

NorthConnex

Building for the future



Volume 1A



Environmental Impact Statement - Volume 1A

Main Volume Chapters 1 to 6

July 2014

In 2012, the NSW Government received an unsolicited proposal from Transurban and the Westlink M7 Shareholders (Sponsors) to design, construct, operate, maintain and finance a tolled motorway linking the M1 Pacific Highway at Wahroonga to the Hills M2 Motorway at the Pennant Hills Road interchange at West Pennant Hills, known as NorthConnex.

Roads and Maritime Services is the Proponent for the environmental impact statement and lodgement of an application for environmental and planning approval. Roads and Maritime is working with the Sponsors on the community consultation and public exhibition of this environmental impact statement.

Roads and Maritime Services

NorthConnex

Environmental impact statement

July 2014

Prepared by

AECOM Australia Pty Ltd

Level 21, 420 George Street, Sydney NSW 2000, PO Box Q410, QVB Post Office NSW 1230, Australia

T +61 2 8934 0000 F +61 2 8934 0001 www.aecom.com

ABN 20 093 846 925

AECOM in Australia and New Zealand is certified to the latest version of ISO9001, ISO14001, AS/NZS4801 and OHSAS18001.

© AECOM Australia Pty Ltd (AECOM). All rights reserved.

AECOM has prepared this document for the sole use of Roads and Maritime Services and for a specific purpose, each as expressly stated in the document. No other party should rely on this document without the prior written consent of AECOM. AECOM undertakes no duty, nor accepts any responsibility, to any third party who may rely upon or use this document. This document has been prepared based on Roads and Maritime Services' description of its requirements and AECOM's experience, having regard to assumptions that AECOM can reasonably be expected to make in accordance with sound professional principles. AECOM may also have relied upon information provided by Roads and Maritime Services and other third parties to prepare this document, some of which may not have been verified. Subject to the above conditions, this document may be transmitted, reproduced or disseminated only in its entirety.

(Blank page)

Contents

Certification	vii
Glossary of terms and abbreviations.....	ix
Executive Summary	xxi
1 Introduction.....	1
1.1 The proposed project.....	1
1.2 Project location	5
1.3 Structure of this environmental impact statement.....	5
2 Assessment process	11
2.1 Approval framework.....	11
2.2 Environmental planning instrument.....	11
2.3 Local Environmental Plans and draft Local Environmental Plans	12
2.4 Other legislation.....	15
3 Strategic justification and project need	19
3.1 NSW strategic planning and policy framework	19
3.2 National strategic planning and policy framework	25
3.3 Project need	28
3.4 Project objectives.....	31
3.5 Statement of strategic need	32
4 Project development and alternatives.....	33
4.1 F3 to Sydney Orbital Link Study.....	37
4.2 Review of the findings of the 2004 report.....	47
4.3 Unsolicited proposal design	50
4.4 Design and construct tender process.....	55
4.5 Ecologically sustainable development.....	64
4.6 The project.....	66
5 Project description	67
5.1 Project scope.....	67
5.2 The completed project	68
5.3 Construction works	140
6 Consultation.....	213
6.1 Community and stakeholder engagement overview	214
6.2 Consultation objectives and strategy.....	215
6.3 Consultation process and activities to date	216
6.4 Summary of issues raised.....	228
6.5 Consultation during the exhibition of the environmental impact statement ..	272
6.6 Future consultation	273
7 Assessment of key issues	275
7.1 Traffic	277
7.2 Noise and vibration	381
7.3 Air quality.....	447

7.4	Health	529
7.5	Urban design, landscape character and visual amenity	557
7.6	Biodiversity	709
7.7	Social and Economic	771
7.8	Hydrogeology and soils.....	801
7.9	Surface Water.....	841
7.10	Non-Aboriginal heritage	881
7.11	Aboriginal heritage.....	919
8	Assessment of other issues	939
8.1	Land use and property	939
8.2	Hazards and risk.....	979
8.3	Resources and waste	1003
8.4	Greenhouse gas and climate change.....	1027
9	Summary of environmental management measures.....	1059
10	Environmental risk analysis.....	1085
10.1	Environmental risk analysis process	1085
10.2	Preliminary environmental assessment.....	1086
10.3	Assessment of the key issues identified in the Director-General's Requirements	1086
10.4	Risk analysis framework	1087
10.5	Environmental risk analysis	1088
10.6	Confirmation of key environmental issues.....	1122
11	Project justification and conclusion.....	1123
11.1	Project justification.....	1123
11.2	Conclusion.....	1132
	References.....	1133
	List of tables	1147
	List of figures	1159
Appendix A	Director-General's Requirements	
Appendix B	<i>Environmental Planning and Assessment Regulation 2000</i> checklist	
Appendix C	Geological long section	
Appendix D	Community communications framework	

Volume 2

Appendix E Technical working paper: Traffic and transport

Appendix F Technical working paper: Noise and vibration

Volume 3

Appendix G Technical working paper: Air quality

Appendix H Technical working paper: Human health risk assessment

Volume 4

Appendix I Technical working paper: Urban design

Volume 5

Appendix J Technical working paper: Biodiversity

Volume 6

Appendix K Technical working paper: Business

Appendix L Technical working paper: Non-Aboriginal heritage

Appendix M Technical working paper: Aboriginal heritage

Appendix N Greenhouse gas methodology and calculations

(Blank page)

Certification

Submission of environmental impact statement

Prepared under Part 5.1 of the *Environmental Planning and Assessment Act 1979*

Environmental impact statement prepared by:

Name:	Scott Jeffries	Todd Brookes
Qualifications:	Bachelor of Chemical Engineering Master of Environmental Law	Bachelor Environmental Management
Address:	AECOM, Level 21 420 George Street Sydney NSW 2000	AECOM, Level 21 420 George Street Sydney NSW 2000
Responsible person:	Ken Kanofski Director Journey Management Roads and Maritime Services NSW	

Address of the land to which the statement relates:

Land within The Hills, Hornsby and Ku-ring-gai local government areas as described within this environmental impact statement.

Description of the infrastructure to which this statement relates:

Construction and operation of a tolled motorway (known as NorthConnex) linking the M1 Pacific Motorway at Wahroonga to the Hills M2 Motorway at West Pennant Hills, including operational ancillary facilities for the control and management of the road.

Environmental impact statement:

An environmental impact statement is attached addressing all matters in accordance with Part 5.1 of the *Environmental Planning and Assessment Act 1979* and Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*.

Declaration:

I certify that I have prepared this environmental impact statement in accordance with the Director-General's Requirements dated 11 April 2014. The environmental impact statement contains all available information that is relevant to the environmental assessment of the infrastructure to which the statement related. To the best of my knowledge, the information contained in the environmental impact statement is neither false nor misleading.

Signature:



Name: Scott Jeffries



Name: Todd Brookes

Date: 02 July 2014

Date: 02 July 2014

(Blank page)

Glossary of terms and abbreviations

Term	Meaning
$\mu\text{g}/\text{m}^3$	Micrograms per cubic metre.
A	
AADT	Average annual daily traffic. The total volume of traffic passing a roadside observation point over a period of a year, divided by the number of days per year. It is calculated from mechanically obtained axle counts.
Aboriginal cultural heritage	The tangible (objects) and intangible (dreaming stories, songlines, 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 s.94 of the <i>National Parks and Wildlife Act 1974</i> .
ABS	Australian Bureau of Statistics.
Abutment	An end support of a bridge.
Acid sulfate soils	Naturally acid clays, mud and other sediments usually found in swamps and estuaries. They may become extremely acidic when drained and exposed to oxygen and may produce acidic leachate run-off that can pollute waters and liberate toxins.
Acute noise levels	Road traffic noise levels received at private dwellings that are predicted to be greater than $65\text{dB(A)}_{\text{Leq}(15\text{hr})}$ (day) and $60\text{dB(A)}_{\text{Leq}(9\text{hr})}$ (night), as presented in Practice Note IV, Step 3, Part (3) of the Roads and Maritime's Environmental Noise Management Manual.
Aggregate	A uniform sized material from sand, gravel, rock or metallurgical slag by screening, blasting or crushing. Used in concrete production and for bitumen sealing.
AHD	Australian Height Datum. The standard reference level used to express the relative height of various features. A height given in metres AHD is essentially the height above sea level. Mean sea level is set as zero elevation.
Airshed	Part of the atmosphere that shares a common flow of air and that is exposed to similar influences.
AHIMS	Aboriginal heritage information management system. A register of NSW Aboriginal heritage information maintained by Office of Environment and Heritage.
Alignment	The geometric layout (eg of a road tunnel) in plan (horizontal) and elevation (vertical).
Alluvial	Relating to, consisting of, or formed by sediment deposited by flowing water.
Ancillary	A subordinate part or element.
ANZECC	Australian and New Zealand Environment and Conservation Council.
Aquatic ecology	Flora and fauna that live in or on water for all or a substantial part of the life span (generally restricted to fresh / inland waters).
Aquifer	Geologic formation, group of formations, or part of a formation capable of transmitting and yielding quantities of water.
Archaeological site	A site with any material evidence of past Aboriginal or non-Aboriginal activity in which evidence of past activity is preserved.
Archaeology	The scientific study of human history, particularly the relics and cultural remains of the distant past.

Term	Meaning
ARI	Average recurrence interval. Used to describe the frequency or probability of floods occurring. (eg a 100 year ARI flood is a flood that occurs or is exceeded on average once every 100 years (100:1)).
Arterial roads	The main or trunk roads of the State road network.
AS 14000	Australian Standards for environmental management. Of note: AS 14001: Environmental management systems – requirements for guidance for use. AS14004: Environmental management systems – general guidelines on principles, systems and supporting techniques.
AS 1940	Australian Standard: Guide to the Storage and Handling of Flammable and Combustible Liquids.
AS 2436	Australian Standard: Noise Control on Construction, Maintenance and Demolition Sites.
AS 2922	Australian Standard: Ambient Air Guide for Siting of Sampling Units.
AS 3580.10.1	Australian Standard: Methods for Sampling and Analysis of Ambient Air.
Asphalt	A dense, continuously graded mixture of coarse and fine aggregates, mineral filler and bitumen usually produced hot in a mixing plant.
ASS	Acid sulfate soils.
At grade	A road at ground level, not on an embankment or in a cutting.
B	
Backfill	Fill replaced in an excavation.
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.
Batter	The constructed slope of road embankments and cuttings usually expressed as a ratio of x horizontal to 1 (one) vertical. A fill batter is where the road is above the existing surface on a filled embankment and refers to the sloping sides of the embankment. A cut batter is where the road is below the existing surface.
Bedrock	Rock of a substantial thickness and extent underlying a relatively soft and variable surface.
Biota	All organisms including flora and fauna, in a given area considered as a unit.
Blasting	The use of explosives for excavating rock, demolition and other purposes.
BOM	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	Volatile organic compounds.
Bund	A small embankment designed to retain water.
C	
Cadastral	Showing the extent and ownership of land (generally on a map).
CALPUFF	Air quality monitoring models used to estimate pollutant concentrations, which include CALPUFF, CALMET and CALPOST.
CALRoads	An air quality modelling package used to predict pollutant concentrations along roads, which includes the CAL3QHCR model.

Term	Meaning
Carbon dioxide equivalent (CO ₂ -e)	The mass of a greenhouse gas that is emitted is multiplied by its global warming potential to convert greenhouse gas emissions to an equivalent quantity of CO ₂ emissions, referred to as carbon dioxide equivalent. For simplicity of reporting, the mass of each greenhouse gas emitted is commonly translated into a carbon dioxide equivalent (CO ₂ -e) amount so that the total impact from all sources can be summed to one figure.
Carriageway	The portion of a roadway used by vehicles including shoulders and ancillary lanes.
Cast in-situ	Concrete which is cast directly into its final position.
Catchment	The area from which a surface watercourse or a groundwater system derives its water.
CEMP	Construction Environmental Management Plan. A site specific plan developed for the construction phase of a project to ensure that all contractors and sub-contractors comply with the environmental conditions of approval for the project and that environmental risks are properly managed.
CH ₄	Methane.
Chainage	Any point on a control line selected to provide more detailed information about the cross-section or any other feature mentioned in the drawings. Also known as a station.
CMA	Catchment Management Authority
CNVMP	Construction Noise and Vibration Management Plan
CO	Carbon monoxide.
CO ₂	Carbon dioxide.
CO ₂ -e	Carbon dioxide equivalent.
Colluvial soils	Stony clays which have been moved downslope by soil creep and slopewash but may include a proportion of windblown red clay (parna) and higher terrace alluvium.
Compaction	An increase in density of a soil material by mechanical means such as rolling the surface layers or for deep compaction, driving sand piles, vibration or impact methods.
Compound site	Facilities used to support the operation of a construction site including (but not limited to) site offices, workshops, delivery areas, storage areas, staff vehicle parking, materials, plant and equipment.
Concentration (air quality)	Vehicles emit pollutants to the air, which are transported and diluted resulting in a volume of pollutant per volume of ambient air. Ambient air quality goals are expressed in terms of concentrations, which are measured in parts per million or micrograms per cubic metre.
Confluence	A point at which streams combine.
Constructability	The ease with which structures can be built.
Construction footprint	The area required to construct the project, including underground components, above ground components and temporary ancillary construction facilities.
Critical habitat	The habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species.
CSIRO	Commonwealth Scientific and Industrial Research Organisation.
Cumulative impacts	Impacts that, when considered together, have different and/or more substantial impacts than a single impact considered alone.
Cut	The material excavated from a cutting.
Cutting	Formation resulting from the construction of the road below existing ground level – the material is cut out or excavated.

Term	Meaning
D	
dBA	Decibels using the A-weighted scale measured according to the frequency of the human ear.
DEC	NSW Department of Environment and Conservation (now OEH and the EPA).
DECC	NSW Department of Environment and Climate Change (formerly DEC and now OEH and EPA).
DECCW	NSW Department of Environment, Climate Change and Water (formerly DEC, DECC and now OEH and the EPA).
Decibel	A scale unit used in the comparison of powers and levels of sound energy. Used for measuring noise.
Dewatering	The removal of water from solid material or soil by wet classification, centrifugation, filtration or similar solid-liquid separation processes.
DEWHA	Australian Government Department of Environment, Water, Heritage and the Arts (now the Department of the Environment).
DGRs	Director-General's Requirements. Requirements and specifications for an environmental impact statement prepared by the Director-General of the then Department of Planning and Infrastructure under section 115Y of the <i>Environmental Planning & Assessment Act 1979</i> .
DIPNR	The NSW Department of Planning and Natural Resources (now part of DP&E and NOW).
Discharge	The volumetric rate of water flow.
DLWC	NSW Department of Land and Water Conservation (now part of DPI)
DoP	NSW Department of Planning (now Department of Planning and Environment).
DP&E	NSW Department of Planning and Environment (formerly DIPNR and DoP).
DP	Deposited Plan. A plan of land deposited in Land and Property Information (part of the Land Management Authority) and used for legal identification purposes. They most commonly depict a subdivision of a parcel of land.
DPI	The NSW Department of Primary Industries, which includes Fisheries NSW, Agriculture NSW and NOW.
Drainage	Natural or artificial means for the interception and removal of surface or subsurface water.
DSEWPaC	Australian Government Department of Sustainability, Environment, Water, Population and Communities (now the Department of the Environment).
DUAP	NSW Department of Urban Affairs and Planning (now DP&E)
E	
Earthworks	All operations involved in loosening, excavating, placing, shaping and compacting soil or rock.
Ecosystem	A functional unit of energy transfer and nutrient cycling in a given place. It includes all relationships within the biotic community and between the biotic components of the system.
Edge effects	A change in species composition, physical conditions or other ecological factors at the boundary between two ecosystems or the ecological changes that occur at the boundaries of ecosystems (including changes in species composition, gradients of moisture, sunlight, soil and air temperature, wind speed and other factors).

Term	Meaning
EEC	Endangered ecological community. An ecological community identified by relevant legislation that is likely to become extinct or is in immediate danger of extinction.
EEO Act	<i>Energy Efficiency Opportunities Act 2006</i> (Commonwealth)
Embankment	An earthen structure where the road (or other infrastructure) subgrade level is above the natural surface.
Emission factor (EF)	Emission factors convert an indicator of activity into estimated greenhouse gas emissions.
Emission source	Source from which greenhouse gases are released.
EMP	Environmental management plan. A plan used to manage environmental impacts during each phase of project development. The plan outlines all proposed mitigation, management and monitoring actions, set to a timeline with defined responsibilities and follow up actions.
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.
Emergency smoke extraction facility	A facility that is designed to maintain air quality in the tunnels in the unlikely event of an emergency. As a secondary feature, these facilities would also supply fresh air the tunnels during low speed, congested traffic conditions.
ENMM	Roads and Maritime's Environmental Noise Management Manual.
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW).
EP&A Regulation	<i>Environmental Planning and Assessment Regulation 2000</i> (NSW).
EPA	NSW Environment Protection Authority.
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth).
Ephemeral creek	A creek that only exists for a short duration of time following rainfall.
EPL	Environment Protection Licence.
Escarpment	A long, cliff-like ridge of rock commonly formed by faulting or fracturing of the earth's crust.
ESCP	Erosion and sediment control plan.
ESD	Ecologically sustainable development. As defined by the <i>Protection of the Environment Administration Act 1991</i> , requires the effective integration of economic and environmental considerations in decision making processes including: <ul style="list-style-type: none"> • The precautionary principle. • Inter-generational equity. • Conservation of biological diversity and ecological integrity. • Improved valuation, pricing and incentive mechanisms (includes polluter pays, full life cycle costs, cost effective pursuit of environmental goals).
F	
Fill	The material placed in an embankment.
FM Act	<i>NSW Fisheries Management Act 1994</i> .
Footprint	The extent of impact that a development makes on the land.
Fragmentation	The breaking up of continuous sections of ecosystems or landscape features.

Term	Meaning
Frequency (sound)	Similar to the pitch of a musical note in sound pressure fluctuations of cycles per second (Hertz). Most sounds comprise a composite of frequencies of varying sound-pressure levels in the range of 20 Hertz to 20,000 Hertz.
G	
GDE	Groundwater Dependent Ecosystems.
Grade	1. The degree of inclination of a road or slope. 2. To trim or smooth an earth, gravel or other surface using a grader or similar implement.
Grade separation	The separations of road, rail or other traffic so that crossing movements at intersections are at different levels. Opposite to at grade.
Greenhouse gas (GHG)	Greenhouse gases are those gases which reduce the loss of heat from the earth's atmosphere by absorbing infrared radiation. Six greenhouse gases are regulated by the Kyoto Protocol: Carbon dioxide (CO ₂), Methane (CH ₄), Nitrous oxide (N ₂ O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs) and Sulphur hexafluoride (SF ₆). The emissions of greenhouse gases are reported in carbon dioxide equivalents (see above).
Ground vibration	The combined speed of ground oscillation at a point from a source of vibration such as a blast or vehicle.
Groundwater	Water that is held in the rocks and soil beneath the earth's surface.
Grubbing	The removal of roots or stumps from below ground level.
H	
ha	Hectare/s.
Habitat	The place where a species, population or ecological community lives (whether permanently, periodically or occasionally). Habitats are measurable and can be described by their flora and physical components.
Haul road	A designated road, often temporary, used for moving materials (often used when new infrastructure is being constructed).
Heavy vehicle	A vehicle is classified as a Class 3 vehicle (a two axle truck) or larger, in accordance with the Austroads Vehicle Classification System.
HFCs	Hydrofluorocarbons.
Hills M2 Motorway integration works	The works to join the project to the Hills M2 Motorway extending from the southern interchange to Windsor Road interchange.
Hydrocarbon	Any organic compound — gaseous, liquid or solid — consisting only of carbon and hydrogen.
Hydrogeology	The science of the distribution and movement of groundwater.
Hydrology	The study of rainfall and surface water runoff processes.
Hydromulching	A procedure to establish grass over a large area. A mixture of grass seed, chopped straw and fertiliser is sprayed over the area to be grassed.
I	
ICNG	Interim Construction Noise Guideline (DECC, 2009).
INP	NSW Industrial Noise Policy (EPA, 2000).
Interchange	A grade separation of two or more roads with one or more interconnecting carriageways.
Intersection at-grade	An intersection where carriageways cross at a common level.
Integration works	Works to join existing roads to the project.
IPCC	Intergovernmental Panel on Climate Change.
ISEPP	<i>State Environmental Planning Policy (Infrastructure) 2007.</i>

Term	Meaning
L	
L _{A10}	The noise level which is exceeded for 10 per cent of the sample period. During the sample period, the noise level is below LA ₁₀ level for 90 per cent of the time. The LA ₁₀ is a common noise descriptor for environmental noise and road traffic noise.
L _{A90}	The noise level which is exceeded for 90 per cent of the sample period. During the sample period, the noise level is below LA ₉₀ level for 10 per cent of the time. This measure is commonly referred to as background noise level.
L _{Aeq}	The equivalent continuous sound level. This is the energy average of the varying noise over the sample period and is equivalent to the level of constant noise which contains the same energy as the varying noise environment. This measure is a common measure of environmental noise and road traffic noise.
LALC	Local Aboriginal Land Council.
L _{Amax}	The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.
Landscape character.	The aggregate of built, natural and cultural aspects that make up an area and provide a sense of place. Includes all aspects of a tract of land – built, planted and natural topographical and ecological features.
LEP	Local Environmental Plan.
LGA	Local government area.
Light vehicle	A vehicle is classified as a Class 2 vehicle or smaller, in accordance with the Austroads Vehicle Classification System.
Local road	A road or street used primarily for access to abutting properties.
LoS	Level of service. A qualitative measure describing operational conditions within a traffic stream and their perception by motorists and / or passengers.
Lot	A parcel of land defined by measurement as a lot in a deposited plan (DP) or as a Crown portion or allotment.
M	
Macroinvertebrates	Macroinvertebrates are fauna with no backbone that can be seen with the naked eye (ie without the aid of a microscope or magnifying glass). Aquatic macroinvertebrates are those that spend all or part of their life cycles in water.
Macrophytes	Macrophytes are aquatic plants that can be seen with the naked eye. They can grow below, within or on top of the water.
Main alignment tunnels	The two underground tunnels forming the principal carriageways of the project.
Median	1. The central reservation which separates carriageways from traffic travelling in the opposite direction. 2. The 'middle number' in a sorted list of numbers.
Micron	One millionth of a metre (abbreviation μ).
Midblock	A general location on a road between two intersections.
Mode	A type or method of transport movement – including for the road corridor: cars, buses, bikes and pedestrians.
Motorway	Fast, high volume controlled access roads. May be tolled or untolled.
Motorway control centre	A centre with facilities necessary for the monitoring, maintenance and control of tunnel services. Also known as a tunnel control centre facility.

Term	Meaning
Motorway operations complex	The combined facility near the southern interchange comprising the motorway control centre, workshops, the water treatment plant and the southern ventilation facility.
Mt	Million tonnes.
MVKT	Million vehicle kilometres travelled.
N	
N ₂ O	Nitrous oxide.
NCA	Noise Catchment Areas.
NES	Matters of national environmental significance (from the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1995</i>).
NGA	National Greenhouse Accounts
NGER Act	<i>National Greenhouse and Energy Reporting Act 2007</i> (Commonwealth).
NML	Noise Management Level
NO	Nitrogen monoxide.
NO ₂	Nitrogen dioxide.
Northern interchange	The connections of the project with the M1 Pacific Motorway (formerly known as the F3 Freeway) and Pennant Hills Road.
Northern ventilation facility	A component of the ventilation system located near the northern portal of the project for the extraction of in-tunnel air from the northbound tunnel.
Notifiable weed	A noxious weed that is classified as a Class 1, 2 or 5 under the <i>Noxious Weed Act 1993</i> .
NOW	NSW Office of Water
NO _x	Oxides of nitrogen.
Noxious weeds	A weed declared to be a noxious under section 7 of the <i>Noxious Weed Act 1993</i> .
NPWS	NSW National Parks and Wildlife Service (now OEH).
NSW	New South Wales
O	
O ₃	Ozone
OEH	NSW Office of Environment and Heritage.
Off-ramp	A section of road which allows vehicles to exit the motorway or project.
OH&S	Occupational health and safety.
On-ramp	A section of road which allows vehicles to enter the motorway or project.
Operation footprint	The area required to accommodate the permanent features of the project, including underground components, above ground components and ancillary facilities associated with motorway operations.
P	
PACHCI	Procedure for Aboriginal Cultural Heritage Consultation and Investigation (Roads and Maritime Services, 2011).
PAD	Potential archaeological deposit. Any location considered to have a moderate to high potential for subsurface archaeological material.
PAH	Polycyclic aromatic hydrocarbons.
PASS	Potential acid sulfate soils.
PCB	Polychlorinated biphenyls.
Peak oil	The predicted time when oil extraction reaches its maximum.

Term	Meaning
pH	A measure of acidity or alkalinity of a solution, numerically equal to 7 for neutral solution, increasing with increasing alkalinity and decreasing with increasing acidity. Originally stood for the words potential of hydrogen.
PIARC	Permanent International Association of Road Congress.
Piezometer	Device used to measure the pressure of groundwater, or static pressure of a liquid.
PM	Particulate matter.
PM _{2.5}	Particulate matter less than 2.5 microns in diameter.
PM ₁₀	Particulate matter less than 10 microns in diameter.
POEO Act	<i>NSW Protection of the Environment Operations Act 1997.</i>
Pollutant	Any measured concentration of solid or liquid matter that is not naturally present in the environment.
Portal	Where a tunnel emerges to the surface, being the entrance or exit of the main alignment tunnels, off-ramps or on-ramps.
Preferred project corridor	A zone on the surface equal to a distance of 50 metres from the outer edge of the underground tunnels.
Proponent	The person or organisation that proposes carrying out the project or activity.
(The) project	NorthConnex
Putrescibles	Material that is able to be broken down or decay.
Q	
Quadrats	A small plot of land in which a plant or animal population study is conducted.
Quarry	An open pit from which stone, sand, gravel or fill is taken.
R	
RBL	Rating background level. The median value of the assessment background levels value for the period over all of the days measured. There is therefore an RBL value for each period — daytime, evening and night-time.
Receiver	An environmental modelling term used to describe a map reference point where the impact is predicted. A sensitive receiver is a home, work place, school or other place where people spend some time.
Remnant native vegetation	Small patches of native vegetation that remain after land use changes to the surrounding area.
REP	Regional Environmental Plan. All regional environmental plans are now deemed State environmental planning policies.
Revegetation	To revegetate an area by direct seeding with non-native species or cover crops and / or native species using manual or mechanical means such as hydromulching, strawmulching and tractor seeding.
Riffle	Areas in a waterway of broken water with rapid current.
Riparian	Relating to the banks of a natural waterway.
RNP	NSW Road Noise Policy (DECCW, 2011).
Roads and Maritime	Roads and Maritime Services of New South Wales.
Road furniture	A general term covering all signs, street lights and protective devices for the control, guidance and safety of traffic and convenience of road users.
Road reserve	A legally defined area of land within which facilities such as roads, footpaths and associated features may be constructed for public travel.
RTA	Roads and Traffic Authority of NSW (now Roads and Maritime Services).

Term	Meaning
Runoff	That part of the rainfall on a catchment which flows as surface discharge past a specified point.
S	
Scour	The erosion of material by the action of flowing water.
Section 170 register	A register established in accordance with section 170 of the <i>Heritage Act 1977</i> to record all heritage items in the ownership or under control of the Roads and Maritime (or other state government agency).
Sediment	Material, both mineral and organic, that is being or has been moved from its site of origin by the action of wind, water or gravity and comes to rest either above or below water level.
Sediment / sedimentation basins	An area where runoff water is ponded to allow sediment to be deposited.
Sedimentation	Deposition of sediment usually by water.
Sensitive receiver	A sensitive receiver, such as a residence, work place, school or other place where people spend some time. An elevated sensitive receiver is a point above ground level.
SEPP	State Environmental Planning Policy.
Severance of land	The creation of a physical barrier between a property and an existing road access to that property, or between two sections of the same property.
Site establishment works	Preliminary works carried out prior to the commencement of construction, including installation of environmental controls, demolition of existing structures, vegetation clearing and establishment of temporary construction facilities.
Shotcrete	Concrete applied to a surface through a pressure hose.
Shoulder	The portion of the carriageway beyond the traffic lanes adjacent to and flush with the surface of the pavement.
Southern interchange	The connections of the project with the Hills M2 Motorway and Pennant Hills Road.
Southern ventilation facility	A component of the ventilation system located near the southern portal of the project for the extraction of in-tunnel air from the southbound tunnel.
Spoil	Surplus excavated material.
State heritage register	A register kept by the NSW Heritage Council which lists places, buildings, works, relics, moveable objects or precincts that the Minister for Planning considers are of State heritage significance.
Sterilisation of land	The project severs a property into fragments of a size or shape that causes the existing land use to become unviable. This would result in a change in land use.
Stockpile	Temporarily stored materials such as soil, sand, gravel and spoil / waste.
Stratum	Layers of rock in the ground.
Surface water	Water flowing or held in streams, rivers and other wetlands in the landscape.
Sustainability	Considering present and future needs and costs.
Swale	A shallow, grass-lined drainage channel.
SWMP	Soil and Water Management Plan.
T	
TAGG	Transport Authorities Greenhouse Group.
Terrestrial	Living or growing on land (ie a terrestrial plant or animal).
Threatened	As defined under the <i>Threatened Species Conservation Act 1994</i> , a species, population or ecological community that is likely to become extinct or is in immediate danger of extinction.

Term	Meaning
Tie-in works	The works to join the project to existing roads, such as the M1 Pacific Motorway.
TMP	Traffic Management Plan.
Tributary	A river or stream flowing into a larger river or lake.
TSC Act	<i>NSW Threatened Species Conservation Act 1995.</i>
TSP	Total suspended particulates.
TSS	Total suspended solids.
Turbidity	A measure of light penetration through a water column containing particles of matter in suspension.
U	
UNFCCC	The 'Kyoto Protocol to the United Nation Framework Convention on Climate Change', which was signed in 1997. Australia ratified the protocol in December 2007.
Urban design	The process and product of designing human settlements, and their supporting infrastructure, in urban and rural environments.
V	
VENM	Virgin excavated natural material.
Ventilation facility	Facilities for the mechanical removal of air from the main alignment tunnels, or mechanical introduction of air into the tunnels.
Verge	That portion of the formation not covered by the carriageway, the median or the footpath.
Viewshed	The area visible from a fixed point.
Vulnerable	As defined under the <i>Threatened Species Conservation Act 1995</i> , a species that is likely to become endangered unless the circumstances and factors threatening its survival or evolutionary development cease to operate.
W	
WARR Act	<i>Waste Avoidance and Resource Recovery Act 2001.</i>
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).
Wetland	A swamp or marsh in which the soil is frequently or permanently saturated with water, or under water.
Wildlife corridor	Linked sections of natural vegetation retained to assist in fauna movement and maintenance of local biodiversity.
X, Y, Z	
Zoning	Zoning regulates land use within an environmental planning instrument (usually by different colour codes on a map accompanying a local environmental plan). Land use tables set out the various purposes for which land may or may not be used or developed in each zone.

(Blank page)