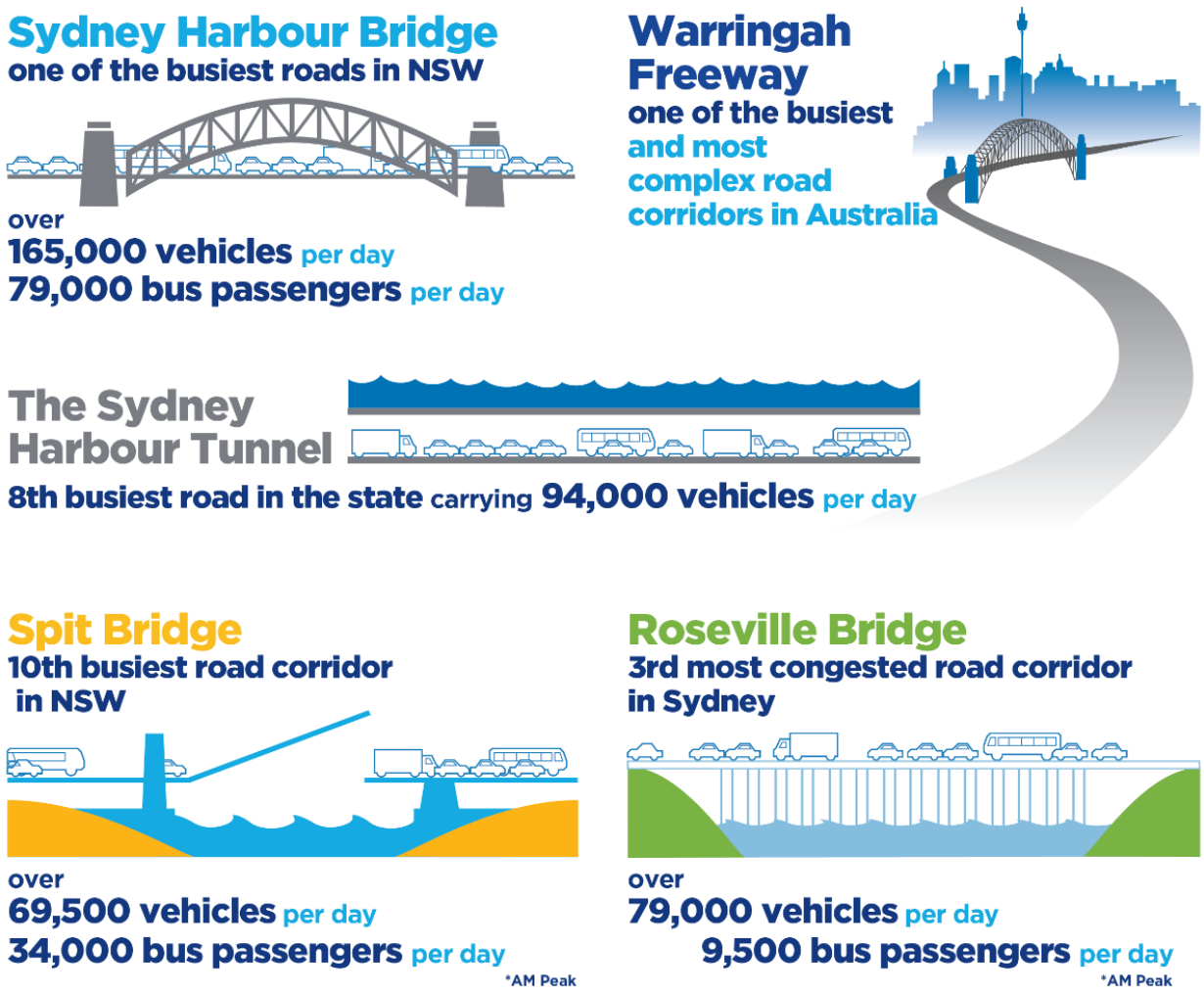

Figure E-2 Key metrics for the Eastern Harbour City's transport network

The high demand and limited capacity on the Sydney Harbour crossings result in delays and unreliable journey times for a significant number of customers who directly rely on these corridors. Furthermore, the limited number of alternate routes for crossing Sydney Harbour makes these corridors critical to the performance of the broader motorway and arterial road network. Network data demonstrates that incidents on the harbour crossings and their approaches can significantly impact journey times for freight, buses and private vehicles travelling north and south on the

arterial network servicing the Northern Beaches region, with Spit Road and Military Road particularly affected. The high road demand and limited number of corridors connecting the Northern Beaches means that incidents on these corridors have significant impacts on journey times to and from the region.

As the Northern Beaches is connected to the rest of Greater Sydney by a small number of transport corridors, this contributes to high levels of congestion, long and unreliable journey times and, consequently, poor accessibility to and from the region. Just three road corridors connect the Northern Beaches with the rest of Greater Sydney: Mona Vale Road, Warringah Road and Military Road/Spit Road. All three currently experience high levels of traffic congestion. The region is particularly reliant on the most southerly corridors: Warringah Road via Roseville Bridge and Spit Road/Military Road via Spit Bridge corridors. Currently, these links carry 71 per cent of all inter-regional road journeys to and from the Northern Beaches.

Further to the large traffic volumes and limited alternative routes, a major contributor to congestion around the Harbour CBD is that many of the most critical road corridors – including Military Road, Warringah Road, the Sydney Harbour Bridge, the Sydney Harbour Tunnel, ANZAC Bridge, Western Distributor and the Warringah Freeway – perform both bypass and access functions. The dual function of these corridors is reflected in the high proportion of vehicles that use them to travel to destinations other than Sydney CBD. These conflicting functions, combined with high traffic volumes, result in congestion and poor network performance experienced by freight, public transport and private vehicle users.

Residents on the Northern Beaches rely heavily on private vehicles and public buses for travel (Northern Beaches Council, 2018). Public transport travel times to the Northern Beaches can be long and unreliable, with bus travel times between Mona Vale and the Sydney CBD in excess of 60 minutes during peak periods despite recent improvement due to the B-Line program. By reducing network congestion, the project would result in improved network resilience and reliability, particularly in peak periods, and would make bus routes to and from the Northern Beaches a more attractive transport option, supporting and encouraging a mode shift to public transport. The project would also create the opportunity for new express bus routes to be developed in response to diverse travel demands and future development.

The project is also identified as a priority initiative under Infrastructure Australia's *Australian Infrastructure Plan: The Infrastructure Priority List (*Infrastructure Australia, 2018) for its importance in addressing urban congestion on Sydney's road network, providing cross-harbour connectivity and Northern Beaches connectivity.

Further detail on these transport challenges and their influence on the proposed design for the Beaches Link and Gore Hill Freeway Connection project is provided in Chapter 3.

Project objectives

To ensure the design of the project meets the identified transport needs, the objectives summarised in Figure E-3 have been developed for the Beaches Link and Gore Hill Freeway project.

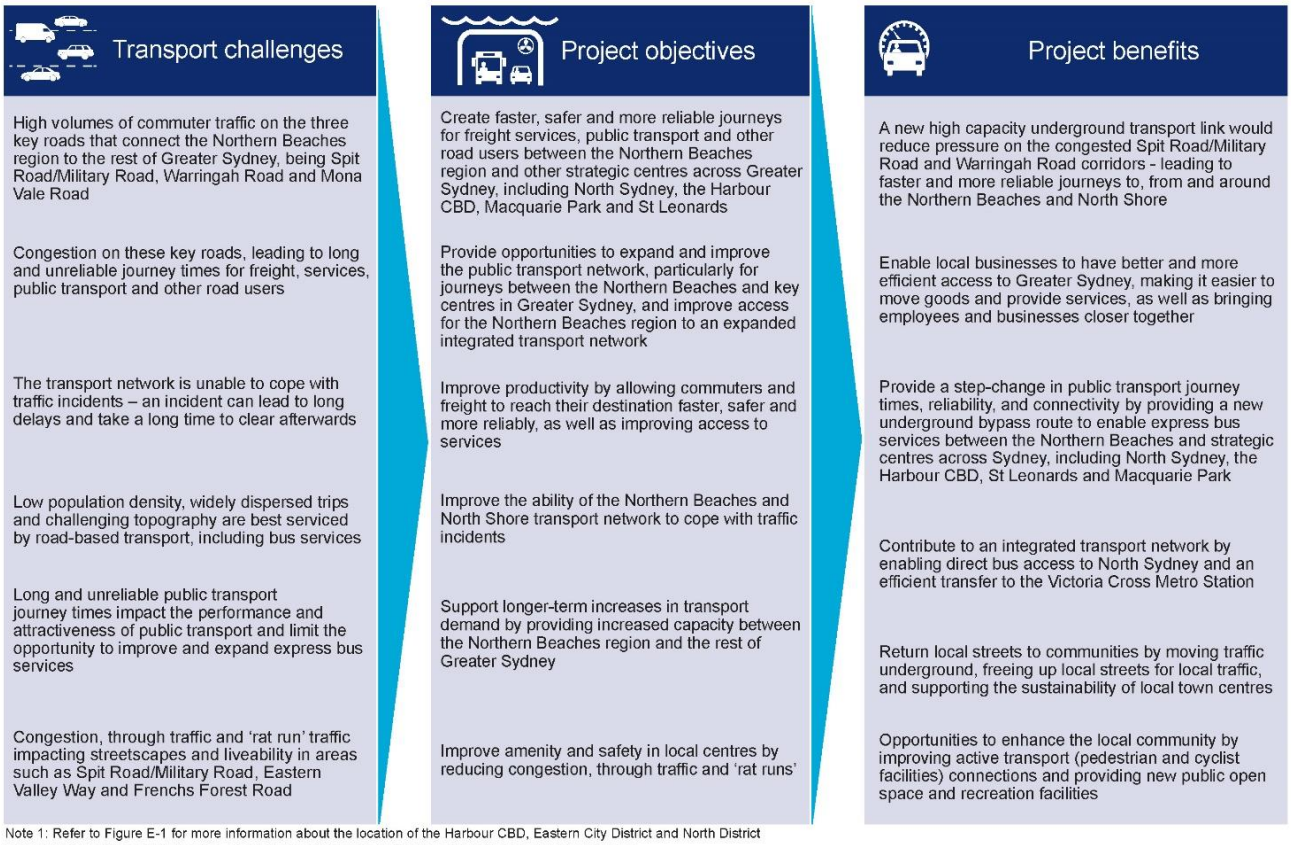

Figure E-3 Project challenges, objectives and benefits

Overview of the Western Harbour Tunnel and Beaches Link program of works

The Western Harbour Tunnel and Beaches Link program of works is a major transport infrastructure program that would make it easier, faster and safer to get around Sydney. As Sydney continues to grow, faster and more reliable trips are essential to reducing congestion and providing new levels of access to jobs, recreation, and services such as schools and hospitals. By creating a western bypass of the Sydney CBD, the Western Harbour Tunnel would take pressure off the Sydney Harbour Bridge, Sydney Harbour Tunnel and ANZAC Bridge; while Beaches Link would create an alternative to the Military Road/Spit Road and Warringah Road corridors to relieve traffic pressure on the North Shore.

The program of works has been designed as part of an integrated transport network, which has a focus on new public transport connections and improved journey times and reliability for buses. It would also provide improvements to walking and cycling routes, providing more active transport options.

The Western Harbour Tunnel and Beaches Link program of works include:

- The Western Harbour Tunnel and Warringah Freeway Upgrade project which comprises a new motorway tunnel connection across Sydney Harbour, and an upgrade of the Warringah Freeway to integrate the new motorway infrastructure with the existing road network and to enable the future connection of the Beaches Link and Gore Hill Freeway Connection project
- The Beaches Link and Gore Hill Freeway Connection project (the project) which comprises a new motorway tunnel connection across Middle Harbour from the Warringah Freeway and Gore Hill Freeway to the Burnt Bridge Creek Deviation at Balgowlah and Wakehurst Parkway at Killarney Heights. The project also includes a surface upgrade of Wakehurst Parkway from Seaforth to Frenchs Forest and upgrade and integration works to connect to the Gore Hill Freeway and Reserve Road at Artarmon.

The components of the Western Harbour Tunnel and Beaches Link program of works are shown in Figure E-4.

The delivery of the Western Harbour Tunnel and Beaches Link program of works would unlock a range of benefits for freight, public transport and private vehicle users. It would support faster and more reliable travel times for journeys between the strategic centres along the Eastern Economic Corridor of Sydney – an area between Port Botany and north-west that accounts for over 40 per cent of the NSW gross State product. For example, with the combined program of works, journeys from Dee Why to Sydney Kingsford Smith Airport are expected to be 56 minutes faster. Delivering the program of works would also improve the resilience of the motorway network, given that each project provides additional capacity and an alternative to heavily congested existing harbour crossings and their approaches.

The program of works would also provide an opportunity to improve existing, and introduce new, bus services between key employment and education centres, directly and reliably linking the Northern Beaches to strategic centres including North Sydney, the Harbour CBD, St Leonards and Macquarie Park via the motorway network This opportunity would better integrate employment, residential and education centres and provide improved road transport access to a wider range of services and facilities.

The Western Harbour Tunnel and Warringah Freeway Upgrade project and the Beaches Link and Gore Hill Freeway Connection project are subject to separate but coordinated environmental assessment and approval processes.

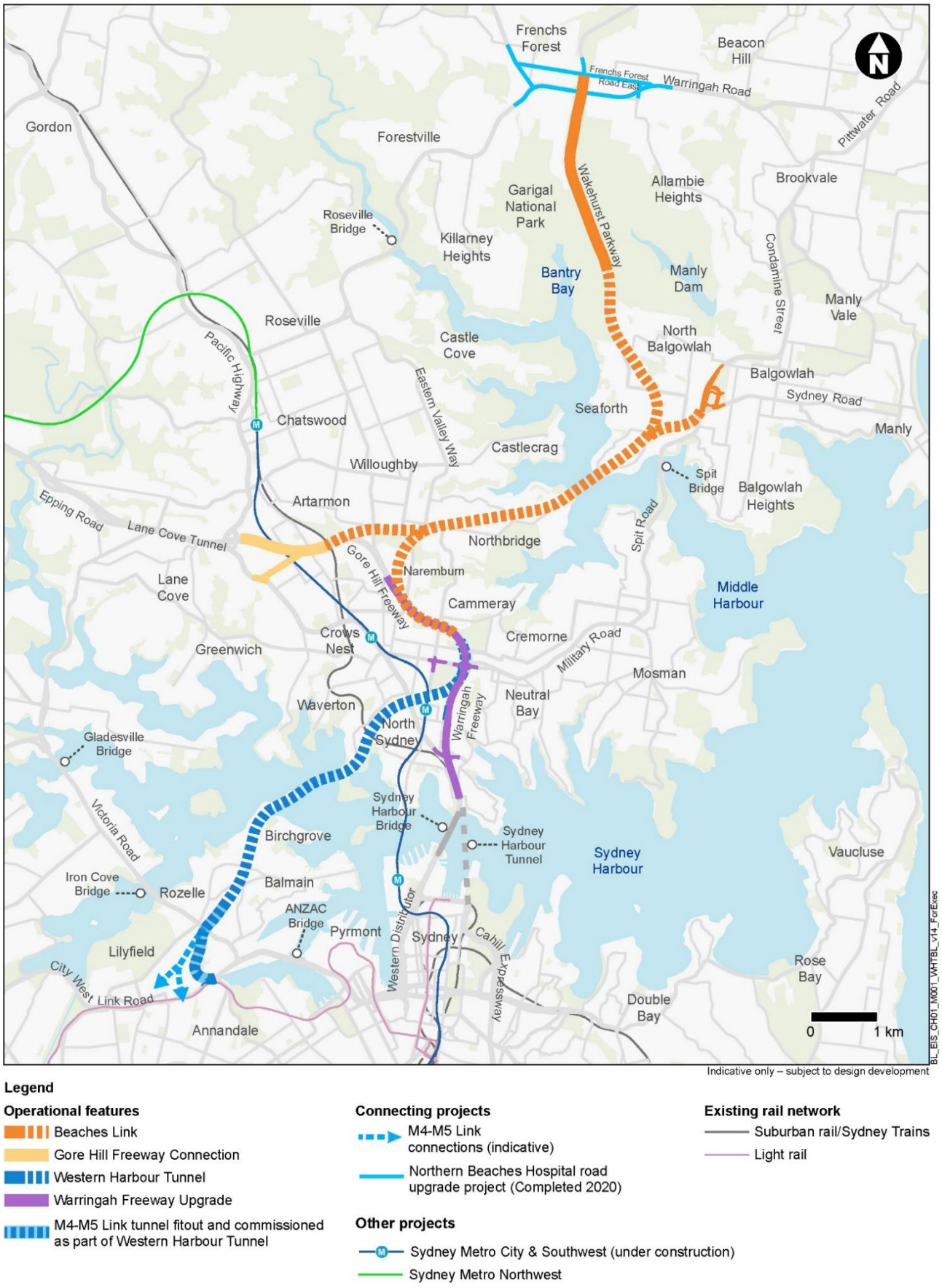

Figure E-4 Western Harbour Tunnel and Beaches Link program of works

The Beaches Link and Gore Hill Freeway Connection project

This environmental impact statement relates to the Beaches Link and Gore Hill Freeway Connection project. The project would comprise:

- Twin tolled motorway tunnels connecting the Warringah Freeway at Cammeray and the Gore Hill Freeway at Artarmon to the Burnt Bridge Creek Deviation at Balgowlah and Wakehurst Parkway at Killarney Heights, and an upgrade of Wakehurst Parkway (the Beaches Link)
- Connection and integration works along the existing Gore Hill Freeway and surrounding roads at Artarmon (the Gore Hill Freeway Connection).

Key features of the Beaches Link component of the project are shown in Figure E-5 and would include:

- Twin mainline tunnels about 5.6 kilometres long and accommodating three lanes of traffic in each direction, together with entry and exit ramp tunnels to connections at the surface. The crossing of Middle Harbour between Northbridge and Seaforth would involve three lane, twin immersed tube tunnels
- Connection to the stub tunnels constructed at Cammeray as part of the Western Harbour Tunnel and Warringah Freeway Upgrade project
- Twin two lane ramp tunnels:
  - Eastbound and westbound connections between the mainline tunnel under Seaforth and the surface at Burnt Bridge Creek Deviation, Balgowlah (about 1.2 kilometres in length)
  - Northbound and southbound connections between the mainline tunnel under Seaforth and the surface at Wakehurst Parkway, Killarney Heights (about 2.8 kilometres in length)
  - Eastbound and westbound connections between the mainline tunnel under Northbridge and the surface at the Gore Hill Freeway, Artarmon (about 2.1 kilometres in length).
- An access road connection at Balgowlah between Burnt Bridge Creek Deviation and Sydney Road including the modification of the intersection at Maretimo Street and Sydney Road, Balgowlah
- New and improved public open space and recreation facilities at Balgowlah including utilisation of the new access road for connectivity to the new facilities
- Upgrade and integration works along Wakehurst Parkway at Seaforth, Killarney Heights and Frenchs Forest, through to Frenchs Forest Road East
- New and upgraded active transport infrastructure (pedestrian and cyclist facilities)
- Ventilation outlets and motorway facilities at the Warringah Freeway in Cammeray, the Gore Hill Freeway in Artarmon, Burnt Bridge Creek Deviation in Balgowlah and Wakehurst Parkway in Killarney Heights
- Operational facilities, including a motorway control centre at the Gore Hill Freeway in Artarmon, and tunnel support facilities at the Gore Hill Freeway in Artarmon and Wakehurst Parkway in Frenchs Forest
- Other operational infrastructure including groundwater and tunnel drainage management and treatment systems, pavement works, surface drainage, signage, tolling infrastructure, fire and life safety systems, roadside furniture, lighting, emergency evacuation and emergency smoke extraction infrastructure, Closed-Circuit Television (CCTV) and other traffic management systems.

Key features of the Gore Hill Freeway Connection component of the project are shown in Figure E-1 and would include:

- Upgrade and reconfiguration of the Gore Hill Freeway between the T1 North Shore & Western Line and T9 Northern Line and the Pacific Highway
- Modifications to the Reserve Road and Hampden Road bridges
- Widening of Reserve Road between the Gore Hill Freeway and Dickson Avenue
- Modification of the Dickson Avenue and Reserve Road intersection to allow for the Beaches Link off ramp
- Upgrades to existing roads around the Gore Hill Freeway to integrate the project with the surrounding road network
- Upgrade and inclusion of traffic lights of the Dickson Avenue and Pacific Highway intersection
- New and upgraded pedestrian and cyclist facilities
- Other operational infrastructure, including surface drainage and utility infrastructure, signage and lighting, CCTV and other traffic management systems.

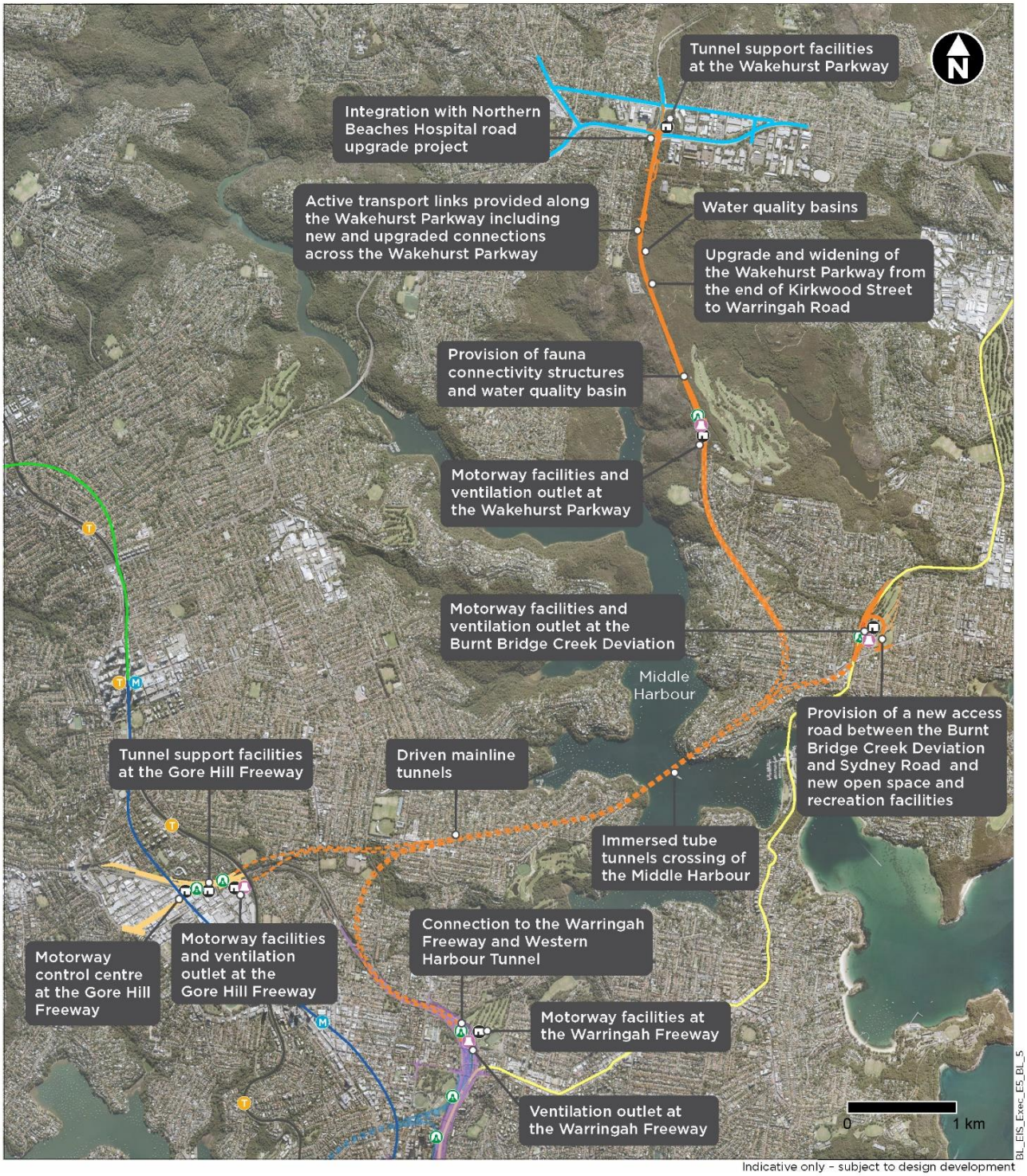

Figure E-5 Key features of the Beaches Link component of the project

Figure E-1 Key features of the Gore Hill Freeway component of the project

Major transport benefits

The project would provide additional capacity across the Middle Harbour road corridor, relieving congestion on existing key road corridors and providing connections to other key existing and future proposed transport projects. By creating a bypass of both the Spit Bridge/Military Road and the Roseville Bridge/Warringah Road corridors, the project would provide direct access from the Northern Beaches to the Warringah Freeway for fast and reliable access to key commercial and employment centres at North Sydney, the Sydney CBD and beyond. It would also provide a fast, reliable link between the Northern Beaches and other key centres in the north-west including St Leonards and Macquarie Park via the direct Gore Hill Freeway connection.

The project through providing an underground bypass would also provide major benefits to public transport, enabling faster, more reliable and direct peak express services between the Northern Beaches, Harbour CBD, North Sydney, St Leonards, and Macquarie Park. It would also improve travel times and reliability on existing services along key routes such as Military Road, Warringah Road, Pacific Highway, Warringah Freeway and Sydney Harbour Bridge by relieving pressure on surface arterial roads, reducing conflicts between express and multi-stop services allowing multi-stop surface bus routes to operate more efficiently on these corridors.

The project would also deliver improved active transport infrastructure, including a new shared path along Wakehurst Parkway with overpass links to the new Northern Beaches Hospital precinct, and shared user underpasses provided beneath Wakehurst Parkway to provide safe connections from Garigal National Park and Manly Dam Reserve. Additional shared pathways would be provided in and around the new and improved open space recreation facilities at Balgowlah, integrating with existing paths to nearby commercial and community receivers. Realignment and reconstruction of the shared user path along the southern side of the Gore Hill Freeway would also be provided.

Project construction

The construction of the Beaches Link component of the project would include works underground, underwater and at the surface. The majority of the tunnel for the project would be constructed using roadheaders. The combination of the high quality Sydney Sandstone beneath most of the city, and the wide cross section required for road tunnels make this the most efficient and common method for constructing road tunnels in Sydney.

The poorer geological ground conditions at the Middle Harbour crossing requires the use of a different methodology to be adopted for the construction of the harbour crossing. Twin immersed tube tunnels, generally similar to the existing Sydney Harbour Tunnel, have been selected as the preferred solution as it would reduce the risk of deep tunnelling through poor geological ground conditions and deliver the best transport product by providing the lowest possible gradient for surface connections.

This section of the tunnel would be constructed by installing a series of pre-fabricated tunnel units to form the harbour crossing. Due to the profile of the harbour bed, the units would sit both partially within a trench closer to the shore and above the bed of the harbour towards the centre of the crossing. Given the very soft sediments at the bed of Middle Harbour, supporting piles would be required at discrete locations along the immersed tube crossing. A locking fill would be placed around the end sections of the immersed tube tunnels for stability and protection.

The shallow sand bar at the entrance to Middle Harbour prevents the transportation of fully completed tunnel units to the tunnel crossing location. The tunnel units would be partially fabricated outside of Middle Harbour then transported with the assistance of tug boats to a temporary floating immersed tube tunnel casting facility located at Spit West Reserve. The tunnel unit fabrication would be completed at a temporary construction support site at Spit West Reserve and transported by tug boats to a temporary mooring area within Middle Harbour before being placed into their final position.

Temporary cofferdams would be constructed within Middle Harbour off the shoreline at Northbridge and Seaforth. The cofferdams would be used to construct underground connection structures, called interface structures, which are required to connect the immersed tube tunnels to the land tunnels.

Although much of the construction works for the Beaches Link component of the project would be underground, surface works would also be required to support tunnelling activities and to construct the temporary construction support sites, surface connections, surface road upgrades, tunnel portals and operational facilities. Construction activities for the Gore Hill Freeway Connection would generally include surface earthworks, bridgeworks, utility works, tunnel construction of retaining walls, installation of stormwater drainage and pavement construction.

The construction of the Beaches Link and Gore Hill Freeway Connection project would require around 14 temporary construction support sites including tunnelling and tunnelling support sites, civil surface sites, cofferdams, mooring sites, wharf and berthing facilities, laydown areas, parking and workforce amenities. About four of these sites are areas within or adjacent to the existing Gore Hill Freeway corridor. An overview of these sites is provided in Figure E-2.

Tunnel spoil generated by the driven tunnels would be removed from acoustic sheds (designed to minimise noise impacts to the local community) at tunnelling temporary construction support sites. Most of the temporary construction support sites have direct access to the arterial road network, and spoil would generally be removed using trucks.

Most of the material dredged for the immersed tube tunnel crossing would be transported to the existing designated offshore disposal site managed by the Commonwealth Department of Agriculture, Water and the Environment in accordance with the *Environment Protection (Sea Dumping) Act 1981.* This disposal site is over 20 square kilometres in area, about 120 metres deep, and non-dispersive, meaning that material disposed of would stay within the disposal site. The disposal site is currently active and receiving material under permits from other marine maintenance and capital projects. An application for the project to dispose of suitable dredged material at the offshore disposal will be submitted to the Department of Agriculture, Water and the Environment.

Dredged materials not suitable for offshore disposal would be transported by barge to a loadout facility to be made spadable and then loaded onto trucks. The material would be classified according to the NSW Environment Protection Authority's *Waste Classification Guidelines* (NSW EPA, 2014a) and disposed of at a suitably licensed land-based facility.

The construction program presented within the environmental impact statement provides indicative timing only. The final construction program, and commencement of works at each construction site, may vary. Subject to planning approval and procurement, construction of the Beaches Link and Gore Hill Freeway Connection project is currently planned to commence in 2023. On that basis, completion of the main construction would be around the end of 2027 and completion of construction works for the new and improved open space and recreation facilities would be in 2028 – a total construction period of five to six years. Early works and site establishment would be the first works carried out for the project, with substantial construction starting around six months later.

For further details on the construction aspects of the project refer to Chapter 6.

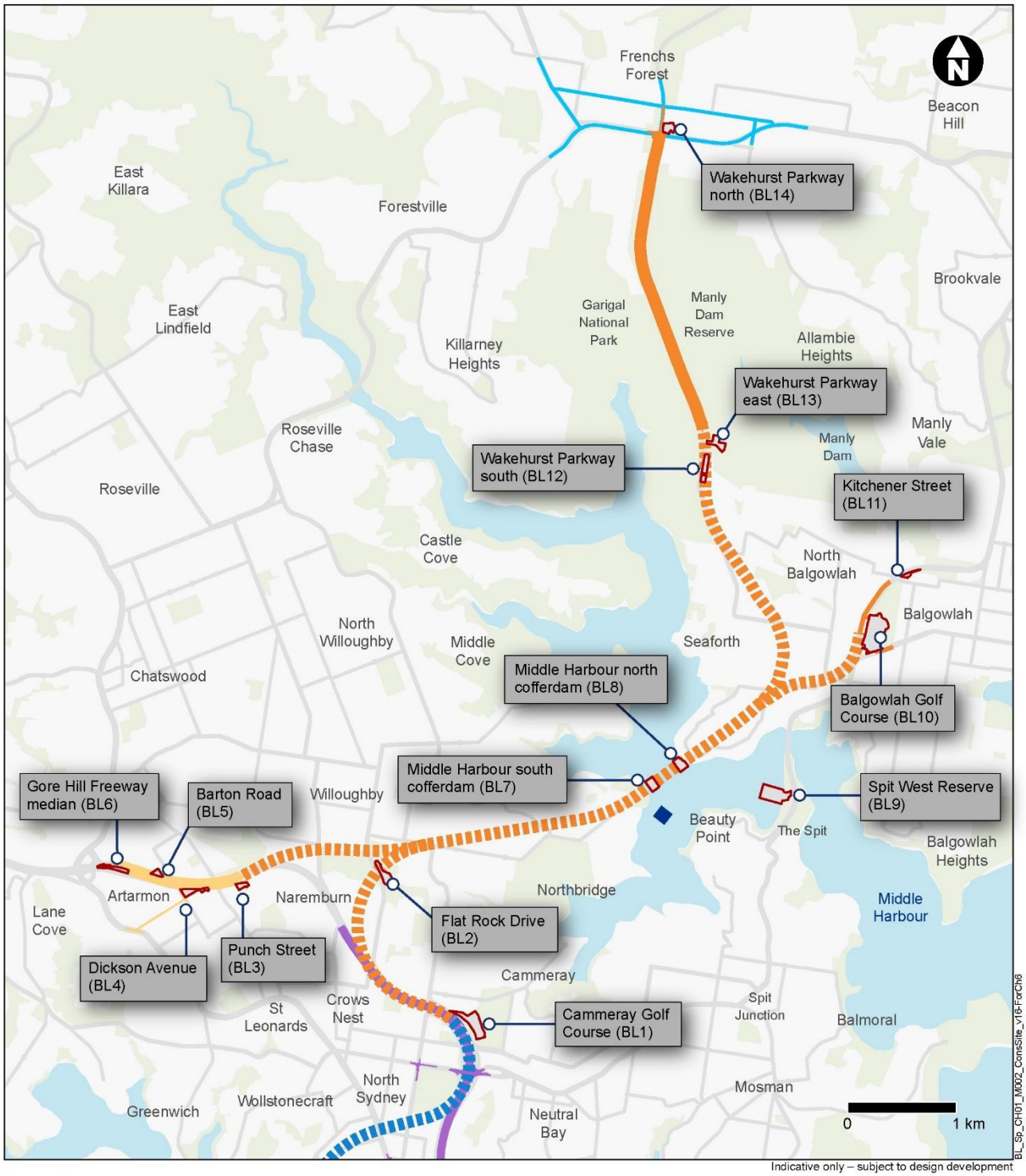

Figure E-2 Overview of the temporary construction support sites

Alternatives considered

The need for additional core motorway capacity at the crossings of Middle and Sydney Harbour was identified as key to development of an appropriate multi-modal Sydney transport network in the *NSW Long Term Transport Master Plan* (Transport for NSW, 2012) and subsequent *Future Transport Strategy 2056* (NSW Government, 2018).

Considering the requirements identified within the *NSW Long Term Transport Master Plan* and the *Future Transport Strategy 2056*, a number of strategic alternatives were considered for delivering the required road capacity at the crossing of Sydney Harbour. The project has undergone extensive evaluation of alternatives from pre-feasibility and strategic investigations through to design development and refinement. The process of developing and assessing project alternatives is outlined in Figure E-3.

The physical and urban geography of the Northern Beaches region presents barriers to the consideration of rail-based solutions in addressing the transport challenges faced by the region. The provision of rail infrastructure is also reliant on the location of and accessibility to high density residential or commercial property in close proximity to the proposed location of stations as well as along its route. Given the high cost of constructing and operating rail infrastructure and the low density nature of the Northern Beaches, it is considered that demand would not be high enough to make investing in a specific or dedicated rail link to the Sydney CBD a viable alternative.

Following identification of a new motorway tunnel as the preferred strategic alternative, a design development process was carried out to determine the most appropriate alignment and construction method to deliver the tunnel. The process for selection of the preferred tunnel alignment and construction methodologies included consideration of ten strategic corridors and over fifteen different combinations of tunnelling methods.

Options were developed and assessed by a multidisciplinary team including design engineers, construction engineers, transport planners and environmental advisors with direct experience in delivering major transport infrastructure in NSW, Australia and internationally.

Following preliminary technical and environmental analysis, five corridor alternatives were shortlisted for a new tunnelled motorway connection between Cammeray, Artarmon, Killarney Heights and Balgowlah (refer to Figure E-4). Selection of the preferred corridor required consideration of various technical, environmental and community factors including:

- Strategic traffic demands and how they define the required connectivity to achieve transport outcomes
- Results of geotechnical, groundwater and contamination investigations
- Topography along the alignment
- Basements and foundations of structures along the routes
- Maritime heritage, biodiversity and marine ecology
- Turbidity and hydrodynamic monitoring and modelling for Middle Harbour
- Opportunities for viable temporary intermediate tunnelling sites that minimise community, environmental and heritage impacts
- Physical and operational interfaces with other major infrastructure (eg Sydney Metro Tunnels, the Warringah Freeway, Northern Beaches Hospital Road Upgrade project)
- Integration with the proposed Western Harbour Tunnel and Warringah Freeway Upgrade project
- Horizontal alignments and waterway crossing methodologies that allow the tunnel to achieve acceptable vertical gradients to achieve the desired transport product, reduce whole of life emissions, operational costs, and improve safety outcomes

- Surface connections and interchanges that integrate with the arterial road network and connect bus routes and public transport nodes
- Interfaces with commercial and recreational maritime traffic
- Construction and operational efficiencies
- Potential impacts on local communities including amenity and connectivity.

The blue corridor was selected as the preferred corridor alternative for the new motorway (refer to Figure E-4). This corridor was selected as it achieves a greater alignment with transport and city-shaping objectives. This reflects the fact that it delivers more direct east-west connectivity relative to the pink corridor, while also providing strong north-south connectivity. This delivers more congestion relief to arterial roads, such as Warringah Road, and also provides the opportunity for new express bus services for customers travelling between the Northern Beaches and strategic centres such as North Sydney, St Leonards and Macquarie Park. The superior east-west connectivity means that the blue option also performs best with respect to productivity objectives. This is a result of enabling greater access to jobs for residents in the Northern Beaches and also the fact that it reduces the cost of business travel.

For further details on the development of the preferred design and the alternatives considered refer to Chapter 4.

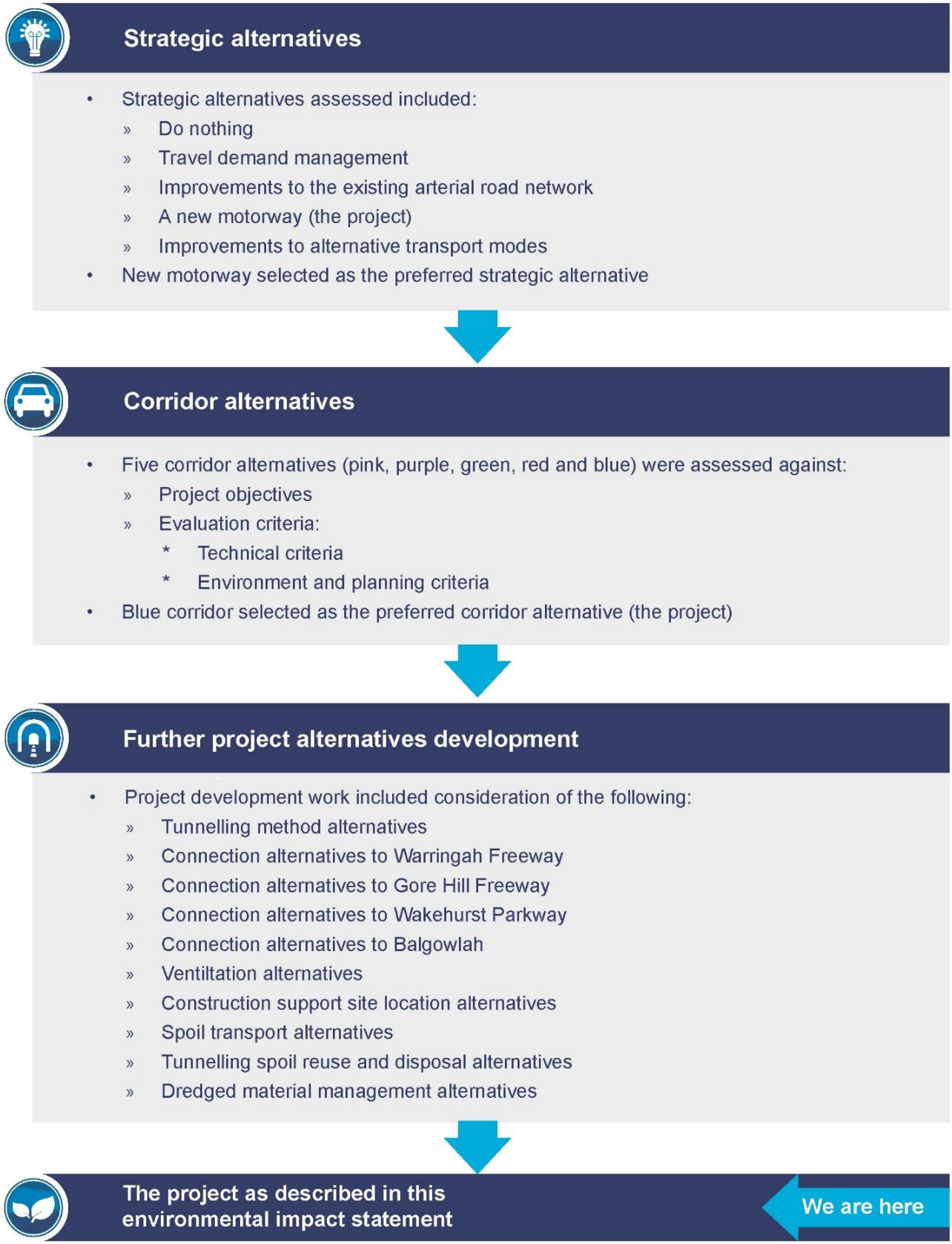

Figure E-3 Alternatives development process

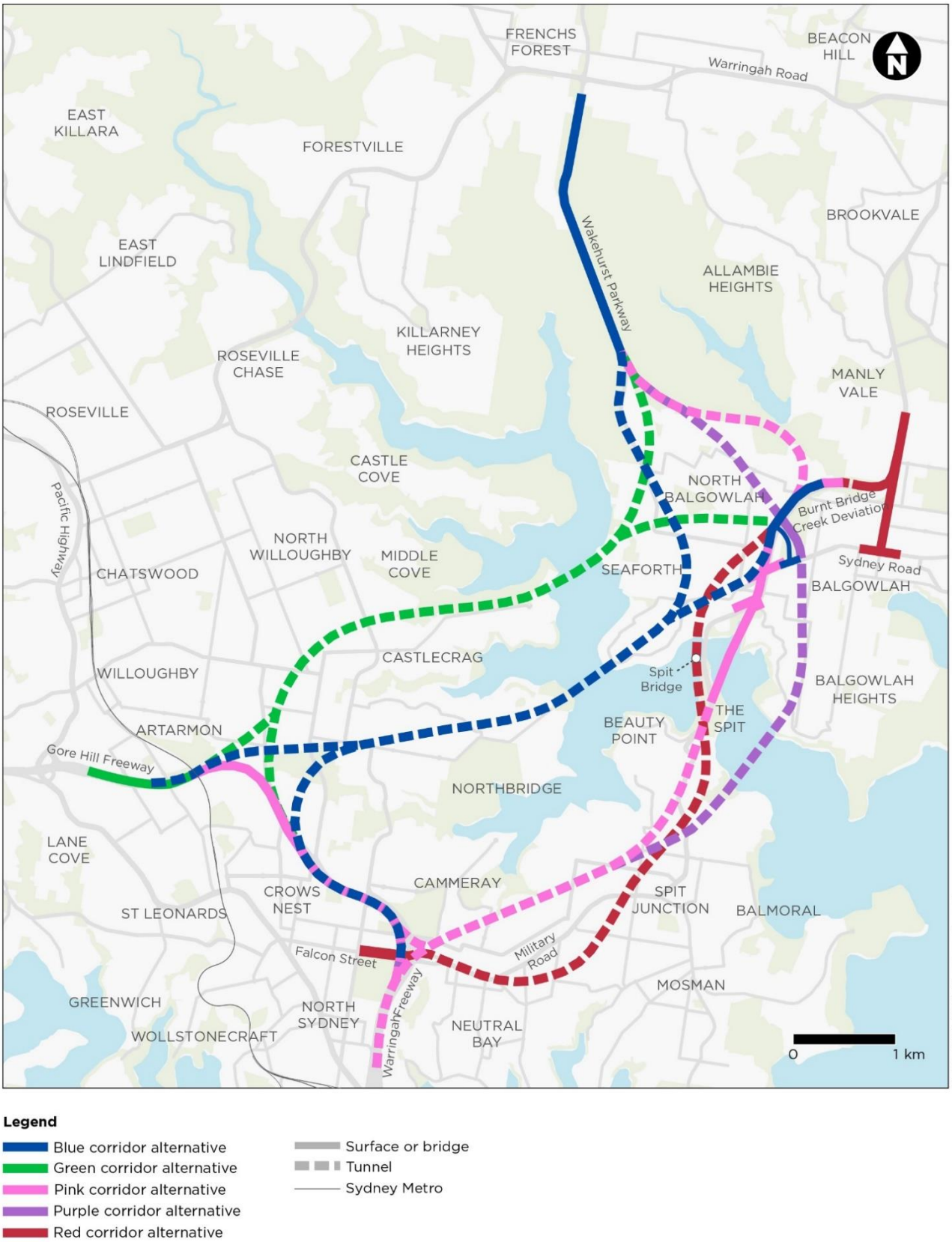

Figure E-4 Shortlisted main corridor alternatives

The proponent

The proponent for the project is Transport for NSW. Transport for NSW is the lead agency of the NSW transport portfolio, with primary responsibility for:

- Transport coordination
- Transport policy and planning
- Transport services
- Transport infrastructure.

Transport for NSW would manage the planning, procurement and delivery of the project.

Planning approval process

Transport for NSW formed the opinion that the construction and operational impacts of the project would require an environmental impact statement. In accordance with clause 1 and clause 14 of Schedule 3 of State Environmental Planning Policy (State and Regional Development) 2011 the project is declared State significant infrastructure. Transport for NSW has also requested the Minister for Planning and Public Spaces to declare the project as critical State significant infrastructure under section 5.13 of the *Environmental Planning and Assessment Act 1979*.

This environmental impact statement is publicly exhibited to provide the community, government agencies and stakeholders with an understanding of what is proposed and to invite comment. Transport for NSW will consider the comments and submit to the Department of Planning, Industry and Environment a submissions report that documents and responds to issues raised during the exhibition period. The Secretary of the Department of Planning, Industry and Environment will then prepare an assessment report for the Minister for Planning and Public Spaces who will then determine whether to grant project approval and specify project conditions.

The assessment and approval process is shown in Figure E-5.

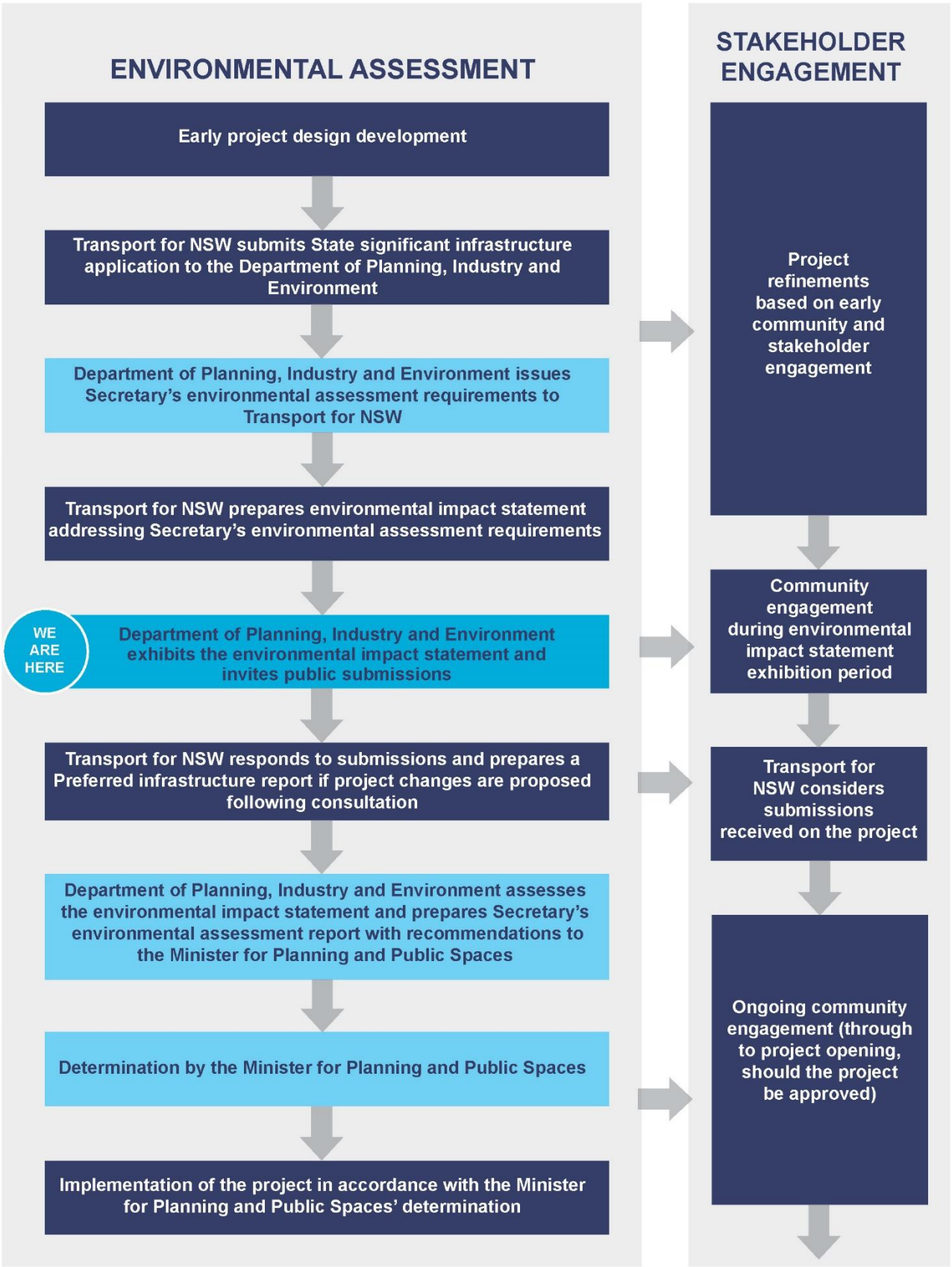

Figure E-5 The assessment and approval process for the project

Environmental assessment

This environmental impact statement has been prepared in accordance with the provisions of Part 5, Division 5.2 of the *Environmental Planning and Assessment Act 1979*. In particular, it addresses the requirements of the Secretary of the Department of Planning, Industry and Environment. It also includes consideration of the issues raised by the community and stakeholders during the development of the project.

It is inevitable that delivery of a project of this scale within a heavily urbanised environment would have some adverse impacts, particularly during construction. These impacts need to be considered within the context of the overall objectives of the project and the significant transport and other benefits it would provide over the medium to longer term, and for future generations.

Key environmental issues have been considered throughout the design and development process. Consultation has been carried out with affected stakeholders to identify potential impacts at an early stage. Where possible, these would be avoided or appropriate management measures developed. These considerations have resulted in a number of design changes and refinements that have mitigated many of the potential significant impacts.

Some project impacts would be largely temporary and confined to the construction period.

Based on the results of the environmental investigations carried out for this environmental impact statement, it is considered that matters of national environmental significance and the environment of Commonwealth land are not likely to be significantly impacted by the project. Accordingly, Transport for NSW has determined that no referral is required under the *Environment Protection and Biodiversity Act 1999* at this stage.

The following sections provide an overview of the benefits and impacts identified within the environmental assessment.

Traffic and transport

Traffic and transport operational outcomes

Benefits from the project would include:

- Travel time savings and reliability benefits for users of the project, as well as for users of existing key corridors which would benefit from reduced traffic demand including Military Road, Spit Road, Warringah Road, and Eastern Valley Way
- Improved connections to North Sydney and Sydney CBD and new connections to St Leonards and Macquarie Park via the Gore Hill Freeway Connection
- Customers travelling between Frenchs Forest and Macquarie Park would be able to bypass approximately 20 sets of traffic lights by using the Beaches Link tunnel
- Improved travel times and reliability for buses travelling along existing key corridors including Warringah Road, Eastern Valley Way and Military Road
- New opportunities for public transport by providing the opportunity to operate express buses to Sydney CBD, North Sydney and beyond, with potential for direct interchange at North Sydney and St Leonards with Sydney Metro and Sydney Trains
- Better access to jobs and businesses, with direct access to the new Northern Beaches Hospital at Frenchs Forest, and better access to businesses on the Northern Beaches from Greater Sydney
- Substantial improvements in road safety, with reduced traffic demand along key road transport corridors, resulting in a 77 per cent forecast reduction in crashes for vehicles redirected to Beaches Link (equating to a reduction of around 560 crashes per year)

- Major reduction of heavy vehicle traffic on the Spit Road and Military Road corridor by up to 74 per cent
- Additional capacity for outbound traffic crossing Sydney Harbour and leaving the lower North Shore, relieving existing corridors including Military Road and Eastern Valley Way. This is illustrated by substantial improvements in average network speeds and the number of vehicle stops during evening peak periods
- Average travel speeds through the Balgowlah and surrounds study area would increase by up to 72 per cent in the morning peak and 40 per cent in the evening peak. The number of vehicle stops would reduce substantially by up to 57 per cent in the morning peak and 27 per cent in the evening peak
- Greater network resilience due to the provision of new road capacity and connectivity, and reduced rat-run traffic and congestion on existing surface roads including Miller Street (Cammeray), Brook Street (Naremburn), Eastern Valley Way (Northbridge), Frenchs Forest Road (Seaforth) and the Ourimbah Road corridor
- Pedestrian and cyclist facilities would improve the overall active transport network with upgraded infrastructure providing increased connectivity and enhanced safety.

During operation of the project, potential localised impacts would include:

- Changes to access in and around North Sydney would streamline movements around North Sydney CBD but would adjust access for some residents and businesses in the area. Impacts would be minimised by ensuring all properties have reasonable alternative routes to maintain access
- Some instances of localised increases to bus travel times through the North Sydney CBD area.

For further information on operational traffic and transport, refer to Chapter 9 (Operational traffic and transport).

Traffic and transport impacts during construction

The project has been designed to minimise traffic and transport impacts during construction and ensure that traffic movement is maintained. Road closures would be carried out to minimise impacts on the community, particularly during peak periods.

During construction, temporary impacts would include:

- Increased heavy vehicle movements around work sites, and localised increases in traffic volumes and traffic delays
- Temporary, full or partial closures of roads within the Gore Hill Freeway and Artarmon area, Burnt Bridge Creek Deviation and Wakehurst Parkway for short periods of time to carry out key construction activities which are located within the road corridor
- Minor adjustments to some bus stops along the project alignment, and some potential short-term adjustments to bus priority infrastructure on Burnt Bridge Creek Deviation may be required (with minor impacts on bus services)
- Temporary adjustments to shared user paths, pedestrian and cyclist facilities along the project alignment
- Temporary impacts on maritime traffic associated with controlled navigation routes and the partial closures of Middle Harbour for recreational, commercial and government users between Northbridge and Seaforth and adjacent to Spit West Reserve to enable construction works for the immersed tube tunnel.

For further information on construction traffic and transport, refer to Chapter 8 (Construction traffic and transport).

Noise and vibration

Noise and vibration impacts during construction

Proposed temporary construction support sites and activities have been designed to minimise noise and vibration impacts on sensitive receivers. Design considerations to reduce noise and vibration impacts include the proximity of temporary construction support sites to sensitive receivers, construction of acoustic sheds and temporary noise barriers, and positioning of vehicle entrances and exits to allow access directly to and from the arterial road network where possible.

Most of the surface construction for the Beaches Link component of the project would be carried out between 7am and 6pm Monday to Friday and between 8am and 1pm on Saturdays. Tunnelling activities would be carried out 24 hours a day, seven days a week underground, supported by surface-based activities within purpose-built acoustic sheds which would be designed to minimise construction noise impacts for the local community. Spoil haulage from the Beaches Link temporary construction support sites would generally occur between 7am and 6pm Monday to Friday and between 8am and 1pm on Saturdays.

Construction of the Gore Hill Freeway Connection surface road works, and surface works associated with the tunnel connections at Burnt Bridge Creek Deviation at Balgowlah and Wakehurst Parkway at Seaforth/Killarney Heights would require extensive out of hours work, to minimise traffic disruptions and maintain safety for workers and road users and the public.

For the prediction of airborne noise impacts from construction sites, consideration was given to realistic worst case construction activities as required by the Interim Construction Noise Guideline (DECC, 2009a). While the noise levels for the realistic worst case might occur at sensitive receivers during the works, noise levels associated with the typical scenario would occur more frequently.

Key results of construction noise modelling include:

- Airborne noise from the project temporary construction support sites would generally be within the noise management levels with the exception of early works, site establishment (including cofferdam construction), site restoration works and out of hours concrete deliveries, when the noise management levels may be exceeded at some receivers for short periods
- Airborne noise levels from surface road works would generally be within the relevant noise management levels, with the exception of the operation of high noise generating equipment such as rock-hammers or concrete saws or when noisy works occur close to sensitive receivers, and works required outside of standard construction hours. Where airborne noise management levels are exceeded, there would be a requirement to implement reasonable and feasible noise mitigation
- Most of the ground-borne noise generated by roadheader tunnelling would be within the noise management levels. The use of rock-hammers for tunnelling activities has the potential to exceed noise management levels at various locations; however, such activities would be scheduled outside evening and night time periods (where feasible and reasonable) to avoid or reduce ground-borne noise level exceedances on receivers
- Vibration from tunnelling works would be generally within the vibration limits for human disturbance at most receivers. Some receivers have the potential to experience vibration levels above the human comfort criteria when rock-hammers are operating nearby. Several heritage listed structures would be within the vibration minimum working distance for cosmetic damage for an unsound heritage structure during the use of large rock hammers. For these receivers, further assessment would be carried out to determine the susceptibility of the structure to be potentially damaged by vibration, and mitigation measures from the *Construction Noise and Vibration Guideline* (Roads and Maritime, 2016) would be implemented

- Construction road traffic management and vehicle movements associated with the project are unlikely to increase road traffic noise levels by more than 2 dB(A). This change represents a minor impact that is likely to be barely perceptible. The number of maximum noise events from construction traffic that could disturb sleep are not likely to substantially increase, because the maximum number of truck movements generated by the project at night would be small compared to existing truck movements along the proposed haulage routes.

Construction noise and vibration impacts would be managed using reasonable and feasible mitigation and management measures including scheduling of works, noise reduction measures for plant and equipment, and provision of respite periods or offers of alternative accommodation for sensitive receivers if appropriate. Temporary noise barriers or solid hoarding would be used at temporary construction support sites where required to minimise noise impacts on residential receivers.

For further information on construction noise and vibration, refer to Chapter 10 (Construction noise and vibration).

Noise and vibration impacts during operation

The project has been designed to include traffic noise mitigation measures where feasible and reasonable. When the Beaches Link and Gore Hill Freeway Connection are operational the noise assessment indicates that:

- The project is predicted to typically decrease road traffic noise levels at most receiver locations
- Receivers to the east of the Warringah Freeway may experience an increase in maximum noise levels compared to the existing situation. This is due to the widening of the Warringah Freeway resulting in the southbound carriageway moving closer to those receivers
- Receivers to the west and east of the new access road which forms the connection between Burnt Bridge Creek Deviation and Sydney Road may experience an increase in maximum noise levels and the number of events compared to the existing situation without the new access road
- Receivers along the Wakehurst Parkway may experience an increase in maximum noise level events and the number of events compared to the existing situation. This is due to the widening of Wakehurst Parkway resulting in both the northbound and southbound carriageways moving closer to those receivers. The magnitude of maximum noise levels events would increase where lanes (and traffic) moves closer to sensitive receivers.

Appropriate mitigation measures would be confirmed in accordance with the *Noise Mitigation Guideline* (Roads and Maritime Services, 2015b). This would include noise barriers and at-property treatments.

For permanent operational infrastructure (such as the motorway facilities and ventilation outlets, wastewater treatment plants etc), no noise criteria would be exceeded. For further information on operational noise and vibration, refer to Chapter 11 (Operational noise and vibration).

Air quality

Air quality impacts during construction

Air quality modelling has been carried out to assess the potential air quality impacts that construction of the project may generate. Air quality impacts during tunnelling and surface works would typically include dust and the effects of airborne particles on human health and amenity as well as potential odour emissions during handling and management of harbour sediments. Spoil handling within acoustic sheds would minimise dispersion of dust at tunnelling sites. Water carts would be used on surface works to wet down works areas as required to minimise dispersion of dust. A comprehensive range of mitigation measures would be used so that any residual dust and associated human health impacts would be negligible.

Air quality impacts during operation

Extensive air quality modelling has been carried out to assess the project's in-tunnel and ambient air quality outcomes. The predicted total concentrations of pollutants were usually dominated by the existing background contributions.

The tunnel ventilation system would be designed to maintain in-tunnel air quality within applicable criteria for nitrogen dioxide (NO_2), carbon monoxide and visibility for all modelling scenarios including a worst case trip scenario.

The ventilation system would be designed so that there would be no emissions from tunnel portals. All emissions would be via ventilation outlets. Under expected traffic conditions, the predicted contribution of tunnel ventilation outlets to pollutant concentrations at ground level was negligible for all receptors.

For some short-term air quality measures (1-hour NO_2 and 24-hour PM_{10} and $PM_{2.5}$), exceedances of the criteria for ambient air quality in the vicinity of the project are predicted to occur both with and without the project. This is usually due to changes in traffic on surface roads and high background concentrations. Where traffic on roads is expected to reduce due to diversion to the tunnels, ambient air quality is expected to improve compared to conditions without the project.

Regarding elevated receptors, for the project's expected traffic levels, there are no adverse impacts predicted at any existing or future buildings up to a height of 30 metres. For potential future buildings above 30 metres in height and within 300 metres of the Gore Hill Freeway ventilation outlet, further assessment of potential air quality impacts may be required at rezoning or development application stage but would not necessarily preclude such development.

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.

For further information on air quality, refer to Chapter 12 (Air quality).

Human health impacts

As the project would deliver an underground motorway, there would be a redistribution of vehicle emissions associated with a reduction of traffic on surface roads. For much of the community this would result in no change or a small improvement to local air quality (ie reduced concentrations and fewer health impacts); however, for some areas located near key surface roads, a small increase in pollutant concentration may occur. Potential health impacts associated with changes in air quality (specifically nitrogen dioxide (NO_2) and particulates) within the local community have been assessed and are considered to be acceptable.

Concentrations of pollutants from vehicle emissions would be higher within the tunnel (compared to outside the tunnel). With the completion of a number of tunnel projects (approved or proposed), there is the potential for exposures to occur within a network of tunnels over varying periods of time. However, exposure to NO_2 is expected to be well within the current health guidelines.

Congestion inside the tunnels is not considered likely to result in adverse health effects, due to the operation of the tunnel ventilation systems and the temporary nature of the potential exposure. For motorcyclists, there is the potential for higher levels of exposure to NO_2 but these exposures, under normal conditions, are not expected to result in adverse health effects.

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.

For further information on human health, refer to Chapter 13 (Human health).

Socio-economic impacts

The project would deliver new strategic road links between Sydney's Northern Beaches and the existing motorway network near Artarmon and North Sydney, bypassing the congested Spit Road and Military Road and Warringah Road corridors. The project would provide links to both the Gore Hill Freeway and Warringah Freeway, improving north–south and east–west connectivity for the Northern Beaches region. The project would include the widening of the Wakehurst Parkway between Seaforth and Frenchs Forest to improve access to the strategic Northern Beaches Hospital precinct and areas further north.

When operational, the project would:

- Reduce traffic along key routes including Military Road, Spit Road, Warringah Road, Eastern Valley Way, Brook Street and Miller Street. The project would also improve average travel speeds through the Warringah Freeway and North Sydney area, resulting in:
  - Improved travel times, enhancing the reliability and resilience of the road network across Sydney and improve access to the north, north-west and north-east of Sydney
  - Improved access and connectivity to community services and facilities within the study area for local residents, through travel time savings and improved travel time reliability
- Provide major benefits to public transport, enabling faster, more reliable and direct peak express services between the Northern Beaches, Harbour CBD, North Sydney, St Leonards, and Macquarie Park
- Reduce rat-run traffic and congestion on existing surface roads including Miller Street (Cammeray), Brook Street (Naremburn), Eastern Valley Way (Northbridge), Frenchs Forest Road (Seaforth) and the Ourimbah Road corridor
- Increase the availability of public open space and passive and active recreation facilities for the community and help to address the current shortfall in recreational facilities within the Northern Beaches Council area
- Enable local businesses to have better and more efficient access to Greater Sydney, making it easier to move goods and provide services, as well as bringing employees and businesses closer together
- Improve pedestrian and cyclist accessibility and connectivity of active transport routes, which would bring long-term benefits for community cohesion.

For further information on socio-economics, refer to Chapter 21 (Socio-economics).

Heritage impacts (Non-Aboriginal and Aboriginal)

Transport for NSW is committed to preserving heritage items along the project corridor and minimising project impacts.

There are 73 listed heritage items and four potential heritage items within the study area. These include four items listed on the State Heritage Register (North Sydney Sewer Vent, St Leonards Park, Tarella and the Walter Burley Griffin Incinerator), with the remainder being of local heritage significance. Impact to the items above the tunnel alignment or adjacent to surface work due to indirect impact from settlement, vibration or changed views related to operational facilities such as noise barriers, has predominantly been assessed as being negligible to minor.

Site-specific management measures would also be applied at specific sites that have been identified as being subject to impact due to the activities associated with construction of the project. Archival recording would be completed prior to any work that has the potential to impact upon the following items:

- Cammeray Conservation Park (including Golf Course), Cammeray (to be completed by the Western Harbour Tunnel and Warringah Freeway Upgrade)

- Item 8: Clive Park and Tidal Pool, Northbridge
- Item 10: Balgowlah Golf Course, Balgowlah
- Item 11: Frenchs Bullock Track, Killarney Heights (pending further design development confirming direct impact).

Additionally, where direct impact in the northern section of the Frenchs Bullock Track would occur due to permanent infrastructure, the Bullock Track would be reformed as close as possible to the existing alignment. Where direct impact to the southern section may occur, further detailed survey would be completed prior to construction to confirm the curtilage to determine if this section remains partially intact (noting the curtilage extends into the existing road corridor, based on available spatial data).

For further information on non-Aboriginal heritage, refer to Chapter 14 (Non-Aboriginal heritage).

Eleven Aboriginal cultural places of local significance were identified within the study area. Based on the results of this assessment and in consultation with the Registered Aboriginal Parties:

- One Aboriginal site (45-6-0662) could not be located or its condition confirmed during field work and the Aboriginal Heritage Office has advised that the site was likely covered by gravel/vegetation. The site is considered likely to be within 50 metres of the construction footprint. The site could be indirectly impacted by vibration and settlement
- Five Aboriginal sites (45-6-0655, 45-6-2940, 45-6-3362, 45-6-3361 and 45-6-3363) are located within 50 metres of surface works including two sites that may be subject to indirect impacts associated with vibration and settlement (45-6-0655 and 45-6-2940)
- Five Aboriginal sites (45-6-3032, 45-6-3012, 45-6-0654, 45-6-0996 and 45-6-3599) are located above or within 50 metres of the tunnel alignment and may be subject to indirect impacts associated with vibration and settlement
- Operational impacts are considered to be negligible

Aboriginal cultural heritage impacts will be managed through vibration monitoring at sites listed in the Aboriginal Heritage Information Management System (AHIMS) database and the implementation of additional management measures where exceedances are identified. An Aboriginal heritage interpretation strategy would be included as part of the project urban design and landscape plan.

For further information on Aboriginal heritage, refer to Chapter 15 (Aboriginal heritage).

Biodiversity (terrestrial and marine) impacts

The southern part of the construction footprint and surrounding area is highly modified and disturbed. Much of the vegetation consists of trees and shrubs in landscaped parks and reserves, private residential gardens and road verges. Native vegetation occurs in the northern parts of the construction footprint on either side of the Wakehurst Parkway (Seaforth to Frenchs Forest) and to a lesser extent, next to the Burnt Bridge Creek Deviation (Balgowlah). Construction of the project would require removal of:

- 15.44 hectares of native vegetation and native revegetation of which 1.38 hectares is consistent with the Duffys Forest Ecological Community in the Sydney Basin Bioregion (listed as Endangered under the Biodiversity Conservation Act)
- 5.48 hectares of other vegetation comprising native plantings, exotic plantings, and weeds and exotics.

The project would remove a small number of individuals of threatened flora species and impact on potential habitat for threatened fauna species. Biodiversity offsets for native vegetation would be provided for the project.

There is potential for indirect impacts to groundwater dependent ecosystems due to groundwater drawdown. Appropriate environmental management measures would be implemented to manage potential drawdown impacts to groundwater dependent ecosystems and baseflow reduction impacts.

There is potential for short-term noise impacts on the Grey-headed Flying-fox camp located in the vegetated area between Balgowlah Road and the Burnt Bridge Creek Deviation (about 120 metres from the surface road works at Balgowlah), fauna in the vicinity of the Wakehurst Parkway during excavation activities and Little Penguins that may occur in Middle Harbour on occasion.

Potential direct impacts on threatened marine species in Middle Harbour, such as the Black Rockcod and White's Seahorse, would be low. Potential impacts on marine mammals and marine turtles would also be low.

Potential underwater noise impacts on marine fauna may occur as a result of dredging and piling activities in Middle Harbour. Noise modelling carried out for the project indicates that impacts would largely be limited to the immediate vicinity of piling and dredging activities. Visual monitoring from the harbour surface would be carried out to identify any underwater noise related impacts on fish, and appropriate at source protection measures would be considered, where required.

For further information on biodiversity, refer to Chapter 19 (Biodiversity).

Geology, soils and groundwater impacts

Ground movement would occur as a result of the construction of the project or associated components. Ground movement may occur as a result of removal of existing rock to form the tunnels or from ingress into the tunnels and associated groundwater drawdown. All project components are expected to experience ground surface settlement impacts of over 10 millimetres. The maximum predicted long-term surface settlement is 85 millimetres at Flat Rock Creek Reserve. However this settlement prediction is conservative and likely to be an over-estimate as it has been based on conservative (worst case) groundwater modelling without design measures to limit groundwater inflows into the tunnel. It has been demonstrated through additional modelling that the installation of tunnel lining under Flat Rock Creek area would be effective in reducing the groundwater induced settlement, reducing settlement to 35 millimetres. The final extent of tunnel lining under the Flat Rock Creek area would be determined through additional investigations as part of further design development. A conservative estimate of maximum long-term surface settlement of over 30 millimetres is expected around the Warringah Freeway portal, Burnt Bridge Creek Deviation portal, Wakehurst Parkway portal, and the Balgowlah ventilation tunnel. All other project components are anticipated to be subject to total settlement of between 10 to 30 millimetres or less. Building settlement between 10 to 50 millimetres is considered to equate to a 'slight' degree of severity, with a typical potential impact being cosmetic cracks that can be filled. No buildings along the tunnel alignment were found to be in the 'slight' to 'very severe' severity categories.

Pre-construction building/structure condition surveys would be prepared for properties (and heritage assets) within the zone of influence of tunnel settlement (for example within the 5 millimetre predicted surface settlement contour and within 50 metres of surface works) and within the minimum working distances for cosmetic and structural damage due to vibration. Within three months of the completion of construction activities that have the potential to impact on the subject surface/subsurface structure, a post condition survey would then be offered to property owners of buildings where a pre-construction building condition survey was carried out. Any property damage caused by the project would be rectified. An Independent Property Impact Assessment Panel, comprising geotechnical and engineering experts, would be established prior to the commencement of works to independently verify building condition survey reports, resolve any property damage disputes and establish ongoing settlement and vibration monitoring requirements. The Panel would be independent of both Transport for NSW and property owners.

A reduction in groundwater baseflow due to groundwater drawdown is predicted at potentially connected surface water systems at Flat Rock Creek, Quarry Creek, and Burnt Bridge Creek.

Drawdown of up to five metres is predicted during construction at the Flat Rock Creek/Quarry Creek groundwater dependent ecosystems and up to 12 metres during operation. However, the assessment of baseflow reduction is conservative and is likely to overestimate actual baseflow reduction as impacts have been modelled without consideration of tunnel linings. A scenario was modelled that included lining of about 300 metres of tunnel below Flat Rock Creek Reserve. The predicted water table drawdown at Flat Rock Reserve for the lined tunnel option was up to eight metres less than the drawdown predicted with no tunnel lining. Tunnel linings would be designed and installed as part of the project to reduce operational groundwater inflows into the tunnels and consequently, the predicted baseflow impacts are likely to be much lower than the conservative prediction.

The project is situated adjacent to a number of areas that are considered to have a 'moderate' or 'high' contamination risk. Further investigations of these sites would be required to quantify risk of soil contamination to construction works. These investigations would be carried out before construction activities so that contamination (if present) can be adequately planned for and managed.

Water table drawdown could also result in migration of contaminants. If contaminants were mobilised from areas of environmental interest identified by the project, they would travel towards the tunnel during construction and operation. This would be managed through monitoring the water quality of tunnel inflows and monitoring groundwater levels and water quality at the existing monitoring sites. Contaminants migrating into this section of the tunnel would be collected and treated at the wastewater treatment plants.

Contaminated sediments have been identified within Middle Harbour and offshore at Spit West Reserve. These contaminated sediments would need to be managed where disturbed during construction activities to reduce the exposure risk to workers and environmental receivers. Based on the elutriate test results and the assessed available natural dilution, water quality impacts at the dredging site due to dissolved contaminants would not be expected. Construction methodologies have been developed to remove or suitably reduce the risks from contaminated sediments during construction activities as detailed in Chapter 6 (Construction work) and Chapter 16 (Geology, soils and groundwater).

Hydrodynamics and water quality impacts

Site investigations and hydrodynamic modelling has been completed to assess and refine the construction methodology for works required within Middle Harbour for the immersed tube tunnel. Dredge plume modelling indicates that the dredging would not have a significant impact on marine water quality. Dredging and construction activities for the project are likely to cause localised increases in suspended sediment concentrations, but due to the rapid dispersion in Middle Harbour it is not likely to result in significant water quality impacts. Monitoring during dredging would assess the compliance of the activities associated with the project. Where appropriate, several silt curtains would be installed to mitigate potential impacts on ecologically sensitive areas.

The behaviour of sediment-bound contaminants when re-suspended into the water column has been previously assessed (Geotechnical Assessments, 2015) for other construction projects (Sydney Metro City & Southwest). These assessments have determined that contaminants are likely to remain bound to sediment particles and not be released into the water column. As an additional control, a backhoe dredge with a closed environmental bucket would be used to remove areas of sediments with elevated levels of contaminants. This would reduce the potential for release of contaminated sediments into the water column, and it is therefore unlikely that marine water quality would be significantly impacted by contaminants.

Regarding surface water quality, the assessment shows that baseflow impacts at Flat Rock Creek and Quarry Creek during the operational phase have the potential to be substantial, noting that operational wastewater treatment plant discharges to Flat Rock Creek may offset this impact. However, baseflow impacts have been modelled conservatively without tunnel linings, which is expected to represent an over-estimated result. Tunnel linings would be designed and installed as part of the project to reduce operational groundwater inflows into the tunnels and consequently the

baseflow impacts are likely to be lower than predicted. Additional gauge data would be collected to confirm the modelled results during further design development.

For further information on hydrodynamics and water quality, refer to Chapter 17 (Hydrodynamics and water quality).

Land use and property impacts

The project has been designed to minimise the need for property acquisition. The need to reduce these impacts has been balanced with temporary and permanent impacts to areas of open space. For the Beaches Link component of the project, 41 properties would require permanent acquisition and five properties would require temporary lease. Of the 41 properties that would be permanently acquired, 37 would be full acquisitions and four would be partial acquisitions. Eight properties required for the project are already owned by Transport for NSW.

For the Gore Hill Freeway Connection component of the project, five properties would be permanently acquired and two properties would be temporarily leased. Of the five properties to be permanently acquired, four would be full acquisitions and one would be a partial acquisition. Any property acquisitions required for the project would be carried out in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* and the land acquisition reforms announced by the NSW Government in 2016.

Temporary land use changes (loss of open space) would occur during establishment and operation of temporary construction support sites and other construction areas at Flat Rock Reserve, Spit West Reserve, Manly Dam Reserve, Bantry Bay Reservoir and a vacant piece of land owned by Transport for NSW and Willoughby City Council at Artarmon.

Permanent land use changes would occur at:

- Cammeray Golf Course, for widening of the Warringah Freeway and where the motorway facilities would be established within the Cammeray Golf Course next to the Warringah Freeway as part of the Western Harbour Tunnel and Warringah Freeway Upgrade project. The golf course would be reconfigured to ensure it remains operational
- Artarmon Park and commercial properties along Punch Street, Lambs Road and Cleg Street for widening of the Gore Hill Freeway and where motorway facilities would be established
- Balgowlah Golf Course and residential properties along Dudley Street, for widening of the Burnt Bridge Creek Deviation for the tunnel portal and where the motorway facilities would be established
- Bantry Bay Reservoir, Sydney Water site.

When completed, the project would deliver new and improved public open space and recreation facilities at Balgowlah and Bantry Bay Reservoir to improve urban amenity.

At Balgowlah, the project would return an area, equivalent to around 90 per cent of the current open space, to the community as new and improved public open space and recreation facilities. A dedicated consultation process jointly led by Transport for NSW and Northern Beaches Council would take place to give the community an opportunity to provide input on the final layout of the new and improved open space and recreation facilities. This consultation would be separate to the consultation for the Beaches Link and Gore Hill Freeway Connection environmental impact statement. This process would start after the environmental impact statement public exhibition period and well in advance of construction starting. As part of this consultation process, a community reference group would be established, with representative stakeholder groups and the community, to support Transport for NSW and Northern Beaches Council with the development of this important public space.

The Bantry Bay Reservoir site would be rehabilitated and revegetated as soon as practicable after construction completion and land that is surplus to Sydney Water's operational requirements would be transferred to the Manly Warringah Memorial State Park.

For further information on land use and property impacts, refer to Chapter 20 (Land use and property).

Cumulative impacts

When completed, the Western Harbour Tunnel and Beaches Link program of works is expected to deliver beneficial cumulative impacts including considerable improvements to travel speeds through sections of the surface road network, increased reliability and a reduction in average journey times.

Adverse cumulative impacts could occur when impacts from the project interact or overlap with impacts from other projects, potentially resulting in a larger overall impact. Cumulative impacts may also occur when projects are constructed consecutively, resulting in construction fatigue for local receivers.

The implementation of environmental management measures for the project would avoid, to the greatest extent possible, cumulative impacts with surrounding development. The project design has carefully considered minimising construction fatigue for the community as far as practical. The intent is to reduce the overall cumulative or consecutive impacts on the community over a longer period. Transport for NSW would 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 further information on cumulative impacts, refer to Chapter 27 (Cumulative impacts).

Management of impacts

This environmental impact statement identifies comprehensive environmental management measures to avoid, manage, mitigate, offset and/or monitor impacts during construction and operation of the project. These include best practice construction environmental planning and management techniques, urban design and landscaping treatments and noise mitigation measures. Further mitigation opportunities are likely to be identified during further design development and construction planning and in consultation with communities and relevant stakeholders.

The design, construction and operation of the project would be carried out in accordance with extensive environmental management commitments identified in this environmental impact statement as included in Appendix Y (Compilation of environmental management measures), as well as any additional measures identified in the conditions of approval for the project.

Stakeholder and community engagement

Since the initial project announcement in March 2017, there has been extensive and ongoing community and stakeholder engagement. This has included:

- Toll free community information line
- Project email
- Project website
- Interactive website portal
- Project database to record correspondence relevant to the project, including contact details and issues raised during the life of the project
- Community update newsletters and letters to residents
- Community information sessions, information displays and staffed pop-ups
- Registered stakeholder database email updates

- Stakeholder briefings, meetings, workshops and presentations
- Interest group correspondence including letters and phone calls
- Face-to-face meetings and doorknocks with individual property owners and residents of properties which may be affected by the project
- Advertisements and proactive media articles in the local press
- Letterbox drops
- Media events at key milestones of the project.

The design has been continually refined throughout the community engagement to improve transport, environmental, amenity, community, heritage and sustainability outcomes.

The project team has developed a community and stakeholder engagement program to continue to proactively engage with local communities, key stakeholders and government agencies.

Next steps

Transport for NSW is seeking approval from the Minister for Planning and Public Spaces for the construction and operation of the project. Steps in the process include:

- Exhibition of the environmental impact statement for a minimum of 28 days in accordance with statutory requirements and invitation for the community and stakeholders to make submissions
- Consideration of submissions. Submissions received by the Secretary of Department of Planning, Industry and Environment would be provided to Transport for NSW and any relevant public authorities. Transport for NSW may then be required to prepare and submit:
  - A submissions report, responding to issues raised in the submissions
  - A preferred infrastructure report, outlining any proposed changes to the project to minimise its environmental impacts or to deal with any other issues raised
- Determination of the environmental impact statement. The Minister for Planning and Public Spaces would then make a decision on the project and, if approved, set conditions of approval.

Consultation with the community and stakeholders would continue throughout the further design development and construction phases as required.

The Department of Planning, Industry and Environment will make this environmental impact statement publicly available for a minimum period of 28 days. During the exhibition period, the environmental impact statement will be available for viewing at the following locations:

- Department of Planning, Industry and Environment major project planning portal: www.planningportal.nsw.gov.au/major-projects/projects/on-exhibition
- Transport for NSW interactive project portal: https://nswroads.work/blportal

Due to COVID-19 restrictions, staffed displays and face to face community information sessions of the environmental impact statement are not proposed to occur during the exhibition period. However this requirement will be reviewed if restrictions are eased and safety controls allow. In order to ensure that adequate opportunities are available for the community to ask questions on the content of the environmental impact statement, Transport for NSW will be running virtual information sessions throughout January and February 2021. Transport for NSW will continue to investigate the opportunity for face to face community information sessions provided COVID-19 guidelines allow.

Details of the times and topics for the virtual information sessions, as well as any potential face to face community information sessions, would be provided through our website, email notifications to registered stakeholders, community updates, and advertisements in local and metropolitan media.

During the exhibition period, a project information line (1800 931 189) and email address (whtbl@transport.nsw.gov.au) will be available for the community and stakeholders.

Written submissions can be made to the Secretary of the Department of Planning, Industry and Environment. All submissions received will be placed on the Department of Planning, Industry and Environment website.

Submissions can be made by creating an account at www.planningportal.nsw.gov.au/major-projects/projects/on-exhibition. This allows you to save a submission in progress and stay up to date with the progress of an application.

If you are unable to make a submission online, you can send a physical copy to the Department by post to the Department office address below. Your submission must include:

- Your name and address, at the top of the letter only
- The name of the application and the application number
- A statement on whether you support or object to the proposal
- The reasons why you support or object to the proposal
- A declaration of any reportable political donations made in the previous two years.

Written postal submissions are to be directed to:

Director, Transport Assessments
Department of Planning, Industry and Environment
Application number SSI-8862
Locked Bag 5022
Parramatta NSW 2124