

## Executive Summary

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The NSW Government is investing \$51.2 billion on transport projects across NSW over the next four years. The F6 Extension is one of the NSW Government's transport priority projects to improve efficiency of traffic flows between the Sutherland and Illawarra region, Sydney Airport and Port Botany precinct, with onward connectivity to the north and west of Sydney.

NSW Roads and Maritime Services (Roads and Maritime) is seeking approval to construct and operate the F6 Extension Stage 1 from the New M5 Motorway at Arncliffe to President Avenue at Kogarah (the project).

Bypassing up to 23 sets of traffic lights on the Princes Highway, the project would reduce congestion on surface roads by removing more than 2,000 heavy vehicles as well as about 10,000 vehicles from major thoroughfares each weekday. By reducing congestion along parallel routes, the project would lead to opportunities for improvements in urban amenity and place making within the project vicinity.

The project would make vital trips across Sydney faster and more reliable by reducing travel times and by connecting Sydney's south to the wider motorway network, providing direct access to WestConnex and through to the proposed Sydney Gateway and Western Harbour Tunnel. Further, the project would introduce new shared cycle and pedestrian pathways, that would expand the existing active transport network, improving pedestrian and cyclist safety.

The project would contribute to a more accessible, more liveable and more productive Greater Sydney as well as growth in Southern Sydney.

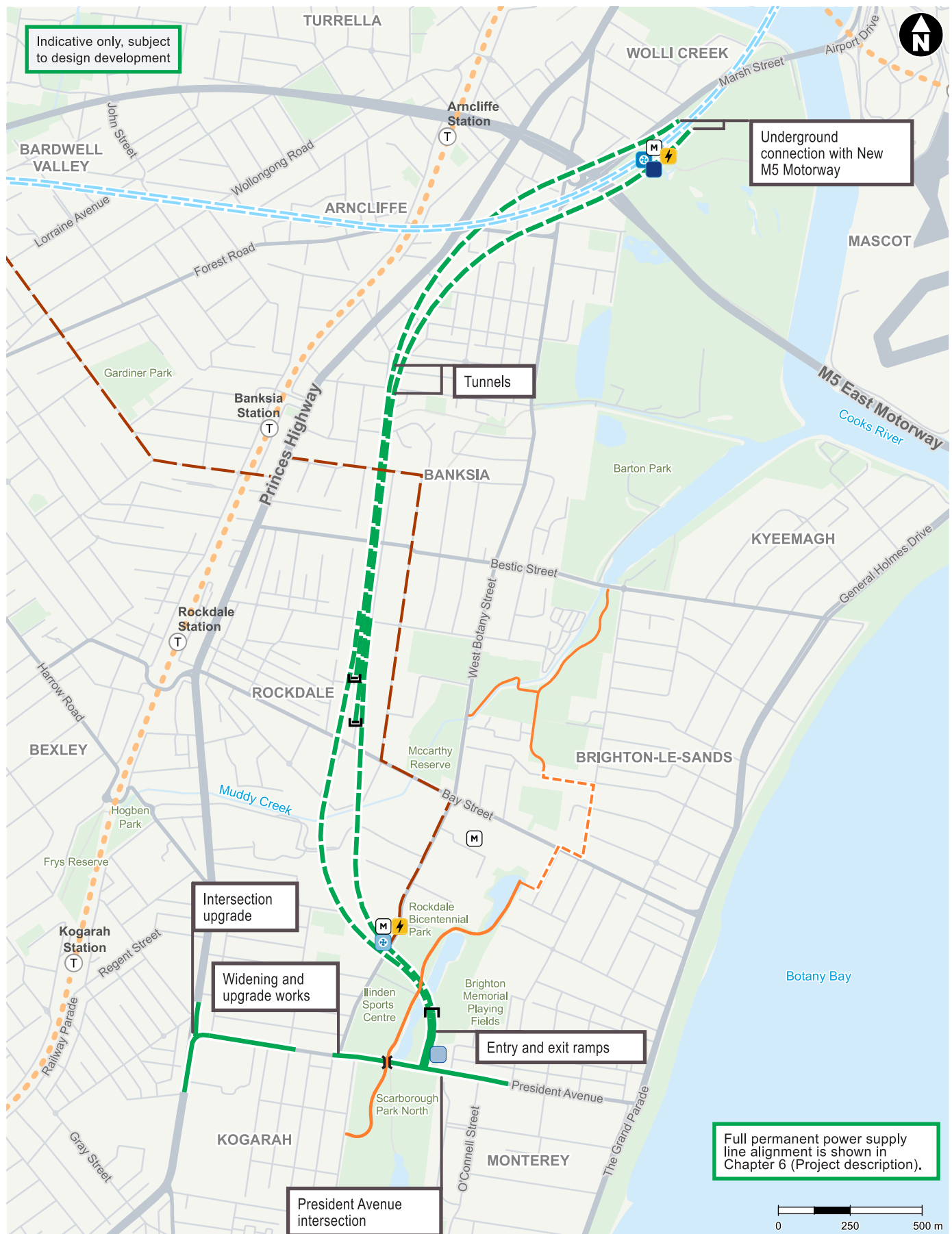
## What is proposed?

The project would comprise a new four kilometre, multi-lane underground road link between the New M5 Motorway and a surface intersection at President Avenue, Kogarah (refer to Figure 1).

The project would be located within the Bayside Local Government Area, and partially within the Canterbury-Bankstown Local Government Area. It would be mainly located underground, with the majority of the motorway operational surface infrastructure located within the existing F6 reserved corridor. This would minimise the environmental and social impacts by reducing the total surface construction footprint.

### Key features of the project

- Mainline tunnels around 2.5 kilometres in length, sized for three lanes of traffic and line marked for two on opening
- Connection to the New M5 Motorway and line marking of additional travel lanes between St Peters interchange to the F6 Extension Stage 1 tunnels
- Entry and exit ramp tunnels around 1.5 kilometres in length and a tunnel portal connecting the tunnels to a surface intersection with President Avenue
- Provision of a new intersection with President Avenue including the widening and raising of President Avenue at this location
- Upgrade of the President Avenue / Princes Highway intersection to improve capacity
- Provision of new shared cycle and pedestrian pathways connecting Bestic Street, Brighton-Le-Sands to Civic Avenue, Kogarah, including a bridge over President Avenue
- Three complexes to operate the motorway (one co-located with the New M5 Motorway operations complex at Arncliffe and two at Rockdale)
- Ventilation facilities would be located at Marsh Street, Arncliffe and West Botany Street, Rockdale and linked to the in-tunnel ventilation systems
- New service utilities, including a permanent power supply line.

**LEGEND**

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| <ul style="list-style-type: none"> <li>The project in tunnel</li> <li>The project on surface</li> <li>On-road cycleway</li> <li>Shared cycle and pedestrian pathways</li> <li>President Avenue shared cycle and pedestrian bridge</li> </ul> | <ul style="list-style-type: none"> <li>Tunnel stub</li> <li>Tunnel portal</li> <li>Water quality basin</li> <li>Water treatment facility</li> <li>Rockdale ventilation facility</li> <li>Motorway operations complex</li> </ul> | <ul style="list-style-type: none"> <li>Substation</li> <li>Permanent power supply line</li> <li>New M5 Tunnel</li> <li>Arncliffe ventilation facility*</li> <li>* Under construction as part of the New M5 Motorway project</li> </ul> | <ul style="list-style-type: none"> <li>Road</li> <li>Waterway</li> <li>Railway line</li> <li>Railway station</li> <li>Parks and recreation</li> </ul> |
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**Figure 1** The project

The project would utilise the following six sites to support construction activities:

- Arncliffe construction ancillary facility (C1) at Kogarah Golf Course, which is currently being used for the New M5 Motorway construction
- Rockdale construction ancillary facility (C2), within an existing Roads and Maritime depot at West Botany Street
- President Avenue construction ancillary facility (C3) at Rockdale, north and south of President Avenue within Rockdale Bicentennial Park and part of Scarborough Park North, plus a smaller site west of West Botany Street
- Construction ancillary facilities (C4 and C5) at the recreation area between West Botany Street and Francis Avenue near Muddy Creek, to support construction of the shared cycle and pedestrian pathways
- Princes Highway construction ancillary facility (C6) on the corner of Princes Highway and President Avenue, Kogarah to support the intersection surface works.

## What are the project objectives?

The objectives of the project are detailed in the figure below.



## Why is it needed?

Road congestion across metropolitan Sydney is estimated to cost up to \$6.1 billion per annum, rising to \$12.6 billion by 2030 if there is no improvement. Travel by road is Sydney's dominant transport mode. Even with high growth in rail freight and public transport, road transport is predicted to remain the most dominant mode over at least the next 20 years. Traffic congestion hinders Sydney's road freight, services and business operations and reduces the reliability of, and accessibility to, public transport. It adversely affects pedestrians and cyclists, as well as noise and air quality.

Both the Princes Highway and The Grand Parade experience high levels of daily traffic including freight, commuter and leisure travel. Travel times are unacceptably long during peak hours, with The Grand Parade currently supporting over 67,000 vehicles each weekday. Through traffic affects pedestrian safety and local amenity, causing significant traffic delays.

There is no motorway between the M1 Princes Motorway south of Waterfall and the Sydney motorway network. This leaves the local roads to handle heavy traffic and at times major congestion.

The Sydney transport network currently services a population of some five million people with about 15.5 million trips on a normal weekday. The population of Greater Sydney is estimated to grow from around five to eight million over the next 40 years, with an additional 817,000 jobs. With this increase in population, there will be continued growth in traffic on Sydney's roads, with the number of trips made around Sydney each day forecast to increase by 31 per cent, from 16 million to 21 million by 2036. This growth will place increasing pressure on the transport network and the key travel demand corridors across the greater Sydney metropolitan area.

Population growth and increasing road freight in the Sydney metropolitan area will result in continued and increasing demand for roads that provide north-south and east-west connections. Without infrastructure investment, the continued demand and use of these corridors will result in additional, prolonged congestion.

## How would the project satisfy this need?

The project would ease congestion on surface roads by providing an underground motorway alternative, allowing users to bypass up to 23 sets of traffic lights on the Princes Highway between St Peters and Kogarah. There would also be a reduction of about 10,000 vehicles per day on General Holmes Drive. This would enhance the use of surface roads by public transport and cyclists, and an overall improvement of local air quality and amenity. The project would not preclude any planned bus service or rail infrastructure improvements. The reduction in through traffic would also create opportunities for place-making at key locations along The Grand Parade and the Princes Highway.

The project would form the first stage of the F6 Extension, which would provide economic benefits by reducing travel times through southern Sydney and between Sydney and the Illawarra region.

## What is the approval process for the project?

The project is State significant infrastructure and requires assessment and approval under Division 5.2 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). This Environmental Impact Statement has been prepared in accordance with the provisions of the EP&A Act and the Secretary's Environmental Assessment Requirements (SEARs). A full checklist of the SEARs is provided in **Appendix A** (Statutory requirements).

A request has been made to the Minister for Planning to specifically declare the project to be critical State significant infrastructure.

The Environmental Impact Statement is publicly exhibited to provide the community, government agencies and stakeholders with an understanding of what is proposed and an opportunity to make comment. Roads and Maritime will consider the feedback in the further development of the project. Roads and Maritime will then submit a report that documents the submissions and responds to issues raised to the Department of Planning and Environment. The Department will prepare an assessment report for the Minister for Planning who will then determine whether or not to grant project approval and specify any project conditions.

## What alternatives were considered?

A multi-criteria analysis was undertaken to confirm the most appropriate section to commence construction of the F6 Extension (Arncliffe to Loftus). The multi-criteria assessment identified that Stage 1 (the project) would be the section between the New M5 Arncliffe to President Avenue at Kogarah. This section was selected as it would provide the greatest benefits to the community, including providing a direct connection to the Sydney motorway network.

The merits of the project were considered in the context of a range of alternatives based on transport, environmental, engineering, social and economic factors, taking the following project components into account:

- Use of the existing F6 reserved corridor
- Northern connection to the motorway network
- Alignment of the mainline tunnel
- Connection at the southern end to the arterial road network
- Any surface road works required
- Shared cycle and pedestrian pathway options.

The preferred design provides a combination of benefits compared with other options assessed, including better constructability, improved access, as well as minimised impacts on properties and on future development potential.

## What are the main community participation outcomes?

Consultation on the project began in October 2017 following the NSW Government's decision to progress with the development of the project. This involved community engagement activities such as doorknocking and distributing fact sheets, in addition to engaging with local stakeholders and government agencies. A range of communication channels were established for the project, to seek input from stakeholders and communities and to support engagement. Key periods of consultation and feedback were:

- Preliminary consultation - October to December 2017
- Ongoing design development - December 2017 to June 2018
- Project information and design - June 2018 to August 2018

The feedback has informed environmental assessment activities and ongoing communications. Key concerns communicated during this period related to:

- Local traffic and increased congestion as a result of the project
- Ecological values and water quality of the Rockdale Wetlands and Rockdale Bicentennial Park
- Property and land use impacts, particularly the potential loss of homes and/or green space
- Noise and pollution resulting from heavy vehicles and increased traffic
- Health and safety of the emissions from the ventilation outlets
- Local business changes in access and loss of parking.

## What are the main beneficial outcomes expected?

These include:

- More direct access from southern Sydney to the wider Sydney motorway network
- Less stop-start travel, with more reliable and shorter travel times between southern Sydney and the CBD
- Reduction in general traffic on sections of General Holmes Drive of about 10,000 vehicles each weekday
- Reduction in heavy vehicles on sections of Princes Highway and West Botany Street of about 40 per cent each weekday and on sections of General Holmes Drive of more than 30 per cent each weekday
- Reduced traffic on surface roads, returning streets to local communities
- Tunnels designed for free-flow traffic at 80 kilometres per hour, leading to reduced vehicle emissions than with stop-start traffic due to congestion or traffic lights
- New shared cycle and pedestrian pathways, connecting Bestic Street, Brighton-le-Sands to Civic Avenue, Kogarah through the reinstated Rockdale Bicentennial Park
- A safe cycle and pedestrian connection across President Avenue
- An enhancement of public recreation facilities at Rockdale Bicentennial Park.

## What are the main adverse outcomes?

The aim is to minimise or avoid any environmental or social impacts by locating the majority of the project underground and by having the majority of surface infrastructure within the existing F6 reserved corridor. However, there will still be some temporary and permanent impacts on the environment associated with the construction and operation of the project, within the total construction footprint of around 34 hectares (including a site currently used for construction of the New M5 Motorway and an existing Roads and Maritime depot site).

### Construction impacts

- Exceedances of acceptable noise criteria during both day and night for the most affected sensitive receptors in the vicinity of some construction ancillary facilities during certain construction activities



- Potential adverse health impacts (e.g. stress, annoyance, sleep disturbance) as a result of traffic and access changes, noise, and visual impacts
- Potential increased congestion during the upgrade of the Princes Highway and President Avenue intersection, while noting that the additional construction traffic is expected to be relatively low compared to existing traffic
- Potential for occasional, temporary and minor dust impacts during construction
- Potential for offensive odours during excavation of the cut-and-cover tunnels due to the natural presence of acid sulfates in the soils
- Temporary loss of access to the facilities within Rockdale Bicentennial Park, including playing fields, skate park and playground
- Biodiversity affected by the project includes:
  - Removal of around 1.24 hectares of native vegetation including two threatened ecological communities listed under the *Biodiversity Conservation Act 2016*
  - Loss of around 4.45 hectares of potential foraging habitat for the Grey-headed Flying Fox, however, no roosting sites or camps occur within the study area
  - Indirect impacts on the Green and Golden Bell Frog related to light, noise, dust and vibration arising from the continued use of the construction site at Arncliffe for an additional four years.

### Property impacts

- Permanent acquisition of five residential properties, six industrial properties, one service station, the partial acquisition of land from three residential properties and from the TAFE NSW St George Main Campus
- Permanent acquisition of around 1.9 hectares of open space within Kogarah Golf Course, Rockdale Bicentennial Park and Scarborough Park North (all owned by Bayside Council)

### Traffic impacts

- Increased traffic along President Avenue, Kogarah, due to the forecast increase in demand to and from the project
- Increased traffic along O'Connell Street, due to the forecast increase in demand to and from the project
- Increased traffic on the New M5 Motorway entry and exit ramps to the St Peters interchange, due to the forecast demand to and from the project, however average speeds on the ramps are forecast to be at least 90 per cent of the posted speed limit during peak hours
- Changes to access arrangements for residents for residents of Moorefield Estate

### Air quality impacts

- Under normal traffic conditions, the contribution of tunnel ventilation outlets to overall pollutant concentrations is expected to be minimal
- For ambient air quality, there are predicted to be mostly small exceedances of some air quality criteria, including one-hour NO<sub>2</sub> and 24-hour PM<sub>10</sub>, both with and without the project. However, the total numbers of receptors with exceedances decreased slightly with the project and in the cumulative scenarios
- Assuming no further construction above 30 metres in the vicinity of the project ventilation outlets, the changes in annual mean PM<sub>2.5</sub> concentration at heights of up to 45 metres above ground level are acceptable (i.e. lower than at ground level, and below the human health risk based criterion for an increase in PM<sub>2.5</sub> of 1.8 µg/m<sup>3</sup>).

### Health impacts

- Potential adverse health impacts (annoyance, sleep disturbance) are predicted where there are noise exceedances of the operational road traffic noise criteria
- A small increase in air pollutant concentrations may occur in some areas located near existing surface roads in the vicinity of the project. Potential health impacts associated with changes in air quality, specifically nitrogen dioxide and particulates, are expected to be tolerable/acceptable within the local community as a result of surface traffic changes.

## Noise impacts

- Exceedances of the operational road traffic noise criteria are expected for a total of 109 receptors (including residential and educational facilities). Affected receptors may therefore be eligible for consideration of at-property noise attenuation.

## Impacts to open space

- Temporary loss of access to Rockdale Bicentennial Park during construction (for around four years), including playing fields, skate park and playground. Compensatory facilities would be installed prior to construction of the project, to be determined in consultation with Bayside Council
- Rockdale Bicentennial Park would be reinstated following construction with enhanced facilities in consultation with Bayside Council and other key stakeholders.

## How will the likely impacts be managed?

The 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 environmental planning and management techniques, urban design and landscaping treatments and noise mitigation measures. Key environmental planning and management mitigations outlined in this Environmental Impact Statement include:

- Preparation of a Construction Traffic and Access Management Plan to manage construction traffic
- A Construction Noise and Vibration Management Plan to manage construction noise and vibration, including out-of-hours work procedures
- Operational road noise mitigation measures that include at-property noise treatments identified through an Operational Noise and Vibration Review
- Preparation of a Construction Air Quality Management Plan to manage construction air quality impacts
- The in-tunnel ventilation system would be designed to maintain in-tunnel air quality well within operational limits, and a monitoring system will be included to monitor and assess both ambient and in-tunnel air quality against relevant criteria
- A Biodiversity Offset Strategy will be prepared and implemented to compensate for losses to biodiversity values in the form of 26 offset credits to achieve a net gain in biodiversity values
- Property acquisition consistent with the requirements of the *Land Acquisition (Just Terms Compensation) Act 1991*
- Ongoing consultation with affected community members in accordance with the Draft Community Consultation Framework
- Urban design and landscaping treatments in accordance with the Place Making and Urban Design Strategy
- A review of operational network performance will be undertaken at both 12 months and five years from commencement of operation to confirm operational traffic impacts. The review would identify relevant mitigation measures, if required, to address impacts on road network performance.

Further mitigation requirements are likely to be identified during detailed design 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 the management measures identified in this Environmental Impact Statement, as well as any additional measures identified in the project's conditions of approval.

## How can I comment on the environmental impact statement?

The NSW Department of Planning and Environment (DPE) will place the Environmental Impact Statement on public exhibition. During the exhibition period, the Environmental Impact Statement will be available for inspection electronically:

- on the DPE website (<http://majorprojects.planning.nsw.gov.au/>)
- at a NSW Service Centre located near you ([www.service.nsw.gov.au/servicecentre/service-nsw](http://www.service.nsw.gov.au/servicecentre/service-nsw))
- on the Roads and Maritime Services project website (<http://www.rms.nsw.gov.au/f6>).

It will also be available at selected Roads and Maritime offices, at various staffed displays in the region, and at selected local council offices and libraries in the Bayside and Canterbury-Bankstown local government areas.

Roads and Maritime will conduct a number of community information sessions. A project information line will be available throughout the exhibition period to answer questions from the community relating to the project at 1800 789 297 (toll free).

Advertisements will be placed in newspapers to advise of the public exhibition, to advise where the Environmental Impact Statement can be viewed, and to provide details of community consultation activities and information sessions.

During the exhibition period, government agencies, project stakeholders and the community will be able to make written submissions to DPE for consideration in its assessment of the project. Submissions can be made electronically through the DPE website (<http://www.majorprojects.planning.nsw.gov.au>). Written submissions may also be directed to:

Director Transport Assessments  
Planning Services Division  
Department of Planning and Environment  
Application number - SSI 8931  
GPO Box 39  
Sydney NSW 2001

Submissions must be received before the close of the exhibition period. All submissions received will be placed on the DPE website.



## Glossary of terms and abbreviations

Terms	Meaning
ADT	Average Daily Traffic. The total volume of traffic (24 hours) passing a roadside observation point over a seven-day period during a set number of weeks; divided by the total number of days. It is calculated from mechanically obtained axle counts.
AAQ	Ambient air quality
AAQ NEPM	<i>National Environment Protection (Ambient Air Quality) Measure</i>
ABL	Assessment background noise level
Aboriginal archaeological site	The present spatial extent of visible Aboriginal archaeological material(s) at a given location
Aboriginal cultural heritage	The tangible (objects) and intangible (dreaming stories, song lines and places) cultural practices and traditions associated with past and present day Aboriginal communities
Aboriginal object	Any deposit, object or material evidence (not being a handicraft made for sale), including Aboriginal remains, relating to the Aboriginal habitation of NSW
Aboriginal place	Any place declared to be an Aboriginal place under section 94 of the <i>National Parks and Wildlife Act 1974</i> (NSW)
ABS	Australian Bureau of Statistics
Absorption	The process of taking in. For a person or an animal, absorption is the process of a substance getting into the body through the eyes, skin, stomach, intestines, or lungs
Acid sulfate soils	Naturally occurring soils, sediments or organic substrates (eg peat) that are formed under waterlogged conditions. These soils contain iron sulfide minerals (predominantly as the mineral pyrite) or their oxidation products. In an undisturbed state below the water table, acid sulfate soils are benign. However if the soils are drained, excavated or exposed to air by a lowering of the water table, the sulfides react with oxygen to form sulfuric acid
ACM	Asbestos containing material
ACTAQ	NSW Government Advisory Committee on Tunnel Air Quality
AHD	Australian height datum
ADT	Average Daily Traffic. The total volume of traffic (24 hours) passing a roadside observation point over a seven-day period during a set number of weeks; divided by the total number of days. It is calculated from mechanically obtained axle counts
Adverse health effect	A change in body function or cell structure that might lead to disease or health problems
Aeolian	Clays, silts and sands that have been deposited by wind.
AEP	Annual Exceedance Probability
AHD	Australian Height Datum. The standard reference level used to express the relative elevation of various features. A height in metres AHD is essentially the height above sea level.
AHIMS	Aboriginal Heritage Information Management System - A register of NSW Aboriginal heritage information maintained by the NSW Office of Environment and Heritage A register of NSW Aboriginal heritage information maintained by the NSW Office of Environment and Heritage
Airshed	A part of the atmosphere that shares a common flow of air and is exposed to similar meteorological influences.

Terms	Meaning
Alignment	The geometric layout (eg of a road) in plan (horizontal) and elevation (vertical)
Alluvium	Sediments (clays, sands, gravels and other materials) deposited by flowing water. Deposits can be made by streams on river beds, floodplains and alluvial fans.
ALS	Airborne Laser Scanning.
AM peak hour	Unless otherwise stated, this refers to vehicle trips arriving at their destination during the average peak one hour in the AM peak period between 7.00 am–9.00 am on a normal working weekday
Amenity	'The pleasantness of a place as conveyed by desirable attributes including visual, noise, odour etc.' (AILA 2018)
ANZECC	Australian and New Zealand Environment and Conservation Council
AQIA	Air quality impact assessment
Aquifer	Geologic formation, group of formations, or part of a formation capable of transmitting and yielding quantities of water.
Archaeological potential	The likelihood of undetected surface and/or subsurface archaeological materials existing at a location
ARI	Average Recurrence Interval - Average recurrence interval An indicator used to describe the frequency of floods. The average period in years between the occurrence of a flood of a particular magnitude or greater. In a long period of say 1,000 years, a flood equivalent to or greater than a 100 year ARI event would occur 10 times. The 100 year ARI flood has a one per cent chance (ie a one-in-100 chance) of occurrence in any one year. Floods generated by runoff from the study catchments is referred to in terms of their ARI, for example the 100 year ARI flood
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
Artefact	Any object which has been physically modified by humans
AS	Australian Standard
ASC NEPM	<i>National Environment Protection (Assessment of site Contamination) Measure 2013</i>
ASS	Acid sulfate soil
Assessment background level [ABL]	The overall background level for each day, evening and night period for each day of the noise monitoring.
ASSMAC	Acid Sulfate Soils Management Advisory Committee
At-grade	A road at ground level, not on an embankment or in a cutting
ATSDR	Agency for Toxic Substances and Disease Register
AWT	Average Weekday Traffic. The total volume of traffic (24 hours) passing a roadside observation point over a five-day weekday period during a set number of weeks (outside of school/public holidays); divided by the total number of days. It is generally calculated from axle counts of passing vehicles
Background noise level	The ambient sound-pressure noise level in the absence of the sound under investigation exceeded for 90 per cent of the measurement period. Normally equated to the average minimum A-weighted sound pressure level
BAM	Biodiversity Assessment Method
BAMC	Biodiversity Assessment Method Credit Calculator
Bank cubic metres	A measure of volume representing a cubic metre of unexcavated material. Once material is excavated, it expands to varying degrees depending on its constituents
BaP	Benzo(a)pyrene

Terms	Meaning
BBWQIP	<i>Botany Bay and Catchment Water Quality Improvement Plan</i>
BC Act	<i>Biodiversity Conservation Act 2016</i>
BDAR	Biodiversity Development Assessment Report
Biodiversity credit report	The report produced by the Biodiversity Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site (OEH 2017).
Biodiversity credits	Ecosystem credits or species credits
Biodiversity offsets	Management actions that are undertaken to achieve a gain in biodiversity values on areas of land in order to compensate for losses to biodiversity values from the impacts of development (OEH 2017).
BL	Beaches Link
Blasting	Rock blasting is the controlled use of explosives and other methods such as gas pressure blasting pyrotechnics or plasma processes, to excavate, break down or remove rock
BoM	Australian Bureau of Meteorology
Bore	A cylindrical drill hole sunk into the ground from which water is pumped for use or monitoring.
Borehole	A hole produced in the ground by drilling for the investigation and assessment of soil and rock profiles.
Box culvert	A culvert of rectangular cross section.
BTEX	Benzene, toluene, ethylbenzene, xylenes
BTEXN	Benzene, toluene, ethylbenzene, xylenes, naphthalene
BTX	Benzene, toluene and total xylenes
Bund	A small embankment designed to retain water
Bus lane	A traffic lane dedicated to buses, but which can also be used by taxis, bicycles and motorcycles
Capacity	The nominal maximum number of vehicles which has a reasonable expectation of passing over a given section of a lane or roadway in one direction during a given time period under prevailing roadway conditions
Carcinogen	A substance that causes cancer
Carriageway	The portion of a roadway used by vehicles including shoulders and ancillary lanes
CASA	Civil Aviation Safety Authority
Catchment	The land area draining through the main stream, as well as tributary streams, to a particular site. It always relates to an area above a specific location
CBD	Central Business District
CCME	Canadian Council of Ministers of the Environment
CCTV	Closed-circuit television
CEMP	Construction Environmental Management Plan
CGS	Characteristic gas situation
Chronic exposure	Contact with a substance or stressor that occurs over a long time (more than one year) [compare with acute exposure and intermediate duration exposure].
Clearing	The removal of vegetation or other obstacles at or above ground level.

Terms	Meaning
Climate change	A change in the state of the climate that can be identified (for example by statistical tests) by changes in the mean and/or variability of its properties, and that persists for an extended period of time, typically decades or longer (IPCC 2007)
Climate projection	A climate projection is the simulated response of the climate system to a scenario of future emission or concentration of greenhouse gases and aerosols, generally derived using climate models. Climate projections are distinguished from climate predictions by their dependence on the emission/concentration/radiative forcing scenario used, which in turn is based on assumptions concerning, for example, future socio-economic and technological developments that may or may not be realised (IPCC 2007)
CLM Act	<i>Contaminated Land Management Act 1997</i> (NSW)
CNVG	<i>Construction Noise and Vibration Guideline</i>
CNVMP	Construction Noise and Vibration Management Plan
CO	Carbon monoxide
CO <sub>2</sub>	carbon dioxide
Concept design	Initial functional layout of a road/road system or other infrastructure. Used to facilitate understanding of a project, establish feasibility and provide basis for estimating and to determine further investigations needed for detailed design
Construction	Includes all physical work required to construct the project
Construction ancillary facilities	Temporary facilities during construction that include, but are not limited to construction sites (civil and tunnel), sediment basins, temporary water treatment plants, precast yards and material stockpiles, laydown areas, workforce parking, maintenance workshops and offices
Construction boundary	The area required for project construction is referred to as the 'construction boundary'.
Construction fatigue	Impact on receivers in the vicinity of concurrent and/or consecutive construction activities
Construction footprint	The land above and below the ground that is required to construct the project.
COPD	Chronic Obstructive Pulmonary Disease
Corridor	A substantial segment of the transport network, in which parallel, possibly competing, transport routes (and modes, where appropriate) operate between two locations
CoRTN	Calculation of Road Traffic Noise
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSM	Conceptual site model
CSWMP	Construction Soil and Water Management Plan
CTAMP	Construction Traffic and Access Management Plan
Cul-de-sac	A street or road that is open for vehicular traffic at one end only
Culvert	A structure that allows water to flow under a road
Cumulative impact	The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Refer to the project SEARs for cumulative impact assessment requirements.
Cut-and-cover	A method of tunnel construction whereby the structure is built in an open excavation and subsequently covered
dB	Decibel - sound level measurement

Terms	Meaning
dB(A)	Decibels (A-weighted)
DCP	Development control plan
DEC	Department of Environment and Conservation
DECC	NSW Department of Environment and Climate Change
DECCW	NSW Department of Environment, Climate Change and Water
Design speed	A nominal speed which determines the geometric design features of a road
DET	Department of Education and Training
Detailed design	The phase of the project following concept design where the design is refined, and plans, specifications and estimates are produced, suitable for construction
Detection limit	The lowest concentration of a chemical that can reliably be distinguished from a zero concentration.
Detour	An alternative route, using existing roads, made available to traffic
DG	Dangerous Goods
DIRDC	Department of Infrastructure, Regional Development and Cities
Discharge	A release of water from a particular source. The volume of water flowing in a stream or through an aquifer past a specific point over a given period of time.
DIWA	Directory of Important Wetlands of Australia
DLWC	Department of Land and Water Conservation
DM 2026	Operation 'do minimum' (DM 2026)
DM 2036	Operation 'do minimum' (DM 2036)
DoEE	Commonwealth Department of Environment and Energy
DP&E	NSW Department of Planning and Environment
DPI	NSW Department of Primary Industries
DPI-Fisheries	NSW Department of Primary Industries – Fisheries. State agency responsible for managing fisheries.
DPI-Water	NSW Department of Primary Industries – Water.
Drainage	Natural or artificial means for the interception and removal of surface or subsurface water.
Drawdown	A lowering of the water table in an unconfined aquifer or the potentiometric surface of a confined aquifer caused by the groundwater inflow to tunnels or pumping of groundwater from wells.
Driven tunnel	Mechanical excavation of a tunnel through rock by a road header or tunnel boring machine, driven along the tunnel alignment from the tunnel entrance.
DS 2026	Operation 'do something' (DS 2026)
DSC 2036	Operation 'cumulative' (DSC 2036)
DUAP	Department of Urban Affairs and Planning
DWE	NSW Department of Water and Energy
Dyke	A vertical or sub-vertical geological structure composed of igneous rock that typically cross cuts the host rock. The dyke is formed as magma from a larger igneous body intrudes the host rock typically along structural weaknesses.
Earthworks	All operations involving the loosening, excavating, placing, shaping and compacting of soil or rock.
EB	Eastbound
Ecology	The study of the relationship between living things and the environment.



Terms	Meaning
Ecosystem credit species	A measurement of the value of threatened species habitat for species that can be reliably predicted to occur with a plant community type (PCT)
ED	Emergency department
EHC Act	<i>Environmentally Hazardous Chemicals Act 1985</i> (NSW)
EIA	Effective impervious area
EIS	Environmental impact assessment
ELA	Eco Logical Australia Pty Ltd
Embankment	An earthen structure where the road (or other infrastructure) is located above the natural surface.
Emergency management	A range of measures to manage risks to communities and the environment. In the flood context it may include measures to prevent, prepare for, respond to and recover from flooding.
Emission	The discharge of a substance into the environment.
Emission factor (EF)	A quantity which expresses the mass of a pollutant emitted per unit of activity. For road transport, the unit of activity is usually either distance (i.e. g/km) or fuel consumed (i.e. g/litre).
Emission rate	A quantity which expresses the mass of a pollutant emitted per unit of time (e.g. g/second)
EMS	Environmental management system. A quality system that enables an organisation to identify, monitor and control its environmental aspects. An EMS is part of an overall management system, which includes organisational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy.
Enabling works	Works which are required to enable the commencement of the main construction works
ENMM	Environmental Noise Management Manual
Entry ramp	A ramp by which one enters a limited-access highway/tunnel
Environment	Includes all aspects of the surroundings of humans, whether affecting any human as an individual or in his or her social groupings (from EP&A Act)
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>
EPHC	Environment Protection Heritage Council
EPL	Environment protection licence
ERP	Environmental Risk and Planning
ESA	Environmental site assessment
ESCP	Erosion and Sediment Control Plan
Evening	Construction noise:
Exit blocking	Queuing traffic from a downstream link or intersection that blocks traffic from being able to travel through and exit an intersection
Exit ramp	A ramp by which one exits a limited-access highway/tunnel
Exposure	Contact with a substance by swallowing, breathing, or touching the skin or eyes. Also includes contact with a stressor such as noise or vibration. Exposure may be short term [acute exposure], of intermediate duration, or long term [chronic exposure].

Terms	Meaning
Exposure assessment	The process of finding out how people come into contact with a hazardous substance, how often and for how long they are in contact with the substance, and how much of the substance they are in contact with.
Exposure pathway	The route a substance takes from its source (where it began) to its endpoint (where it ends), and how people can come into contact with (or get exposed) to it. An exposure pathway has five parts: a source of contamination (such as chemical leakage into the subsurface); an environmental media and transport mechanism (such as movement through groundwater); a point of exposure (such as a private well); a route of exposure (eating, drinking, breathing, or touching), and a receptor population (people potentially or actually exposed). When all five parts are present, the exposure pathway is termed a completed exposure pathway.
F6 Extension (previously referred to as SouthLink)	A proposed motorway link between the New M5 at Arncliffe and the existing M1 Princes Highway at Loftus, generally along the alignment known as the F6 corridor. The project is being delivered by NSW Roads and Maritime Services and would be subject to separate assessment and planning approval
FD	Finite difference
Feasible and reasonable	Consideration of standard or good practice taking into account the benefit of proposed measures and their technological and associated operational application in the NSW and Australian context. 'Feasible' relates to engineering considerations and what is practical to build. 'Reasonable' relates to the application of judgement in arriving at a decision, taking into account mitigation benefits and cost of mitigation versus benefits provided, community expectations and nature and extent of potential improvements
Fill	The material placed in an embankment.
Flood	Relatively high stream flow which overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or local overland flooding associated with major drainage before entering a watercourse, and/or coastal inundation resulting from super-elevated sea levels and/or waves overtopping coastline defences excluding tsunamis.
Flood immunity	Relates to the level at which a particular structure would be clear of a certain flood event.
Flood prone land	Land susceptible to flooding by the Probable Maximum Flood. Note that the flood prone land is synonymous with flood liable land.
Flood storage area	Those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood. The extent and behaviour of flood storage areas may change with flood severity, and loss of flood storage can increase the severity of flood impacts by reducing natural flood attenuation. Hence, it is necessary to investigate a range of flood sizes before defining flood storage areas.
Floodplain	Area of land which is subject to inundation by floods up to and including the probable maximum flood event (i.e. flood prone land).
Floodplain Risk Management Plan	A management plan developed in accordance with the principles and guidelines in the NSW Floodplain Development Manual (FDM), (DIPNR 2005). Usually includes both written and diagrammatic information describing how particular areas of flood prone land are to be used and managed to achieve defined objectives.
Floodway area	Those areas of the floodplain where a significant discharge of water occurs during floods. They are often aligned with naturally defined channels. Floodways are areas that, even if only partially blocked, would cause a significant redistribution of flood flow, or a significant increase in flood levels.
FM Act	<i>Fisheries Management Act 1994 (NSW)</i>
FMS	Flood Management Strategy
Footpath	The paved area in a footway

Terms	Meaning
Footway	An area open to the public designated for the movement of pedestrians or has one of its main uses for pedestrians
Fractured Rock Aquifer	Occur in sedimentary, igneous and metamorphosed rocks that have been subjected to disturbance, deformation or weathering, which allow water to move through joints, bedding planes and faults. Although fractured rock aquifers are found over a wide area, they generally contain much less groundwater than alluvial and porous sedimentary aquifers.
Freeboard	A factor of safety typically used in relation to the setting of floor levels, levee crest levels, etc. It is usually expressed as the difference in height between the adopted Flood Planning Level and the peak height of the flood used to determine the flood planning level. Freeboard provides a factor of safety to compensate for uncertainties in the estimation of flood levels across the floodplain, such as wave action, localised hydraulic behaviour and impacts that are specific event related, such as levee and embankment settlement, and other effects such as future climate change. Freeboard is included in the FPL.
Freeways	Fast, high volume, access controlled roads that primarily link regional hubs and cities usually with grade separated intersections and without traffic lights
Gateway to the South	An accelerated pinch points program, the Gateway to the South Pinch Points Program aims to ease congestion and improve journey reliability on Sydney's key southern corridors. The NSW Government has committed \$300 million to address critical pinch points along the A1, A3 and A6 routes south of the M5 Motorway
GDEs	Groundwater dependent ecosystems. Refers to communities of plants, animals and other organisms whose extent and life process are dependent on groundwater, such as wetlands and vegetation on coastal sand dunes.
Genotoxic carcinogen	These are carcinogens that have the potential to result in genetic (DNA) damage (gene mutation, gene amplification, chromosomal rearrangement). Where this occurs, the damage may be sufficient to result in the initiation of cancer at some time during a lifetime.
GHG	greenhouse gas
GIL	Groundwater investigation level
Glare	'The uncomfortable brightness of a light source when viewed against a darker background.' (ILE 2011)
GMP	Groundwater monitoring plan
GPS	Global Positioning System
GPT	Gross pollutant trap
Grade separation	The separation of road, rail or other transport modes, so that crossing movements at intersections are at different levels
GRAL	Dispersion modelling system
GRAMM	Meteorological modelling system
Groundwater	Water located within an aquifer or aquitard that is held in the rocks and soil in interconnected pores or fractures located beneath the water table.
GSP	NSW State Gross Product
GWh	Gigawatt hours
Ha	Hectares
HCV	Heavy commercial vehicle
HDD	Horizontal Directional Drilling
Heavy vehicles	A heavy vehicle is classified as a Class 3 vehicle (a two axle truck) or larger, in accordance with the Austroads Vehicle Classification System

Terms	Meaning
HI	Hazard Index
HSL	Health screening level
Hydraulics	The term given to the study of water flow in waterways, in particular the evaluation of flow parameters such as water level and velocity.
Hydrogeology	The study of subsurface water in its geological context.
Hydrograph	A graph which shows how the discharge or stage/flood level at any particular location varies with time during a flood.
Hydrology	The study of rainfall and surface water runoff processes.
IAQM	Institute of Air Quality Management
IARC	International Agency for Research on Cancer
IBRA	Interim Biogeographic Regionalisation for Australia
ICNG	<i>Interim Construction Noise Guideline</i>
Impact	Influence or effect exerted by a project or other activity on the natural, built and community environment
Indirect impact	An impact on biodiversity values that occurs when development related activities affect threatened species, threatened species habitat, or ecological communities in a manner other than direct impact. Compared to direct impacts, indirect impacts often:
Inhalation	The act of breathing. A hazardous substance can enter the body this way [see route of exposure].
Interchange	An intersection of two or more roads that typically uses grade separation, and one or more ramps, to permit traffic on at least one carriageway to pass through the junction without directly crossing any other traffic stream
IPCC	Intergovernmental Panel on Climate Change
IS	Infrastructure Sustainability
ISCA	Infrastructure Sustainability Council of Australia
Junction	A place where two or more roads meet
km/h	Kilometres per hour
$K_v$	Vertical hydraulic conductivity
$L_{A1}$	A-weighted sound level exceeded for 1% of the measurement period
$L_{A90}$	A-weighted sound level exceeded for 90% of the measurement period
$L_{Aeq}$	A-weighted equivalent sound level
LALC	Local Aboriginal Land Council
$L_{Amax}$	A-Weighted, maximum sound level
Landscape character zone	'An area of landscape with similar properties or strongly defined spatial qualities, distinct from areas immediately nearby.' (RMS 2018)
LATM	Local Area Traffic Management
LCV	Light Commercial Vehicle. Vehicles up to 4.5 tonnes Gross Vehicle Mass (GVM), including cars which have been registered for business use
LCZs	landscape character zones
LEP	Local Environmental Plan
LGA	Local Government Area
LiDAR	Light detection and ranging
LOAEL	lowest observed adverse effect level

Terms	Meaning
Local Drainage	Smaller scale drainage systems in urban areas. Commonly defined as areas where the depth of inundation along overland flow paths is less than 150 millimetres during a 1% AEP storm.
Local population	The population that occurs in the study area. In cases where multiple populations occur in the study area or a population occupies part of the study area, impacts on each subpopulation must be assessed separately (OEH 2017).
Local road	A road or street used primarily for access to abutting properties
LoS	Level of service
LTAAEL	Long Term Average Annual Extraction Limit as outlined in the water sharing plan
Lugeon	The lugeon (L) is a unit of measure to quantify hydraulic conductivity, generally used by geotechnical engineers in describing packer tests. 1L represents $1 \times 10^{-7}$ m/sec ( $8.6 \times 10^{-3}$ m/day in a homogeneous isotropic medium).
LUIP	Land Use and Infrastructure Plan
m	Metres.
m <sup>2</sup>	Square metres.
m <sup>3</sup>	Cubic metres.
M5 East Motorway	Part of the M5 Motorway corridor. Located between Beverly Hills and Sydney Airport (General Holmes Drive)
M5 motorway corridor	The M5 East Motorway and the M5 South West Motorway
Magnitude	Magnitude is the ... <i>'measurement of the scale, form and character of a development proposal when compared to the existing condition. In the case of visual assessment this also relates to how far the proposal is from the viewer.'</i> (RMS 2018)
MAH	Monocyclic aromatic hydrocarbons
Managed motorway	A managed motorway uses active traffic management to reduce congestion, improve reliability of travel times and inform travellers of real-time incidents and expected travel times to set destination along the motorway
Median	The central reservation which divides a carriageway for traffic travelling in opposite directions
Merit approach	The merit approach weighs social, economic, ecological and cultural impacts of land use options for different flood prone areas together with flood damage, hazard and behaviour implications, and environmental protection and well-being of the State's rivers and floodplains.
mg/m <sup>3</sup>	micrograms per cubic metre
Mitigation measure	Any measure that facilitates the safe movement of wildlife and/or prevents wildlife mortality.
MLALC	Metropolitan Local Aboriginal Land Council
MNES	Matters of National Environmental Significance
MOC1	Arncliffe Motorway Operations Complex
MOC2	Rockdale Motorway Operations Complex (north)
MOC3	Rockdale Motorway Operations Complex (south)
Mode	A type or method of transport movement – including for the road corridor: cars, buses, bikes and pedestrians
Model area	Area covered by the groundwater model as shown on <b>Figure 3-4</b> .
Motorway	Fast, high volume controlled access roads. May be tolled or untolled
MUSIC	Model for Urban Stormwater Improvement Conceptualisation



Terms	Meaning
MVHT	million vehicle hours travelled
MVKT	million vehicle kilometres travelled
NB	Northbound
NCA	Noise catchment areas
NCG	Noise Criteria Guideline
NCG	Noise Criteria Guideline (various, as referenced in the report)
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
Network productivity	Indication of efficiency of a road network, which can be expressed in terms of vehicle kilometres travelled and vehicle hours travelled per day
NH <sub>3</sub>	Ammonia
NHMRC	National Health and Medical Research Council
NMG	Noise Mitigation Guideline
NML	Noise management level
NO	nitric oxide
NO <sub>2</sub>	Nitrogen dioxide
NOAEL	No observed adverse effect level
NoW	NSW Office of Water
NO <sub>x</sub>	Nitrogen oxides
NPfI	Noise Policy for Industry
NPW Act	<i>National Parks and Wildlife Act 1974 (NSW)</i>
NSW	New South Wales
NSW DEC	NSW Department of Environment and Conservation
NSW DPI	NSW Department of Primary Industries
NSW EPA	NSW Environmental Protection Agency
NSW Health	NSW Department of Health
NSW OEH	NSW Office of Environment and Heritage
NTU	Nephelometric Turbidity Unit
O <sub>3</sub>	Ozone
OCP	Organochlorine pesticide
OCPs	Organochlorine pesticides
OEH	NSW Office of Environment and Heritage
OEHHA	Office of Environmental Health Hazard Assessment, California Environment Protection Agency (Cal EPA)
OEMP	Operational Environmental Management Plan
OFFMP	Operation Flora and Fauna Management Plan
OLS	Obstacle limitation surface
OU	Odour units
Overbridge	Bridge that conveys another road, rail or pedestrians over the described road
Overland flooding	Inundation by local runoff rather than overbank discharge from a stream, river, estuary, lake or dam.

Terms	Meaning
PACHCI	Procedure for Aboriginal Cultural Heritage Consultation and Investigation (Roads and Maritime 2011)
PAD	Potential Archaeological Deposit
PAH	Polycyclic aromatic hydrocarbon
Palaeochannel	Ancient river systems eroded deeply into the landscape and infilled with alluvial sediments. These systems often underlie modern creek or river systems but not always.
PANS-OPS	Procedures for air navigation systems operations
PASS	Potential acid sulfate soils
PCB	Polychlorinated Biphenyls
PCT	Plant community type
PCU	passenger car units
Peak flood level	The maximum water level occurring during a flood event.
Peak spreading	Increases in traffic demand in time periods immediately before or after the critical AM peak and PM peak periods, with commensurate decreases in the forecast peak period traffic demand
Perched Water	Unconfined groundwater held above the water table by a layer of impermeable rock or sediment.
PEST	Parameter Estimation
PFAS	Perfluoralkylated Substances
PFOA	Perfluorooctanoic acid
PIARC	Permanent International Association of Road Congresses
PM	Particulate matter
PM peak hour	Unless otherwise stated, this refers to trips travelling on the network during the average peak one hour in the PM peak period between 3.00 pm–6.00 pm on a weekday hour
PM <sub>1</sub>	Particulate matter below one micron in diameter, often termed very fine particles
PM <sub>10</sub>	Particulate matter less than or equal to 10 micrometre diameter
PM <sub>2.5</sub>	Particulate matter less than or equal to 2.5 micrometre diameter
PMA	Personal Manager - Acquisition
PMF	Probable Maximum Flood
POEO Act	Protection of the Environment Operations Act 1997 (NSW)
POEO Regulation	Protection of the Environment Operations (Waste) Regulation 2014 (NSW)
Point of exposure	The place where someone can come into contact with a substance present in the environment [see exposure pathway].
Pollutant	Any matter that is not naturally present in the environment.
Population	A group of organisms, all of the same species, occupying a particular area.
Portal	The entry and/or exit to a tunnel
ppbv	Parts per billion by volume
ppm	Parts per million
Pre-construction	All work prior to, and in respect of the State significant infrastructure, that is excluded from the definition of construction
Private vehicle	Includes all motorised vehicles such as cars, 4WDs, vans, motorbikes, motor scooters, utes and trucks, not registered for business use

Terms	Meaning
Probability	A statistical measure of the expected chance of flooding (see annual exceedance probability).
RBL	Rating background levels
RCP	Reinforced concrete pipe
Revegetation	Direct seeding or planting (generally with native species) within an area in order to re-establish vegetation that was previously removed from that area.
Riparian	Relating to the banks of a natural waterway.
Risk	The probability that something would cause injury or harm.
RL	Reduced Level. The reduced level is the vertical distance between an elevation and an adopted datum plane such as the Australian Height Datum (AHD).
RMS	Roads and Maritime Services
RNP	<i>NSW Road Noise Policy</i>
Road reserve	An area of land within which facilities such as roads, footpaths and associated features may be constructed for public travel
Roads and Maritime	NSW Roads and Maritime Services
Roadside	The area from the edge of the carriageway to the boundary of the road reserve
Roadside furniture	A general term covering all signs, street lights, protective devices for the control, guidance and safety of traffic and convenience of road users
ROL	Road Occupancy Licence
Roundabout	An intersection where all traffic travels in one direction clockwise around a central island
Route of exposure	The way people come into contact with a hazardous substance. Three routes of exposure are breathing [inhalation], eating or drinking [ingestion], or contact with the skin [dermal contact].
RSLs	Regional Screening Levels
RTA	NSW Roads and Traffic Authority
Runoff	The portion of water that drains away as surface flow.
RWQ	Recreational water quality
s	Seconds
SA	Statistical area
SA1	Statistical area level 1 district
SA2	Statistical area level 2 district
SA3s	Statistical Areas Level 3
SACL	Sydney Airport Corporation Limited
Salinity	The concentration of dissolved salts in water, usually expressed in EC units or milligrams of total dissolved solids per litre (mg/L TDS). The conversion factor between EC and mg/L is dependent on the chemical composition of the water, but a conversion factor of 0.6 mg/L TDS = 1EC unit is commonly used as an approximation.
SAQP	Sampling, analysis and quality plan
Saturation flow	The number of vehicles per hour that could pass through a signalised intersection on a specific approach lane if the signal remained green for the entire 60 minutes
SB	Southbound
Scour	The erosion of material by the action of flowing water.

Terms	Meaning
Screenline	Theoretical boundaries specifically designed to collectively analyse directional and two-way traffic volumes
SEARs	Secretary Environmental Assessment Requirements
Secant pile wall	A continuous barrier wall formed by constructing intersecting reinforced concrete piles socketed into bedrock.
SEIFA	Socioeconomic indices for areas
Sensitive receiver	A location where a person works or resides, including residential, hospitals, hotels, shopping centres, play grounds, recreational centres or similar.
Sensitivity	'Capacity of a landscape or view to accommodate change without losing valued attributes.' (AILA 2018)
SEPP	State Environmental Planning Policy
SEPP 33	<i>State Environmental Planning Policy No. 33 – Hazardous and Offensive Development</i>
SEPP 55	<i>State Environmental Planning Policy No. 55 – Remediation of Land</i>
SES	State Emergency Services
SHR	State Heritage Register
Sky glow	'The brightening of the night sky' (ILE 2011)
SLG	stakeholder liaison group
Slug test	A hydraulic test conducted in a monitoring well to measure the hydraulic conductivity of the screened lithology. The test is conducted by adding or removing a slug of water and monitoring the response.
SMCMA	Sydney Metropolitan Catchment Management Authority Area
SMP	Sustainability Management Plan
SMPM	Sydney Strategic Motorway Project Model
SO <sub>2</sub>	Sulfur dioxide
SoHI	Statement of Heritage Impact
Species credits	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection.
Species credit species	Threatened species that are assessed and require credits and offsets according to Section 6.4. of the Biodiversity Assessment Method
SPI	St Peters interchange
Spoil	Surplus excavated material
SSI	State significant infrastructure
Steady state	Steady state flow conditions occur when the magnitude and direction of flow is constant across the whole model domain. Compare to transient flow conditions.
STM	Strategic Travel Model
Stockpile	Temporarily stored materials such as soil, sand, gravel and spoil/waste.
Stub tunnel	Driven tunnels constructed to connect to potential future motorway links
Surface water	Water flowing or held in streams, rivers and other water bodies in the landscape.
SVOC	Semi-volatile organic compounds
Swale	A shallow, grass-lined drainage channel.
SWOOS	Southern and Western Suburbs Ocean Outfall Sewer

Terms	Meaning
SWSOOS	Southern and Western Sydney Ocean Outfall System
Sydney Gateway	A high-capacity connection between the St Peters interchange (under construction as part of the New M5 project) and the Sydney Airport and Port Botany precinct
T90	Distillation temperature where 90% of the fuel is evaporated
TAGG	Transport Authorities Greenhouse Group
Tanked structure	A tanked structure is constructed with a fully impermeable casing or membrane that reduces inflows to such an extent that for all intents and purposes are considered negligible.
TAPM	The Air Pollution Model
TCEQ	Texas Commission on Environmental Quality
TCP	Traffic Control Plan
TCS	Traffic Control Signal
TEQ	Toxicity equivalent
TfNSW	Transport
THC	total hydrocarbons
Threatened Biodiversity Data Collection	Part of the BioNet database, published by OEH and accessible from the BioNet website at <a href="http://www.bionet.nsw.gov.au">www.bionet.nsw.gov.au</a> .
TKN	Total Kjeldahl Nitrogen
TMC	Transport Management Centre
Toxicity	The degree of danger posed by a substance to human, animal or plant life.
Toxicological profile	An assessment that examines, summarises, and interprets information about a hazardous substance to determine harmful levels of exposure and associated health effects. A toxicological profile also identifies significant gaps in knowledge on the substance and describes areas where further research is needed.
TP	Total Phosphorus
Transport for NSW	NSW Government Department Transport for NSW
Transport infrastructure	Permanent installations including roads, rail, buildings and storage associated with transport
TRH	Total recoverable hydrocarbons
Tributary	A river or stream flowing into a larger river or lake.
TSP	Total suspended particulates
Tunnel portal	The entrance/exit to the tunnel.
TWA	Trade waste agreement
UBD	Universal Business to Business Directories Pty LTD
UK	United Kingdom
UN	United Nations
Uncertainty factor	Mathematical adjustments for reasons of safety when knowledge is incomplete. For example, factors used in the calculation of doses that are not harmful (adverse) to people. These factors are applied to the lowest-observed-adverse-effect-level (LOAEL) or the no-observed-adverse-effect-level (NOAEL) to derive a minimal risk level (MRL). Uncertainty factors are used to account for variations in people's sensitivity, for differences between animals and humans, and for differences between a LOAEL and a NOAEL. Scientists use uncertainty factors when they have some, but not all, the information from animal or human studies to decide whether an exposure would cause harm to people [also sometimes called a safety factor].



Terms	Meaning
UNFCCC	United Nations Framework Convention on Climate Change
US	United States
US EPA	United States Environmental Protection Agency
V/C	Volume to Capacity ratio
Vadose zone	Within an aquifer the vadose zone is the unsaturated zone between the water table and ground surface.
Values	'Any aspect of landscape or views people consider to be important. Landscape and visual values may be reflected in local, state or federal planning regulations, other published documents or be established through community consultation and engagement, or as professionally assessed.' (AILA 2018)
Veh	Vehicle
Veh/h	Vehicle per hour
VEM	Visual Envelope Map
VENM	Virgin excavated natural material
Ventilation facility	Facility for the mechanical removal of air from the mainline tunnels, or mechanical introduction of air into the tunnels. May comprise one or more ventilation outlets
VHT	vehicle hours travelled
Viewpoint	'The specific location of a view, typically used for assessment purposes.' (AILA 2018)
VKT	Vehicle kilometres travelled
VOC	Volatile organic compounds
Vulnerable	As defined under the <i>Threatened Species Conservation Act 1995</i> (NSW), a species that is facing a high risk of extinction in NSW in the medium-term future.
WARR Act	<i>Waste Avoidance and Resource Recovery Act 2001</i> (NSW)
Water table	The surface of saturation in an unconfined aquifer at which the pressure of the water is equal to that of the atmosphere.
Waterway	Any flowing stream of water, whether natural or artificially regulated (not necessarily permanent).
WB	Westbound
WestConnex program of works	A program of works that includes the M4 Widening, King Georges Road Interchange Upgrade, M4 East, New M5 and M4-M5 Link projects
Western Harbour Tunnel and Beaches Link	The Western Harbour Tunnel component would connect to the M4-M5 Link at the Rozelle interchange, cross underneath Sydney Harbour between the Birchgrove and Waverton areas, and connect with the Warringah Freeway at North Sydney. The Beaches Link component would comprise a tunnel that would connect to the Warringah Freeway, cross underneath Middle Harbour and connect with the Burnt Bridge Creek Deviation at Balgowlah and Wakehurst Parkway at Seaforth. It would also involve the duplication of the Wakehurst Parkway between Seaforth and Frenchs Forest
WHO	World Health Organisation
WHT	Western Harbour Tunnel
WHTBL	Western Harbour Tunnel and Beaches Link
WM Act	<i>Water Management Act 2000</i> (NSW)
WQO	Water Quality Objectives
$\beta$ coefficient	Beta coefficient