



**Transport**  
Roads & Maritime  
Services



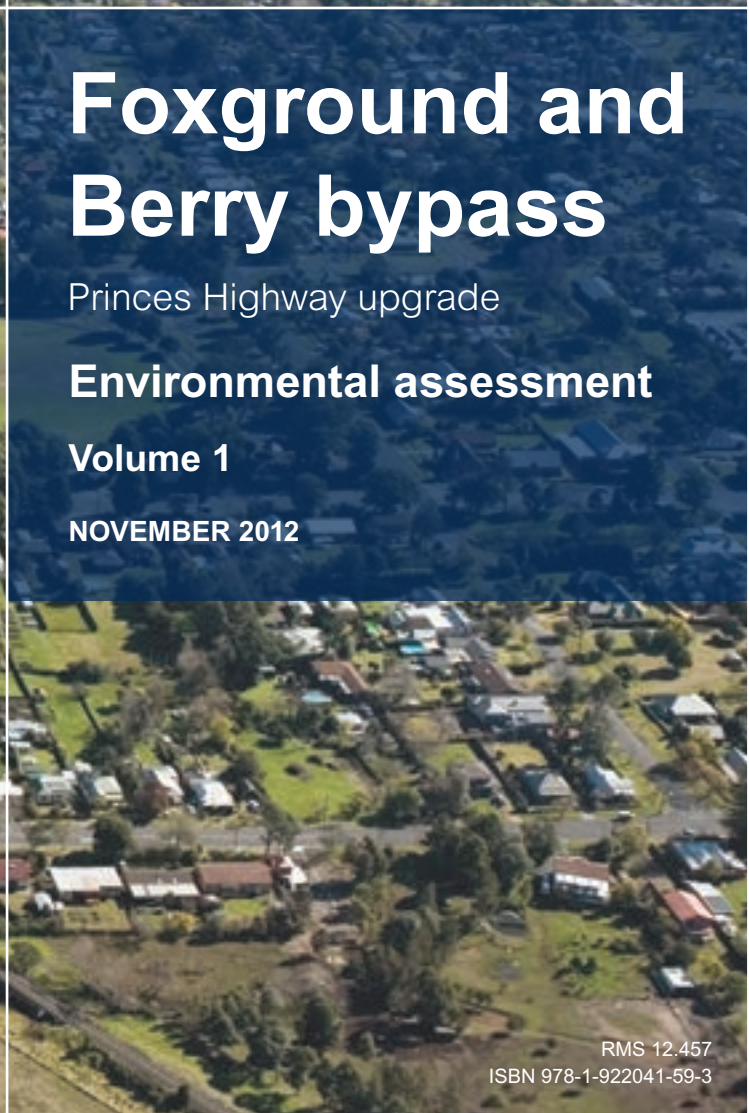

# Foxground and Berry bypass

Princes Highway upgrade

**Environmental assessment**

**Volume 1**

**NOVEMBER 2012**



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# Roads and Maritime Services

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## Princes Highway upgrade - Foxground and Berry bypass Environmental assessment

November 2012

### **Prepared for**

Roads and Maritime Services

### **Prepared by**

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# Certification

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Submission of environmental assessment

Prepared under Part 3A of the *Environmental Planning and Assessment Act 1979*

## Environmental assessment prepared by:

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**Applicant name:** Roads and Maritime Services

**Applicant address:** 101 Miller Street  
North Sydney NSW 2059

**Proposed development:** Princes Highway upgrade – Foxground and Berry bypass  
environmental assessment

**Land to be developed:** Roads and Maritime Services (RMS) propose to upgrade 11.6 kilometres of the Princes Highway between Toolijooa Road north of Foxground and Schofields Lane south of Berry, in New South Wales (NSW) (the project), to achieve a four lane divided road (two lanes in each direction) with median separation. The project includes bypasses of Foxground and Berry. The project would be located in the Kiama and Shoalhaven local government areas.

**Environmental assessment:** An environmental assessment is attached addressing all matters in accordance with Part 3A of the *Environmental Planning and Assessment Act 1979*.

**Declaration:** I certify that I have prepared the contents of this environmental assessment in response to the Director-General's Requirements dated 11 February 2011 and that to the best of my knowledge the information contained in the environmental assessment is not false or misleading.

Signature:



Signature:



Name: Jon Williamson  
Date: November 2012

Name: Miriam Streulens  
Date: November 2012

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# Glossary of terms and abbreviations

Term	Meaning
µg/m	Micrograms per cubic metre.
<b>A</b>	
A, B, C soil horizons	Subsurface soil layers.
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> .
Aboriginal scarred tree	Aboriginal scarred trees show evidence of bark or timber removal by Aboriginal people for traditional purposes. Scarred trees provide significant evidence of Aboriginal occupation in what is now a highly modified landscape.
Aboriginal stakeholders	Members of a local Aboriginal land council, Aboriginal groups or other Aboriginal people who have registered their interest with the RMS to be consulted about a proposed RMS project or activity.
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.
Activity	This is broadly defined in the <i>Environmental Planning &amp; Assessment Act 1979</i> and includes most physical undertakings of the RMS in construction and maintenance of roads and road infrastructure facilities. Activities are subject to assessment under Part 5 and Part 5.1 of the Act (or under Part 3A if declared by the Minister for Planning).
Acute noise levels	Road traffic noise levels received at private dwellings that are predicted to be greater than 65dB(A) <sub>Leq(15hr)</sub> (day) and 60dB(A) <sub>Leq(9hr)</sub> (night), as presented in Practice Note IV, Step 3, Part (2) of the <i>RMS' Environmental Noise Management Manual</i> .
Adaptive management	A systematic, rigorous approach (such as monitoring) for deliberately learning from management actions with the intent to improve subsequent management policy or practice.
Afflux	An increase in water level resulting from a constriction in the flow path.
AFG	Aboriginal focus group. AFG meetings are held to consult with Aboriginal stakeholders who have registered their interest to be consulted regarding an RMS project.

Term	Meaning
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.
AHIMS	Aboriginal heritage information management system. A register of NSW Aboriginal heritage information maintained by OEH.
Alignment	The geometric layout (eg of a road) in plan (horizontal) and elevation (vertical).
Alluvial	Relating to, consisting of, or formed by sediment deposited by flowing water.
Alluvial groundwater systems	Groundwater that is present in permeable (unconsolidated) material, usually small rocks and gravel.
Alluvium	Unconsolidated deposit of gravel, sand or mud formed by water.
AM peak period	6-10am weekdays.
Ancillary	A subordinate part or element.
ANZECC	Australian and New Zealand Environment and Conservation Council.
AQMP	Air Quality Management Plan.
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).
Aquatic 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.
Aquifer	Geologic formation, group of formations, or part of a formation capable of transmitting and yielding quantities of water.
Arboreal	To live in, or be connected with, trees.
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.
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)).
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand.
Arterial roads	The main or trunk roads of the State road network.
AS	Australian Standard.
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.

Term	Meaning
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 or asphaltic concrete	A dense, continuously graded mixture of coarse and fine aggregates, mineral filler and bitumen usually produced hot in a mixing plant.
ASS	Acid sulphate soils.
Assemblage	A group of interacting populations in a given area.
ASSMP	Acid Sulfate Soil Management Plan.
At-grade	A road at ground level, not on an embankment or in a cutting. Opposite to grade separated.
AusRivAS	Australian River Assessment System. An assessment methodology for assessing river health using macroinvertebrates.
AWBM	Australian Water Balance Model.
<b>B</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% of the measurement period. Normally equated to the average minimum A-weighted sound pressure level.
Balanced earthworks	Earthworks in which the quantity of material taken from road cuttings along the road mathematically equals the fill required to construct the embankments in that length of road.
Base case	Also known as “do nothing” case. Used in evaluating projects to compare the cost and benefit of the existing road (the base case) with another or a number of other projects or options.
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.
Bench	A ledge constructed in a batter or natural slope to provide sight distance around a curve, greater security against slip or to assist batter drainage.
Benchmark	A survey mark, established as a point of reference for future measurement.
Biodiversity corridor	Linked sections of natural vegetation retained to assist in fauna movement and maintenance of local biodiversity.
Biofilm	A group of microorganisms growing on a solid substrate.
Biofiltration system	Pollution control system using living material to capture and biologically degrade process pollutants.

Term	Meaning
Bioretention system	System in which the bioretention process occurs, which removes contaminants and sediments from stormwater runoff.
Biota	All organisms including flora and fauna, in a given area considered as a unit.
Blasting	The use of explosive for excavating rock, demolition and other purposes.
Blue Book	<i>Managing Urban Stormwater: Soils and Construction</i> (Landcom, 2004)
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.
BTUCA	Berry Township Urban Conservation Area.
Bund	A small embankment designed to retain water.
<b>C</b>	
Cadastral	Showing the extent and ownership of land (generally on a map).
CALRoads Package	An air quality monitoring model.
Capacity	The nominal maximum number of vehicles that can travel along a road in a given time.
Carbon dioxide equivalent (CO <sub>2</sub> -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 <sub>2</sub> 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 <sub>2</sub> -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 place/situ	Concrete which is cast directly into its final position.
Catch drain	An open channel constructed along the high side of a road cutting or embankment outside the batter to intercept and redirect surface water.
Catchment	The area from which a surface watercourse or a groundwater system derives its water.
CCDs	Census Collection Districts.
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.
Centreline	The basic line which defines the axis or alignment of the centre of a road.
CH <sub>4</sub>	Methane.

Term	Meaning
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.
CIP	Community Involvement Plan.
Clear zone	The area that begins at the outer edge of the lane, next to the shoulder and extends for a set distance, which is provided or designed for emergency use by errant vehicles.
Clearing	The removal of vegetation or other obstacles at or above ground level.
Climbing lane	An auxiliary lane, usually on a long upgrade, primarily for the use of slow moving vehicles. Differs from overtaking lanes as linemarking does not initially direct all traffic to the left hand side of the road.
CMA	Catchment Management Authority
CNVMP	Construction Noise and Vibration Management Plan
CO	Carbon monoxide.
CO <sub>2</sub>	Carbon dioxide.
CO <sub>2-e</sub>	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, crib sheds, 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.
Concept design	Initial functional layout of a road/road system or other infrastructure. Used to facilitate understanding of a project, establish feasibility, and provide a basis for estimating and to determine further investigations needed for detailed design.
Confluence	A point at which streams combine.
Constructability	The ease with which structures can be built.
CPTED	Crime prevention through environmental design.
CRG	Community Review Group.
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.
Cul-de-sac	A street or road that is open for vehicular traffic at one end only.

Term	Meaning
Cultural heritage assessment report	A report combining an Aboriginal archaeological assessment and Aboriginal cultural assessment, required to be submitted to OEH for any Part 6 <i>National Parks and Wildlife Act 1974</i> approval or prepared for projects under Part 3A of the <i>Environmental Planning and Assessment Act 1979</i> where Aboriginal cultural heritage is identified as a key issue.
Culvert	A stream or drain.
Cumulative impacts	Impacts that, when considered together, have different and/or more substantial impacts than a single impact considered alone.
Curing	The process of keeping fresh concrete or mortar damp so that the cement is provided with enough water to harden.
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.
<b>D</b>	
dBA	Decibels using the A-weighted scale measured according to the frequency of the human ear.
DCC&EE	Australian government Department of Climate Change and Energy Efficiency.
DEC	NSW Department of Environment and Conservation (now OEH).
DECC	NSW Department of Environment and Climate Change (formerly DEC and now OEH).
DECCW	NSW Department of Environment, Climate Change and Water (formerly DEC, DECC and now OEH).
Decibel	A scale unit used in the comparison of powers and levels of sound energy. Used for measuring noise.
Deck	The floor of a bridge directly carrying traffic loads.
Design speed	A nominal speed which determines the geometric design features of a road.
Design vehicle	A hypothetical road vehicle, the mass, dimensions and operating characteristics of which are used to give geometric requirements.
Design year	The predicted year in which the design traffic would be reached.
Detour	An alternative route, using existing roads, made available to traffic during temporary closure of a road.
Development consent	Consent granted under Part 4 of the <i>Environmental Planning and Assessment Act 1979</i> . Usually relates to the approval of a development application by a local council.
Deviation	An alteration to the alignment of a portion of a road.
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 SEWPaC).



Term	Meaning
DGRs	Director-General's requirements. Requirements and specifications for an environmental assessment prepared by the Director-General of the Department of Planning under section 75F of the <i>Environmental Planning &amp; Assessment Act 1979</i> .
DIPNR	NSW Department of Infrastructure Planning and Natural Resources (Now DP&I).
Discharge	The volumetric rate of water flow.
Diversion drain	A drain leading water away from a given area.
Divided road	A road with a separate carriageway for each direction of travel created by placing a physical separation (eg median) between the opposing traffic directions.
DLWC	NSW Department of Land and Water Conservation (now part of DPI)
DoP	NSW Department of Planning (now DP&I).
DP&I	NSW Department of Planning and Infrastructure (formerly DUAP, 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 now part of NSW Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS).
Drainage	Natural or artificial means for the interception and removal of surface or subsurface water.
Driven pile	A steel, concrete or timber pile which is forced into the ground by a pile driver.
Driveway	A defined area for vehicles to travel between a carriageway and a property adjacent or near to the road.
DSEWP&C	Australian Government Department of Sustainability, Environment, Water, Population and Communities (formerly DEWHA).
DTIRIS	NSW Department of Trade and Investment, Regional Infrastructure and Services.
DUAP	NSW Department of Urban Affairs and Planning (now DP&I)
<b>E</b>	
EA	Environmental assessment. A focussed analysis undertaken for the purposes of Part 3A of the Environmental Planning and Assessment Act 1979, written generally to comply with the environmental assessment requirements (DGRs) issued by the Director-General of the Department of Planning.
Earthworks	All operations involved in loosening, excavating, placing, shaping and compacting soil or rock.
ECF	Energy Content Factor
Ecology	The relationship between living things and the environment.

Term	Meaning
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.
ECRTN	NSW Environmental Criteria for Road Traffic Noise.
Eddying	A movement in a flowing stream of water in which the current doubles back to form a small whirl.
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).
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)
Electrofishing	Electrofishing uses an electric current to stun and catch fish. It is a common method of fish sampling in ecological studies.
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. It is a synthesis of 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.
ENCM	NSW <i>Environmental Criteria for Road Traffic Noise</i> (ECRTN) (Environment Protection Authority, 1999), which has been superseded by the ICNG but is used for guidance in assessing the potential for sleep disturbance.
ENM	Excavated Natural Material
ENMM	RMS Environmental Noise Management Manual.
Environment	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> (NSW).
EP&A Regulation	<i>Environmental Planning and Assessment Regulation 2000</i> (NSW).
EPA	NSW Environment Protection Authority (formerly part of DECCW, now part of OEH).

Term	Meaning
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth).
Ephemeral	Existing for a short duration of time.
EPI	Environmental planning instrument. Legal documents that regulate land use and development – includes state environmental planning policies and local environmental plans.
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"> <li>- The precautionary principle.</li> <li>- Inter-generational equity.</li> <li>- Conservation of biological diversity and ecological integrity.</li> <li>- Improved valuation, pricing and incentive mechanisms (includes polluter pays, full life cycle costs, cost effective pursuit of environmental goals).</li> </ul>
Estuary	The mouth or lower course of a river in which the current meets the sea's tide.
Evapo-transpiration	The sum of evaporation and plant transpiration from the land to the atmosphere.
Off-ramp	A short section of road which allows vehicles to enter or exit a highway.
<b>F</b>	
Facies	The character of a rock expressed by its formation, composition, and fossil content.
Fauna furniture	Items such as rocks, piping, raised log railings and refuge poles, that are within fauna crossing structures and assist fauna utilising these structures.
FBB	Foxground and Berry bypass project.
Fence stiles	A structure that provides passage through or over a fence.
Fill	The material placed in an embankment.
Flood mitigation	Measures taken to control or minimise the effects of flooding.
Floristics	A branch of botany dealing with the types, numbers, distribution, and relationships of plant species in a particular area or areas
Fly ash	Particles produced as a by-product in coal fired power stations.
FM Act	<i>NSW Fisheries Management Act 1994</i> .
Footpath	The paved area in a footway.
Footprint	The extent of impact that a development makes on the land.
Formation	The final shape of the road after completion of earthworks but before placing any pavement layers.

Term	Meaning
Fragmentation	The breaking up of continuous sections of ecosystems or landscape features.
Freeboard	The vertical distance from the top water level of a flood or creek to a specific location such as a road surface level or a ground level of a house.
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.
Fretting	Wearing of exposed soils.
FullCAM	Full Carbon Accounting Model Ecosystem modeling as part of an NCAS estimate.
<b>G</b>	
GDE	Groundwater Dependent Ecosystems.
Geofabrics	Permeable material that separates water from particulates.
Geomorphic	Of, or pertaining to, the earth or the forms of its surface.
Geotextile	A synthetic, permeable cloth designed to be buried under the ground often used for soil strengthening or drainage purposes.
Geoweb	Geofabric within which infill material is placed and compacted.
GHG	Greenhouse gas
Global warming potential (GWP)	GWP is a measure of how much a given mass of a greenhouse gas is estimated to contribute to global warming. It is a relative scale that compares a gas with the same mass of carbon dioxide and is calculated over a specific time interval.
GPS	Global Positioning System.
Grade	1. The rate of longitudinal rise (or fall) with respect to the horizontal expressed as a percentage or ratio. 2. To trim or smooth an earth, gravel or other surface using a grader or similar implement.
Grade separation	The separation of road, rail or other traffic so that crossing movements at intersections are at different levels. Opposite to at-grade.
Greenfield	Previously undeveloped land.
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 <sub>2</sub> ), Methane (CH <sub>4</sub> ), Nitrous oxide (N <sub>2</sub> O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs) and Sulphur hexafluoride (SF <sub>6</sub> ). The emissions of greenhouse gases are reported in carbon dioxide equivalents (see above).
Ground cover	A low growing woody or herbaceous plant.
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.

Term	Meaning
<b>H</b>	
ha	Hectare/s.
Ha ha effect	A term in urban design that refers to a barrier, one side of which is concealed from view, designed to allow an unobstructed view from one side while maintaining a physical barrier in one direction.
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).
Headwall	Small retaining wall placed at the outlet of a stormwater pipe or culvert.
Heavy vehicle	A heavy vehicle is classified as a Class 3 vehicle (a two axle truck) or larger, in accordance with the Austroads Vehicle Classification System.
HEC-RAS	Hydraulic Engineering Centre River Analysis System, developed by the US Army Corps of Engineers. Models the hydraulics of water flow through natural channels.
HFCs	Hydrofluorocarbons.
HIP	Heritage Interpretation Plan.
Hydrocarbon	Any organic compound — gaseous, liquid or solid — consisting only of carbon and hydrogen.
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.
Hydroseeding	Broadcasting of seed under pressure by spraying a slurry of water, seed and fertiliser in addition to mulch, binder and a green dye.
Hyporheic	The zone where surface water intersects and interacts with groundwater.
<b>I</b>	
I & I	Industry and Investment NSW.
ICNG	Interim Construction Noise Guideline.
Impact	Influence or effect exerted by a project or other activity on the natural, built and community environment.
Indigenous species	Plant species native to the area in which the project is located.
Inert construction waste	Byproducts from construction that are chemically and biologically inactive.
INP	NSW Industrial Noise Policy.
Intensity of rainfall	The rainfall in a unit of time (usually expressed as mm/h).
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.

Term	Meaning
Intersection turning counts	The number of vehicles counted turning at an intersection.
Intrusive noise	An environmental noise source that may cause annoyance.
IPCC	Intergovernmental Panel on Climate Change.
ISEPP	<i>State Environmental Planning Policy (Infrastructure) 2007.</i>
<b>J</b>	
Junction	A place where two or more roads meet.
Jute mesh	A mesh that is designed to hold soil and seeds in place until vegetation can take hold and which naturally degrades into the soil.
<b>K</b>	
Kerb	An edge stone or concrete shape used for bordering a road and defining the footway.
<b>L</b>	
LA <sub>10</sub>	The noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below LA <sub>10</sub> level for 90% of the time. The LA <sub>10</sub> is a common noise descriptor for environmental noise and road traffic noise.
LA <sub>90</sub>	The noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below LA <sub>90</sub> level for 10% of the time. This measure is commonly referred to as background noise level.
LA <sub>eq</sub>	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.
LA <sub>max</sub>	The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.
Landscape	1. A tract of land. 2. A prospect or piece of scenery or land which may include villages, towns, cities and infrastructure.
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.
Lane	A portion of the carriageway allotted for the use of a single line of vehicles.
LCV	Light commercial vehicle
Left-in and left-out	Restricted turning movements for vehicles entering and leaving the highway. Only left hand turns would be permitted due to the central median barrier to prevent conflicting traffic movements.
LEP	Local environmental plan.
LGA	Local government area.
Light vehicle	A vehicle less than five tonnes gross.
Lithology	General physical characteristics of a rock.



Term	Meaning
Local provenance species	Species found growing in the locality of a project.
Local road	A road or street used primarily for access to abutting properties.
Longitudinal	Running lengthways rather than across.
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.
<b>M</b>	
Macrophytes	Macrophytes are aquatic plants that can be seen with the naked eye. They can grow below, within or on top of the water.
Median	The central reservation which separates carriageways from traffic travelling in the opposite direction.
Methodology	The method for analysis and evaluation of the relevant subject matter.
micron	One millionth of a metre (abbreviation $\mu$ ).
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.
MP	Member of Parliament.
Mt	Million tonnes.
MUSIC	Model for Urban Stormwater Improvement Conceptualisation
MVKT	Million vehicle kilometres travelled.
<b>N</b>	
N <sub>2</sub> O	Nitrous oxide.
NCA	Noise Catchment Areas.
NCAS	National Carbon Accounting System.
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).
NOHC	Navin Officer Heritage Consultants.
NML	Noise Management Levels.
NO	Nitrogen monoxide.
NO <sub>2</sub>	Nitrogen dioxide.
Notifiable weed	A noxious weed that is classified as a Class 1, 2 or 5 under the Noxious Weed Act 1993.
NOW	NSW Office of Water

Term	Meaning
NO <sub>x</sub>	Oxides of nitrogen.
Noxious weeds	A weed declared to be a noxious under section 7 of the Noxious Weed Act 1993.
NPWS	NSW National Parks and Wildlife Service (now OEH).
NSW	New South Wales.
<b>O</b>	
O <sub>3</sub>	Ozone
OEH	NSW Office of Environment and Heritage.
Offline construction	Sections of project that are to be constructed away from the existing highway.
OH&S	Occupational health and safety.
On-ramp	A ramp by which one enters a limited-access highway.
Online construction	Sections of the project where the existing highway would be upgraded.
Origin-destination surveys	A count of the number of vehicles travelling from one point to another.
Overtaking lane	An auxiliary lane provided to allow for slower vehicles to be overtaken. Line marked so that all traffic is initially directed into the left hand lane with the inner lane being used to overtake.
<b>P</b>	
PACHCI	Procedure for Aboriginal Cultural Heritage Consultation and Investigation.
PAD	Potential archaeological deposit. Any location considered to have a moderate to high potential for subsurface archaeological material.
PAH	Polyaromatic hydrocarbons.
PAMP	Pedestrian Access Mobility Plan.
Paramics	Traffic simulation modelling software.
Parish and Portion	NSW was originally divided into 141 administrative districts called Counties, which were further divided into 7515 districts known as Parishes. The parcels of land within Parishes are known as Portions.
Part 3A approvals (EP&A Act)	Major project approvals. Relates to the approval of a major project / critical infrastructure project under Part 3A of the <i>Environmental Planning and Assessment Act 1979</i> .
PASA	Potential Archaeologically Sensitive Areas.
PASS	Potential acid sulfate soils.
Pavement	The portion of a carriageway placed above the subgrade for the support of, and to form a running surface for vehicular traffic.
PCB	Polychlorinated biphenyls.
Peak Oil	The predicted time when oil extraction reaches its maximum.
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.

Term	Meaning
PHA	Preliminary hazard analysis.
PIARC	Permanent International Association of Road Congresses.
Piezocene (electric cone)	Device used to test to determine subsurface stratigraphy for geotechnical and environmental site characterisation purposes.
Piezometer	Device used to measure the pressure of groundwater, or static pressure of a liquid.
PM	Particulate matter.
PM <sub>10</sub>	Particulate matter less than 10 microns in diameter.
PMF	Probable maximum flood. Largest flood that could theoretically occur at a particular location and defines the extent of flood prone land (the floodplain).
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.
Pool	Areas in a waterway with little or no flow.
Productive agricultural land	Land with the best combination for soil, climate and topography for agricultural production as mapped by NSW Industry and Investment. Often shown in the maps accompanying regional planning strategies and local environmental plans.
PRM	Probabilistic Rational Method.
Proponent	The person or organisation that proposes carrying out the project or activity.
Public domain	The community's public space.
Putrescibles	Material that is able to be broken down or decay.
<b>Q</b>	
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.
<b>R</b>	
RAN	Royal Australian Navy.
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.
RCE	Riparian, Channel and Environmental.
RCMS	Riparian Corridor Management Study.
Receptor/receiver	An environmental modelling term used to describe a map reference point where the impact is predicted. A sensitive receptor is a home, work place, school or other place where people spend some time. An elevated receptor is a point above ground level.
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.

Term	Meaning
Representative impact scenario	The <i>representative impact scenario</i> would see the project as described being undertaken but without the implementation proposed measures such as: Mitigation; on site management; minimisation of impacts; offsetting measures and monitoring procedures.
Revegetation	To revegetate an area by direct seeding with 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.
RMS	Roads and Maritime Services of New South Wales.
RNP	NSW Road Noise Policy.
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.
Roadside	The area from the edge of the carriageway to the boundary of the road reserve.
Roundabout	An intersection where all traffic travels in one direction around a central island.
RTA	Roads and Traffic Authority of NSW (now RMS)
Run off	That part of the rainfall on a catchment which flows as surface discharge past a specified point.
<b>S</b>	
Saddle	A low point of a ridge connecting two peaks.
Safe intersection sight distances	The minimum sight distance which should be available from vehicles on the legs of an intersection.
'Sandtrack'	An alternative route to the winding, hilly section of Princes Highway between Gerringong and Bomaderry (via Fern Street, Crooked River Road, Gerroa Road and Bolong Road).
SAQP	Sampling Analysis and Quality Plan.
SCC	Shoalhaven City Council.
Scour	The erosion of material by the action of flowing water.
SCRS	South Coast Regional Strategy.
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 RMS (or other state government agency).
Section 90 permit	An Aboriginal impact heritage permit issued by OEH under s.90 of the <i>National Parks and Wildlife Act 1974</i> .
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/Sediment ation basin	An area where runoff water is ponded to allow sediment to be deposited.

Term	Meaning
Sediment trap	A structure or barrier designed to trap sediment in run-off before it enters the stormwater system, channels or streams.
Sedimentation	Deposition of sediment usually by water.
Select material zone (SMZ)	A road is broken up into a number of specified layers. The top layers are classified as 'base' and 'sub base' layers. The next level down is classified as a 'select zone' and the next layer below (SMZ), which is a selection of material from the site that has higher strength qualities. The 'upper zone of formation' (UZF), includes the 'select material'.
Selected fill	Fill complying with specified requirements.
SEPP	State environmental planning policy.
SES	State Emergency Services.
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.
Shared path	A pathway used for both cyclists and pedestrians, usually located on the side of the road.
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.
SICPH CL	Southern Illawarra Coastal Plain and Hinterland Cultural Landscape.
Sight distance	The distance measured along the carriageway over which objects of defined height are visible to a driver whose eyes are at a specified height above the pavement surface level.
SIGNAL 2	Stream Invertebrate Grade Number – Average Level. A scoring system for macroinvertebrate samples from Australian rivers.
SIS	Species impact statement.
Site compound	Area enclosing construction machinery, stockpiles, site offices and other ancillary facilities.
Slag	Waste matter separated from metals during the smelting or refining of ore.
SO <sub>2</sub>	Sulphur dioxide.
SoC	Statement of commitments.
Socio-economic	Involving combination of social and economic matters.
SOHI	Statement of Heritage Impact.
Spall	Splintering or flaking of rock (often from weathering).
Span	The distance between the centres of adjacent supports of a bridge.
Spoil	Surplus excavated material.
Spot bolting	A method of stabilising walls of excavations.
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.

Term	Meaning
Stock underpass	A structure to permit the passage of stock beneath a road.
Stockpile	Temporarily stored materials such as soil, sand, gravel and spoil/waste.
STP	Sewage treatment plant.
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.
<b>T</b>	
TAGG	Transport Authorities Greenhouse Group.
Taxa	Groups or categories, at any level, in a system for classifying plants or animals.
Terrestrial	Living or growing on land (ie a terrestrial plant or animal).
Terrestrial ecology	Flora and fauna whose habitat on land as opposed to in water, or on the ground as opposed to on another plant.
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.
Tie-in point	A location where the highway connects with the local road network or a location where the upgraded highway connects with immediately adjacent sections of highway.
TIG	Technical Investigation Group.
Tip Sheet	Illustrated information documents designed to provide contractors with practical guidance of statutory and RMS best practice requirements relating to specific workplace OHS hazards.
TMP	Traffic Management Plan.
TN	Total Nitrogen.
TP	Total Phosphorus.
TPH	Total petroleum hydrocarbon.
TRACKS	Strategic traffic modelling for current to future year growth rates.
TRACL	Toolijooa Ridge Aboriginal cultural landscape.
Transport interchange	A station or other transport node that offers transferability between modes – such as between rail, road, air, and sea.
TRCL	Toolijooa Ridge Cultural Landscape.
Tributary	A river or stream flowing into a larger river or lake.
TSC Act	NSW <i>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.



Term	Meaning
Type 'S' Interchange	An S-shaped interchange that has been designed to provide left-in and left-out access in both directions. The interchange is designed to utilise adjoining existing road infrastructure either side of the upgrade, connected by an overbridge.
Typical cross section	A cross section of a carriageway showing typical dimensional details, furniture locations and features of the pavement construction.
<b>U</b>	
UNFCCC	The 'Kyoto Protocol to the United Nation Framework Convention on Climate Change', which was signed in 1997 and Australia ratified the protocol in December 2007.
Underpass	A grade separation where the subject carriageway passes under an intersecting carriageway (or railway). A tunnel constructed for the use of pedestrians, cyclists, fauna and/or stock under the carriageway.
Unsignallised	Without traffic signals, such as traffic lights.
Urban design	The process and product of designing human settlements, and their supporting infrastructure, in urban and rural environments.
USEPA	United States Environmental Protection Agency
<b>V</b>	
Valley tunnels	Small but steep valleys (and ridges) running in south easterly direction into Broughton Creek off the ridgeline between Broughton Mill Creek and Broughton Creek catchments.
Vascular flora species	Plants containing specialised conducting tissues which transport water, minerals, salts and sugars throughout the plant.
Vegetated portals	The transition from the open pastoral landscape to enclosed tree lined creeks and remnant areas of forest.
VENM	Virgin excavated natural material
Verge	That portion of the formation not covered by the carriageway, the median or the footpath.
Viewshed	The area visible from a fixed point.
VKT	Vehicle kilometres travelled.
VMP	Vegetation Management Plan.
VMS	Variable Message Sign.
Volcanoclastic	Particulate aggregate, in which most fragments have been deposited by volcanic eruption
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.
<b>W</b>	
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).

Term	Meaning
Wetland	A swamp or marsh in which the soil is frequently or permanently saturated with water, or under water.
Wick drains	Vertical drains that allow for the quick settlement of soft soils.
WONS	Weeds of National Significance
Worst case impact scenario	The <i>worst case impact scenario</i> would see the project as described being undertaken but without the implementation of: Mitigation measures; on site management; minimisation of impacts; offsetting measures and monitoring procedures.
WRAPP	Waste Reduction and Purchasing Policy.
<b>X, Y, Z</b>	
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.