



Transport for NSW

Western Harbour Tunnel and Warringah Freeway Upgrade

Environmental Impact Statement

January 2020





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A	Secretary's environmental assessment requirements checklist
B	Environmental Planning and Assessment Regulation checklist
C	Environmental risk analysis
D	Utilities management strategy
E	Community consultation framework
F	Technical working paper: Traffic and transport
Volume 2B and 2C	
G	Technical working paper: Noise and vibration
Volume 2D	
H	Technical working paper: Air quality
Volume 2E	
I	Technical working paper: Health impact assessment
Volume 2F	
J	Technical working paper: Non-Aboriginal heritage
K	Technical working paper: Maritime heritage
L	Technical working paper: Cultural heritage assessment report
Volume 2G	
M	Technical working paper: Contamination
N	Technical working paper: Groundwater
O	Technical working paper: Surface water quality and hydrology
Volume 2H	
P	Technical working paper: Hydrodynamic and dredge plume modelling
Q	Technical working paper: Marine water quality
R	Technical working paper: Flooding
Volume 2I	
S	Technical working paper: Biodiversity development assessment report
T	Technical working paper: Marine ecology

Appendix reference:	Document name:
Volume 2J	
U	Technical working paper: Socio-economic assessment
V	Technical working paper: Urban design, landscape character and visual impact
W	Technical working paper: Arboricultural impact assessment
X	Climate change and greenhouse gas calculations
Y	Compilation of environmental management measures

Certification

Submission of environmental impact statement

Prepared under Division 5.2 of the *Environmental Planning and Assessment Act 1979*.

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Proposed development:

Western Harbour Tunnel and Warringah Freeway Upgrade

Address of the land on which the infrastructure to which the statement relates:

Land within the Inner West, North Sydney and Willoughby local government areas as described within the environmental impact statement.

Description of the infrastructure to which the statement relates:

Construction and operation of the Western Harbour Tunnel and Warringah Freeway Upgrade, which would comprise two main components:

- A new crossing of Sydney Harbour involving twin tolled motorway tunnels connecting the M4-M5 Link at Rozelle and the existing Warringah Freeway at North Sydney (the Western Harbour Tunnel)
- Upgrade and integration works along the existing Warringah Freeway, including infrastructure required for connections to the Beaches Link and Gore Hill Freeway Connection project (the Warringah Freeway Upgrade).

Environmental impact statement:

An environmental impact statement is attached addressing all matters in accordance with Division 5.2 of the *Environmental Planning and Assessment Act 1979*.

Declaration: I certify that I have prepared the contents of this environmental impact statement in response to the Secretary's environmental assessment requirements dated 15 December 2017 and the relevant provisions of Schedule 2 of the Environmental Planning and Assessment Regulation 2000. To the best of my knowledge the information contained in the environmental impact statement is not false or misleading.

Signature:



Name: Peter Rand
Date: 15 January 2020

Glossary and abbreviations

Abbreviation	Definition
100-year flood	A 100-year flood is the flood that will occur or be exceeded on average once every 100 years. It has a 1% probability of occurring in any given year. The same principle applies to other flooding events, such as 10-year, 20-year and 50-year flood.
ABS	Australian Bureau of Statistics
ACHAR	Aboriginal Cultural Heritage Assessment Report
ACTAQ	Advisory Committee on Tunnel Air Quality
ADCP	Acoustic doppler current profiler
AEP	Annual exceedance probability
AHD	Australian height datum
AHIMS	Aboriginal Heritage Information Management System
Alluvium	Unconsolidated deposit of gravel, sand or mud formed by water flowing in identifiable channels. Commonly well sorted and stratified.
AM peak	Time period between 8am and 9am
ANSI	American National Standards Institute
ANZAC	Australian and New Zealand Army Corps
ANZECC	Australian and New Zealand Environment and Conservation Council
APPEA	Australian Petroleum Production Exploration Association
AQIA	Air Quality Impact Assessment
Aquitard	A zone within the earth that restricts groundwater flow from one aquifer to another.
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ARR	Australian rainfall and runoff
AS	Australian standard
ASRIS	Australian Soil Resource Information System
Average recurrence interval	The long-term average number of years between the occurrence of a flood larger than the selected event.
Beaches Link	The Beaches Link and Gore Hill Freeway Connection project which comprises a new tolled motorway tunnel connection across Middle Harbour from the Warringah Freeway and Gore Hill Freeway to Balgowlah and Killarney Heights and including the surface upgrade of Wakehurst Parkway from Seaforth to Frenchs Forest and upgrade and integration works to connect to the Gore Hill Freeway at Artarmon.
BDAR	Biodiversity Development Assessment Report
BFPL	Bush fire prone land

Abbreviation	Definition
Biodiversity Assessment Method (BAM)	Established under section 6.7 of the BC Act to assess impacts on threatened species and threatened ecological communities (TECs), and their habitats, and the impact on biodiversity values, where required under the BC Act.
B-Line	Northern Beaches Bus Rapid Transit
The Blue Book	Managing Urban Stormwater, Soils and Construction guidelines, Volumes 1 (Landcom, 2004) and 2 (2008).
BOM	Bureau of Meteorology
bt	Blacktown soil landscape group
BTEX	Benzene, toluene, ethylbenzene and xylene
Burra Charter	<i>Australia ICOMOS Charter for Places of Cultural Significance</i>
CASA	Civil Aviation Safety Authority
CBD	Central business district
CEO	Chief Executive Officer
CCTV	Closed circuit television
CEMP	Construction environmental management plan
CH ₄	Methane
Chart datum	The level of water from which charted depths displayed on a nautical chart are measured.
CO	Carbon monoxide
CO ₂	Carbon dioxide
Cofferdam	A temporary enclosure within a body of water that is constructed to allow dewatering of an enclosed area.
Complaint fatigue	An impact that may occur where community perceptions of project complaint management systems result in failure to report concerns about construction impacts. This impact may be compounded where multiple agencies are responsible for issues in the same area where construction of multiple projects occurs.
Construction fatigue	An impact that may be experienced by receivers that are in the vicinity of concurrent or consecutive project construction activities where the activities overlap or have little or no break between the activities of one project, or multiple adjacent projects.
Construction footprint	The total area required to facilitate the construction of the project.
Construction support sites	Parcels of land on which construction-related activities would be carried out.
CPTED	Crime prevention through environmental design
CSIRO	Commonwealth Scientific and Industrial Research Organisation

Abbreviation	Definition
Cumulative impact	An impact that may occur when impacts from one project interact or overlap with impacts from other projects and potentially result in a larger overall effect on the environment, businesses or local communities. Cumulative impacts may also occur when projects are constructed consecutively with construction activities occurring over extended periods of time with little to no break in between.
Cut and cover tunnel	Tunnels that are typically constructed at locations where the tunnel alignment does not have enough rock cover to support the construction of traditional driven tunnels.
CYCA	Cruising Yacht Club of Australia
dB	Decibel
dB(A)	A-weighted decibels
DCP	Development control plan
DEC	Department of Environment and Conservation
DECC	Department of Environment and Climate Change
DECCW	Department of Environment Climate Change and Water
Dioxins	Polychlorinated dibenzo-para-dioxins
DIPNR	Department of Infrastructure Planning and Natural Resources
DLWC	Department of Lands and Water Conservation
DPE	Department of Planning and Environment (now known as Department of Planning, Industry and Environment)
DPIE	Department of Planning, Industry and Environment
Drained structures	Underground structures designed to allow the inflow of groundwater, which is then captured, treated and discharged.
Drawdown	The localised lowering of groundwater levels as a result of water extraction.
Dredging	Excavation carried out underwater or partially underwater.
Driven tunnel	Tunnels excavated using roadheaders.
EIA	Environmental impact assessment
EIS	Environmental impact statement
EMS	Environmental management system
EPA	NSW Environment Protection Authority
EPBC	<i>Environmental Protection and Biodiversity Conservation Act 1999 (Cth)</i>
EPL	Environmental protection licence
ESD	Environmentally sustainable development
ESP	Electrostatic precipitator

Abbreviation	Definition
FDM	Floodplain Development Manual
Floodway	Floodplains that transmit large quantities of water.
Flood fringe	Floodplains that do not play a significant role in either storing or conveying water.
Flood storage	Floodplains that store a significant volume of water.
Gore Hill Freeway Connection	Connection and integration works along the existing Gore Hill Freeway and surrounding roads at Artarmon.
GRAL	Graz Langrangian model
GRAMM	Graz Mesoscale model
Groundwater	All waters occurring below the land surface. The upper surface of the soils saturated by groundwater in any particular area is called the water table.
GSC	Greater Sydney Commission
GSP	Gross state product
gy	Gynea landscape group
ha	Hawkesbury landscape group
HAT	Highest astronomical tide
HMAS	Her Majesty's Australian Ship
IAQM	UK Institute of Air Quality Management
IBC	Intermediate bulk containers
ICOMOS	International Councils on Monuments and Sites
Immersed tube tunnel	A series of steel tunnel segments placed on top, or within the top layers, of harbour rock and sediment.
IPCC	International Panel on Climate Change
ISCA	Infrastructure Sustainability Council of Australia
ISO	International standard
kg	Kilogram
km	Kilometre
km/h	Kilometres per hour
kN	Kilonewtons
ktCO ₂ -e	Kilotonnes of carbon dioxide equivalent
kV	Kilovolt
la	Lambert landscape group

Abbreviation	Definition
L _{A90}	Noise level exceeded for 90% of the measurement period.
L _{Aeq}	Sound level in decibels equivalent to the total A-weighted sound energy measured over a stated period of time.
L _{Amax}	Maximum A - weighted sound pressure level.
LALC	Local Aboriginal Land Council
LCZ	Landscape character zone
LED	Light-emitting diode
LEP	Local environmental plan
LGA	Local government area
LoS	Level of service
L/s/km	Litres per second per kilometre
LTAEL	Long term average annual extraction limit
m	Metre
m/s	Metres per second
mm	Millimetres
mm/s	Millimetres per second
m ²	Square metres
m ³	Cubic metres
m ³ /s	Cubic metres per second
Mainline tunnel	Tunnels connecting the approved M4-M5 Link at Rozelle to the Warringah Freeway and to the Beaches Link tunnels at Cammeray.
mf	Manmade fill
mg	Milligrams
mg/L	Milligrams per litre
mg/m ³	Milligrams per cubic metre
ML/year	Megalitres per year
MUSIC	Model for Urban Stormwater Improvement Conceptualisation
MVA	Megavolt ampere
NADG	National Assessment Guidelines for Dredging
NBN	National Broadband Network
NCA	Noise catchment area

Abbreviation	Definition
NEPC	National Environment Protection Council
NHMRC	National Health and Medical Research Council
NML	Noise management level
NO	Nitrogen oxides
NO ₂	Nitrous dioxide
NO _x	Nitrogen oxides
NOHSC	National Occupation Health and Safety Commission
NPW	National Parks and Wildlife
NSW	New South Wales
NTU	Nephelometric turbidity unit
NZS	New Zealand standard
OCP	Organochlorine pesticides
OCSE	Office of the Chief Scientist and Engineer
OEH	Office of Environment and Heritage (now known as the Department of Premier and Cabinet (Heritage))
OEMP	Operational environmental management plan
OLS	Obstruction limitation surface
OPP	Organophosphorus pesticides
OU	Odour unit
PACHCI	Procedure for Aboriginal cultural heritage consultation and investigation
PAH	Polycyclic aromatic hydrocarbons
Palaeochannels	Old river or stream channels which have been filled or buried by younger sediment.
Palaeovalley	A drowned river valley.
PANSW	Port Authority of NSW
PANS-OPS	Procedures for air navigation systems operations
PCB	Polychlorinated biphenyls
PCU	Passenger car unit
PFAS	Poly-fluoroalkyl substances
pH	A measure of the degree of acidity or alkalinity expressed on a logarithmic scale of 1-14, on which 1 is most acid, 7 is neutral and 14 is most basic (alkaline).

Abbreviation	Definition
PIARC	Permanent International Association of Road Congress
Pile	Heavy stake or post installed to support the foundations of a structure.
PM peak	Time period between 5 pm and 6 pm.
PM _{2.5}	Particulate matter less than or equal to 2.5 micrometre diameter.
PM ₁₀	Particulate matter less than or equal to 10 micrometre diameter.
PMF	Probable maximum flood
PMP	Probable maximum precipitation
POEO Act	<i>Protection of the Environment Operations Act 1977 (NSW)</i>
Probable maximum flood event	The largest flood that could conceivably occur (a worst-case flood event).
ppm	Parts per million
PVC	Polyvinyl Chloride
RAP	Reconciliation Action Plan
RBL	Rated background level
REF	Review of Environmental Factors
Residual lands	Lots that would be wholly or partially occupied during construction of the project, but would not be required for permanent operational infrastructure or other operational activities (also referred to as surplus lands).
RFS	Rural Fire Service
Rh	Hawkesbury sandstone
RMS	NSW Roads and Maritime Services (now part of Transport for NSW)
Roadheader	An excavation machine that has a rotating, rock-cutting head on the front, mounted to a boom.
Roads and Maritime	NSW Roads and Maritime Services (now part of Transport for NSW)
RSL	Returned & Services League of Australia
RTA	Roads and Transport Authority
Rwa	Ashfield shale
SEAR	Secretary's environmental assessment requirement
SEPP	State environmental planning policy
SMPM	Sydney motorways projects model

Abbreviation	Definition
SO ₂	Sulphur dioxide
SPL	Sound pressure level
SRA	State Rail Authority
SREP	Sydney regional environmental plan
SSC	Suspended sediment concentrations
SSI	State Significant Infrastructure
Standard construction hours	7 am to 6 pm Monday to Friday, 8 am to 1 pm Saturday and no construction works on Sundays or public holidays.
STM	Strategic travel model
Substratum acquisition	The acquisition of land below the surface of the ground.
TAFE	Technical and Further Education
TAGG	Transport Authorities Greenhouse Group
TBT	Tributyltin
TECs	Threatened ecological communities
TEQ	Toxic equivalence quotient
TfNSW	Transport for NSW
The project	Western Harbour Tunnel and Warringah Freeway Upgrade project.
TRH	Total recoverable hydrocarbons
Trough structure	Similar to cut and cover structure, except a cover is not required.
TSC Act	<i>Threatened Species Conservation Act 2016 (NSW)</i>
TSP	Total suspended particles
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNFCCC	United Nations Framework Convention on Climate Change
UNSW	University of New South Wales
µg/m ³	Microgram per cubic metre
USEPA	United States Environmental Protection Agency
VENM	Virgin Excavated Natural Material
VIS	Vegetation Information System

Abbreviation	Definition
VOCs	Volatile organic compounds
VKT	Vehicle kilometres travelled
WAL	Water access licence
Warringah Freeway Upgrade	Upgrade and integration works along the existing Warringah Freeway, including infrastructure required for connections to the Beaches Link and Gore Hill Freeway Connection project.
WBCSD	World Council for Sustainable Business Development
Western Harbour Tunnel	A new crossing of Sydney Harbour involving twin motorway tunnels connecting the M4-M5 Link at Rozelle and the existing Warringah Freeway at North Sydney.
WFU	Warringah Freeway Upgrade
WHO	World Health Organisation
WHT	Western Harbour Tunnel
WQO	NSW water quality objectives
WRI	World Resources Institute
WSP	Water Sharing Plan
WWTP	Wastewater Treatment Plant
xx	Disturbed landscape group

