



Artist's Impression

## Environmental Impact Statement – Glossary

# Warragamba Dam Raising

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# Glossary of terms

## A

**AAD:** Average annual damages.

**Abiotic:** Not derived from physical organisms.

**Aboriginal cultural heritage:** The tangible (objects) and intangible (dreaming stories, legends and places) cultural practices and traditions associated with past and present-day Aboriginal communities.

**Aboriginal object(s):** The legal definition for material Aboriginal cultural heritage under the NSW National Parks and Wildlife Act 1974.

**ABS:** Australian Bureau of Statistics.

**Abundance:** the quantification of a population of a species or community.

**ACHA:** Aboriginal cultural heritage assessment.

**ACHCR:** Aboriginal cultural heritage consultation requirements.

**ACHMP:** Aboriginal cultural heritage management plan.

**Acid sulfate soils:** The acidic soils that result from the disturbance or drainage and subsequent oxidation of previously waterlogged potential acid sulphate soils.

**ADT:** Average daily traffic.

**ADWG:** Australian drinking water guidelines.

**Aeolian:** Clays, silts, and sand that have been deposited by wind.

**AEP:** Annual exceedance probability. An indicator of flood probability. The probability of a flood event being equalled or exceeded within a year (ARR 2019).

**AERMET/AERMOD:** AERMET is the meteorological data pre-processor (computer program) used to develop the meteorological file for AERMOD (computer program). AERMOD is the dispersion model, used to assess air quality.

**AHD:** Australian height datum. The standard reference level used to express the relative elevation of various features - essentially the height above sea level.

**AHIMS:** Aboriginal heritage information management system. A web-available database which contains information and records about Aboriginal objects maintained by the NSW Office of Environment and Heritage.

**AIDR:** Australian Institute for Disaster Resilience

**Air NEPM:** National Environment Protection (Ambient Air Quality) Measure 2016.

**Alkalinity:** A measure of the acid neutralising capacity of a liquid.

**Alluvium:** Unconsolidated deposit of gravel, sand or mud formed by water flowing in identifiable channels. Commonly well sorted and stratified.

**AM peak hour:** This refers to vehicle trips travelling on the network during the average peak one hour in the AM (morning) peak period between 7.00 am–9.00 am on a normal working weekday.

**Amphibious:** Suited to both land and water.

**Amphidromous:** Fishes migrating from salt to fresh water or from fresh to salt water at a stage of the life cycle other than the breeding period.

**Anadromous:** Fishes migrating from the sea, up rivers to spawn.

**ANCOLD:** Australian National Committee on Large Dams.

**ANZECC:** Australian and New Zealand Environment and Conservation Council.

**AOBV:** Area of outstanding biodiversity value.

**Aoi:** Area of influence.

**AoS:** Assessment of significance.

**AQIA:** Air quality impact assessment.

**Aquifer:** Geologic formations which hold and store groundwater.

**Aquitard:** A zone within the Earth that restricts the flow of groundwater between aquifers.

**AR&R:** Australian rainfall and runoff. The national guideline for estimating flood characteristics in Australia.

**AR:** Assessment report.

**Arboreal:** Species living in trees.

**Archaeological potential:** The likelihood that an area contains physical remains associated with an earlier phase of occupation, activity or development of that area.

**ARI:** Average recurrence interval. An indicator of the frequency of floods. The average time period between occurrences equalling or exceeding a given value (ARR 2019).

**ARMCANZ:** Agriculture and Resource Management Council of Australia and New Zealand.

**Artefact:** An object made by human agency.

**Assemblage:** A group of stone artefacts found in close association with one another.

**AUSRIVAS:** Australian River Assessment System

**Austroroads:** Peak organisation of Australasian road transport and traffic agencies.

**Avoid:** In the development planning process, potential impacts on biodiversity values and the environment are avoided through careful site selection and project design.

## B

**BACI:** Before-after-control-impact.

**BAM:** Biodiversity assessment method.



**BAR:** Biodiversity assessment report. A report that must be prepared in accordance with Section 3.2 of the FBA.

**Batter:** The side slope of walls, embankments and cuttings or the degree of such slope, usually expressed as a ratio of horizontal distance to one vertical height.

**BBAM:** BioBanking assessment methodology.

**BBCC:** BioBanking credit calculator. The computer program that provides decision support to assessors and proponents by applying the FBA, and which calculates the number and type of biodiversity credits required to offset the impacts of a major project.

**BBQ:** Barbecue.

**BC Act:** *Biodiversity Conservation Act 2016* (NSW).

**BCT:** Biodiversity Conservation Trust.

**Benchmarks:** the quantitative measures of the range of variability in vegetation condition in vegetation with relatively little evidence of modification by humans since European (post 1750) settlement. Benchmarks are defined for specified variables for each PCT. Vegetation with relatively little evidence of modification generally has minimal timber harvesting (few stumps, coppicing, cut logs), minimal firewood collection, minimal exotic weed cover, minimal grazing and trampling by overabundant native herbivores, minimal soil disturbance, minimal canopy dieback, no evidence of recent fire or flood, is not subject to high frequency burning, and has evidence of recruitment of native species.

**Benthos** (Adj: *benthic*): bottom-dwelling organisms.

**Biota:** Collectively, the plants, microorganisms, and animals of a region.

**Bioturbation:** Disturbance of soil by plants and animals.

**Blacktown LEP 2015:** Blacktown Local Environmental Plan 2015.

**Blue Mountains LEP 2015:** Blue Mountains Local Environmental Plan 2015.

**BMP:** Blast management plan.

**BoM:** Bureau of meteorology.

**BOS:** Biodiversity offset strategy.

**BS:** British standard.

**BSA:** Biodiversity stewardship agreement.

**Bund:** A closed embankment or area used to store liquid.

**Burra Charter:** *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance, 2013*

**BV:** Biodiversity value.

**BVT:** Biometric vegetation type.

## C

**CaCO<sub>3</sub>:** Calcium carbonate.

**CALD:** Culturally and linguistically diverse.

**Calms:** Winds less than 0.5 metres per second.

**Camden LEP 2010:** Camden Local Environmental Plan 2010

**Catadromous:** Fishes migrating down rivers to the sea to spawn.

**Catchment:** The area of land drained by a creek or river system, or a place set aside for collecting water which runs off the surface of the land.

**CBA:** Cost benefit analysis.

**CBD:** Central business district.

**CC&C:** Community consultation and communication.

**CE:** Critically endangered.

**CEEC:** Critically endangered ecological community. An ecological community specified in Part 2 of Schedule 1A of the TSC Act and/or listed under Part 13, Division 1, Subdivision A of the EPBC Act.

**CEMP:** Construction environmental management plan.

**CFD:** Computational fluid dynamics.

**CFFMP:** Construction flora and fauna management plan.

**CFMP:** Construction flood management plan.

**cfu:** Colony forming units.

**Chance per year/Chance in a year:** Refers to the chance of a certain level of flooding occurring in any one year. The chance that a certain level of flooding occurs in any one year is not related to the timing of other floods. For example, a 1 in 100 chance per year flood refers to a level of flooding with a 1 in 100 (or 1 percent) chance of occurring in any one year, regardless of whether that level or other levels of flooding have occurred in that year (NSW Office of Water 2014).

**CHL:** Commonwealth Heritage List.

**Chl-*a*:** Chlorophyll-*a*. This is a green pigment found in plants which absorbs sunlight and converts it to sugar during photosynthesis. The chlorophyll-*a* concentration in bodies of water is an indicator of phytoplankton abundance and biomass in waterways, which makes it a useful as an indicator of water quality.

**Chlorophyll:** With respect to determining water quality, a measure of the concentration of micro-algae in the water column.

**CIE:** Centre for International Economics.

**Clean Air Regulation:** Protection of the Environment Operations (Clean Air) Regulation 2010 (NSW).

**CMIP:** Coupled model inter-comparison project. A project of the World Climate Research Programme to develop virtual climate models.

**CMP:** Conservation management plan.

**CNVMP:** Construction noise and vibration management plan.

**CO:** Carbon monoxide.

**CO<sub>2</sub>:** Carbon dioxide.

**Coffer dam:** A temporary watertight enclosure pumped dry to permit construction work below the waterline.

**Colluvial:** Comprised of colluvium – sediments moved downslope by soil creep and slope wash.

**Connectivity:** the measure of the degree to which an area(s) of native vegetation is linked with other areas of vegetation.

**Connectivity value:** has the meaning given in section 4.2.3 of the FBA.

**Conservation status:** is regarded as the degree of representation of a species or community in formal conservation reserves

**Construction CSEP:** Construction community and stakeholder engagement plan.

**CoRTN:** Calculation of road traffic noise.

**CPI:** Consumer price index.

**CR:** Compulsory requirements.

**Critical habitat:** has the same meaning as the TSC Act.

**Critically endangered ecological community:** an ecological community specified in Part 2 of Schedule 1A of the TSC Act and/or listed under Part 13, Division 1, Subdivision A of the EPBC Act.

**CSEP:** Community and stakeholder engagement plan.

**CSIRO:** Commonwealth Scientific and Industrial Research Organisation.

**CSSI:** Critical state significant infrastructure.

**CSW:** Castlereagh swamp woodland.

**CSWMP:** Construction soil and water management plan.

**Cth:** Commonwealth. In particular, Commonwealth of Australia.

**CTMP:** Construction traffic management plan.

**CU:** Colour units.

**Curtilage:** The area of land (including land covered by water) surrounding a place of heritage significance, which is essential for retaining and interpreting its heritage significance.

**CWMP:** Construction waste management plan.

## D

**DAMROU:** Hydrodynamic model (computer program) to assess dam gate and fuse plug operations.

**DAWE:** Department of Agriculture, Water and the Environment (Commonwealth)

**dB(A):** Decibels (A-weighted).

**dB:** Decibels. A scale unit used in the comparison of powers and levels of sound energy.

**DBH:** Diameter at breast height.

**DCP:** Development control plan.

**DE:** Downstream environment.

**DEC:** Department of Environment and Conservation. Former NSW government department.

**DECC:** Department of Environment and Climate Change. Former NSW Government department.

**DECCW:** Department of Environment, Climate Change and Water. Former NSW Government department.

**Decile:** Quantitative method of splitting up a set of ranked data into 10 equally sized subsections.

**DEM:** Digital elevation model.

**Depauperate:** Lacking in variety or numbers of species.

**Development:** has the same meaning as development in section 1.4 of the EP&A Act and includes development as defined in section 5.11 of the EP&A Act.

**Development footprint:** the area of land that is impacted by a proposed major project that is under the EP&A Act, including access roads, and areas used to store construction materials. For the purposes of this assessment, the development footprint includes areas directly cleared for construction including raised dam spillway, buttress and associated infrastructure.

**Development site:** an area of land that is subject to a proposed Major Project that is under the EP&A Act.

**DIPNR:** Department of Infrastructure, Planning and Natural Resources. Former NSW government department.

**DISRD:** Department of Industry, Skills and Regional Development. Former Commonwealth government department.

**Diurnal:** During the daytime.

**DIWA:** Directory of important wetlands in Australia.

**DMP:** Dust management plan.

**DO:** Dissolved oxygen.

**DoEE:** Department of the Environment and Energy (Commonwealth). Former Commonwealth Government Department.

**DoEH:** Department of Environment and Heritage. Former Commonwealth government department, predecessor of former Department of Environment and Energy. From 1 February 2020, the environment portfolio of DoEE was moved to the Department of Agriculture, Water and the Environment (DAWE).

**DPE:** Department of Planning and Environment. Former NSW Government Department, now DPIE.

**DPI:** Department of Primary Industries (NSW).

**DPIE:** Department of Planning, Infrastructure and Environment (NSW).

**DSC:** NSW Dams Safety Committee, former NSW government regulator, now Dams Safety NSW.

**DSEWP&C:** Department of Sustainability, Environment, Water, Population and Communities. Former Commonwealth government department which ceased operation on 18 September 2013 and has been superseded by DAWE.

## E

**E:** Endangered.

**ECL:** East coast low. Extratropical cyclone affecting the Australian east coast.

**Ecology:** The relationship between living things and the environment.

**Ecosystem credits:** A measurement of the value of endangered ecological communities (EECs), critically endangered ecological communities (CEECs), and threatened species habitats for species which can be reliably predicted to occur within a plant community type (PCT). Ecosystem credits measure the loss of in biodiversity values at a development site and the gain in biodiversity values at an offset site.

**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.

**Edaphic:** Produced or influenced by the soil.

**eDNA:** Environmental DNA (deoxyribonucleic acid) – DNA collected from a variety of samples such as soil or water rather than directly sampled from an individual organism.

**EEC:** Endangered ecological community. An ecological community identified by relevant legislation as having “endangered” status.

**EES:** Environment, Energy and Science Group. The EES Group is part of the Department of Planning, Industry and Environment and includes the majority of the former OEH.

**eFlows:** Environmental flows.

**EHNv:** Epizootic haematopoietic necrosis virus.

**EIA:** Environmental impact assessment.

**EIS:** Environmental impact statement.

**Element:** An individual piece of fabric, or an assemblage of fabric which contributes to the heritage place’s significance. See ‘fabric’.

**EMP:** Environmental management plan.

**EN:** Endangered.

**ENSO:** El Niño–Southern Oscillation.

**Enterococci:** Any streptococcal bacteria normally found in the human intestinal tract, used as an indicator of water quality.

**Environmental flow releases:** Daily releases of water from a dam water storage with the objective of improving the water quality and ecological health of the downstream waterways. The environmental flow releases are based upon inflows to the dam and aim to mimic the natural variability in flows.

**EOI:** Expression of interest.

**EP&A Act:** *Environmental Planning and Assessment Act 1979* (NSW).

**EP&A Reg:** *Environmental Planning and Assessment Regulation 2000* (NSW).

**EPA:** Environment Protection Authority (NSW).

**EPBC Act:** *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth).

**Epiphytic:** Organisms growing on the surface of a plant that derive nutrients from the air, rain or debris around it.

**EPL:** Environment protection licence.

**Erosion:** The process by which material, such as rock or soil, is worn away or removed by wind or water.

**ESCCI-ECL:** Eastern seaboard climate change initiative - East coast lows.

**ESCP:** Erosion and sediment control plan.

**ESD:** Ecologically sustainable development.

**eSPADE:** Online database of soil and land information provided by the NSW Government.

**Estuary:** The part of the mouth or lower course of a river which meets the sea’s tides.

**EU:** European Union.

**Eutrophication:** A process where a water body receives excess nutrients that stimulate excessive plant growth.

**Expert:** a person who is accredited by the Chief Executive under section 142B(1)(b) of the TSC Act, or if arrangements of accreditation under section 142B(1)(b) are not in place, a person who has the relevant experience and/or qualifications to provide an expert opinion in relation to the biodiversity values to which an expert report relates.

**Exotic plant cover:** exotic plants are vascular plants not native to Australia. Exotic plant cover is measured as total percentage foliage cover of all exotics in all strata.

## F

**Fabric:** The physical elements of a heritage place.

**Faecal coliforms:** A group of bacteria found in animal (including human) intestines, used as an indicator of water quality.

**FBA:** Framework for biodiversity assessment.

**FDM:** Floodplain Development Manual.

**FEA:** Finite element analysis.

**FERC:** Federal Energy Regulation Commission (United States of America).

**FESM:** Fire extent and severity mapping

**FFMP:** Flora and fauna management plan.

**Flocculation:** The process in which fine particulates come out of suspension in a liquid and clump together in a floc.

**Flooding impact zone:** The area between the full supply level and Project PMF that would be affected by temporary inundation during flood mitigation operations.

**Floodplain harvesting:** Capture of overland floodplain waters.

**Floristic:** Relating to the study of the distribution of plants.

**Fluvial:** Material deposited by moving waters.

**FM Act:** *Fisheries Management Act 1994* (NSW)

**FMZ:** Flood mitigation zone – the zone above the full supply level in lake Burragorang used to capture and temporarily store flood waters.

**Forb:** A herbaceous flowering plant that is not a grass, sedge, or rush.

**FPL:** Flood planning level.

**Freeboard:** Usually expressed as the difference in height between the adopted flood planning level and the peak height of the flood used to determine the flood planning level. Freeboard provides a factor of safety to compensate for uncertainties in the estimation of flood levels across the floodplain.

**Freshes:** Medium flows that move through a river system from the upper catchments.

**FRP:** Filterable reactive phosphorus.

**FSL:** Full supply level – the maximum level of water in the dam for drinking water supply.

## G

**GBMWA:** Greater Blue Mountains World Heritage Area.

**GBMWAAC:** Greater Blue Mountains World Heritage Area Advisory Committee.

**GBMWHAMC:** Greater Blue Mountains World Heritage Area Management Committee.

**GCM:** Global climate models.

**GDE:** Groundwater dependent ecosystem.

**GEEBAM:** Google Earth engine burnt area map

**GEMS:** Greenhouse and energy minimum standards.

**Geomorphology:** The study of the physical features of the surface of the earth and their relation to its geological structure.

**GHG:** Greenhouse gas.

**GIS:** Geographic information system.

**GL/d:** Gigalitres per day.

**GL/yr:** Gigalitres per year.

**GL:** Gigalitre. 1 GL = 1 billion litres or 1,000 megalitres of water.

**GP:** General practice.

**GPS:** Global positioning system.

**Graminoid:** herbaceous plant with grass-like features.

**Granivorous:** Species feeding on grain.

**GREP:** NSW Government Resource Efficiency Policy 2014.

**GSC:** Greater Sydney Commission.

## H

**H14 protocol:** The current operating protocol for the Warragamba Dam gates. It details an automatic gate opening and closing sequence when the water level in the dam exceeds full supply level.

**ha:** hectare (10,000 square metres).

**Habitat:** The particular local environment occupied by an organism.

**Habitat component:** the component of habitat that is used by a species for either breeding, foraging, or shelter.

**Hardness:** The concentration of all metallic cations, except those of the alkali metals, present in water. In general, hardness is a measure of the concentration of calcium and magnesium ions in water and is frequently expressed as mg/L (milligrams per litre) calcium carbonate equivalent.

**Harm:** With respect to Aboriginal objects, this has the same meaning as the *National Parks and Wildlife Act 1974* (NSW).

**Hawkesbury LEP:** Hawkesbury Local Environmental Plan 2012.

**HCA:** Heritage conservation areas.

**Heavy vehicles:** A heavy vehicle is classified as a Class 3 vehicle (a two-axle truck) or larger, in accordance with the Austroads Vehicle Classification System.

**Heritage Act:** *Heritage Act, 1977* (NSW).

**Heterophylly:** Marked changes in leaf shape on the same plant.

**HMAS:** Her Majesty's Australian Ship. A vessel of the Royal Australian Navy.

**HMP:** Heritage management plan.

**HN:** Hawkesbury-Nepean.

**HNCMA:** Hawkesbury-Nepean Catchment Management Authority.

**HNFMAC:** Hawkesbury-Nepean Flood Management Advisory Committee.

**HNFMSC:** Hawkesbury-Nepean Floodplain Management Steering Committee.

**HNv:** Hawkesbury-Nepean Valley.

**Hornsby LEP:** Hornsby Local Environmental Plan 2013.

**hr:** Hour.

**Hydraulics:** The term given to the study of water flow in waterways, in particular the evaluation of flow parameters such as water level and velocity.

**Hydro-blasting:** A concrete removal technique that uses high pressure water.

**Hydrology:** Term given to the study of the rainfall and runoff process; in particular, the evaluation of peak flows, flow volumes and the derivation of hydrographs for a range of floods.

**Hz:** Hertz. A unit used to measure frequency.

## I

**IBRA:** Interim biogeographic regionalisation of Australia.

**IBRA region:** A bioregion identified under the Interim biogeographic regionalisation for Australia (IBRA) system, which divides Australia into bioregions on the basis of their dominant landscape-scale attributes.

**IBRA subregion:** A subregion of a bioregion identified under the IBRA system and based on major catchment areas.

**ICA:** Insurance Council of Australia.

**ICNG:** Interim construction noise guidelines.

**ICOLD:** International Commission on Large Dams.

**ICOMOS:** International Council on Monuments and Sites.

**ILUA:** Indigenous land use agreement.

**Impact area:** the area between 2.78 metres above FSL (RL 119.5 mAHD) and 10.25 metres above FSL (RL 126.97 mAHD) in the upstream study area. This area has been used as the basis for offsetting impacts on biodiversity, and World Heritage and protected lands values in the upstream study area.

**Important area:** An area of the CEEC or EEC that is necessary for the entities' long-term persistence and recovery. This may include areas identified in recovery plans, and/or an CEEC or EEC at the limit of the community's range.

**Important wetland:** A wetland that is listed in the Directory of Important Wetlands of Australia (DIWA), or is a wetland mapped under State Environmental Planning Policy (Coastal Management) 2018.

**In situ:** Latin phrase: 'on the spot', 'in place', or 'undisturbed'.

**Individual:** in relation to organisms, a single, mature organism that is a threatened species defined in section 49(1) of the TSC Act, or any additional threatened species listed under Part 13 of the EPBC Act.

**Induration:** the process of or condition produced by growing hard.

**Infrastructure SEPP:** State Environment Planning Policy (Infrastructure) 2007 (NSW).

**Insectivorous:** Species feeding on insects, worms and other invertebrates.

**INSW:** Infrastructure NSW.

**Interpretation:** Presenting the cultural significance of a place to the users and the community.

**IPCC:** Intergovernmental Panel on Climate Change.

**IQQM:** Integrated quantity/quality model.

**IS Rating Tool:** Infrastructure sustainability rating tool.

**ISCA:** Infrastructure Sustainability Council of Australia.

**Isolated find:** A single artefact found in an isolated context.

## J

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## K

**kg:** Kilogram (1,000 grams).

**km/h:** Kilometres per hour.

**km:** Kilometre (1,000 metres).

**km<sup>2</sup>:** Square kilometre(s).

**kN:** Kilonewton(s) (1,000 newtons). A unit used to measure force.

**KSAT:** Koala spot assessment technique.

**KTP:** Key threatening process.

**kW:** Kilowatt(s) (1,000 watts).

**kWh:** Kilowatt hour(s). A unit of energy equal to 3.6 megajoules.

## L

**LA<sub>1</sub>:** A-weighted sound level exceeded for 1% of the measurement period.

**LA<sub>10</sub>:** A-weighted sound level exceeded for 10% of the measurement period.

**LA<sub>90</sub>:** A-weighted sound level exceeded for 90% of the measurement period.

**Lacustrine:** Relating to lakes.

**L<sub>Aeq</sub>:** A-weighted average sound level over a given period.

**L<sub>Amax</sub>:** Maximum A-weighted noise levels as measured with a fast response time interval, which corresponds to a time period of 125 milliseconds.

**Laminite:** Sedimentary rock composed of very fine layers.

**Landform:** Any one of the various features that make up the surface of the earth.

**Landscape value:** the value given to landscape attributes of a development site after an assessment undertaken in accordance with section 4.2 of the FBA.

**LCZ:** Landscape character zone(s).

**Leachate:** Water that has passed through a soil and contains soluble material removed from that soil.

**Lentic:** Descriptive of a standing body of water such as a lake or pond.

**LEP:** Local Environmental Plan.

**Levee banks:** Artificial embankments that prevent inundation of the protected area up to the design limit.

**LGA:** Local Government Area.

**Life cycle:** the series of reproduction, growth, development, aging, and death of an organism.

**Littoral:** Relating to or located on the shore of the sea or a lake.

**Liverpool LEP:** Liverpool Local Environmental Plan 2008.

**LLS:** Local Land Services.



**Local population:** the population that occurs within the development footprint. The assessment of the local population may be extended to include individuals beyond the study area if it can be clearly demonstrated that contiguous or interconnecting parts of the population continue beyond the study area. In cases where multiple populations occur on the study area or a population occupies part of the study area, impacts on each subpopulation must be assessed separately.

**Local wetland:** a wetland that is not identified as an important wetland.

**Locality:** the area within a ten-kilometre radius of the development footprint.

**LOS:** Level of service.

**LOTE:** Language other than English.

## M

**m/s<sup>1.75</sup>:** Units of vibration dose measured in metres per second to the power of 1.75.

**m:** Metre(s).

**m<sup>2</sup>:** Square metre(s).

**m<sup>3</sup>:** Cubic metre(s).

**m<sup>3</sup>/s:** Cubic metre(s) per second.

**Ma:** Marine.

**Macroinvertebrates:** Invertebrates visible to the naked eye, with a body length exceeding 1 millimetre.

**Macrophyte:** Aquatic plant large enough to be seen by the naked eye.

**Major project:** State Significant Development or State Significant Infrastructure project.

**MC:** Main construction.

**Mesic:** Habitat containing a moderate amount of moisture.

**MetroNet:** The hydro-economic model used to identify optimal solutions for maintaining the security of greater Sydney's water supply, now and in the future.

**mg/L:** Milligram(s) per litre.

**MGA:** Map grid of Australia.

**Mi:** Migratory.

**MIC:** Maximum instantaneous charge.

**Micro S/cm:** Micro Siemen(s) per centimetre. Unit used to measure electrical conductivity – the amount of electrical current a material can carry or its ability to carry a current.

**MIKE11:** One dimensional hydraulic model software used to create hydraulic models.

**Minimise:** a process applied throughout the development planning and design life cycle which seeks to reduce the avoidable impacts of development on biodiversity values.

**Mitchell Landscape:** Landscapes with relatively homogenous geomorphology, soils and broad vegetation types, mapped at a scale of 1: 250,000.

**ML/d:** Megalitre(s) per day.

**ML/yr:** Megalitre(s) per year.

**ML:** Megalitre(s) (1,000,000 litres).

**mm/s:** Millimetre(s) per second.

**mm:** Millimetre(s).

**MNES:** Matter(s) of national environmental significance (under the EPBC Act).

**Monte Carlo:** Flood modelling framework that allows for the incorporation of a wide range of variability in key inputs. It is most practical for models where two or more variables need to be considered in the analysis.

**Morphodynamic:** Relating to landscape changes due to erosion and sedimentation.

**Morpho-species:** A species distinct from others only by its form and structure.

**MP:** Member of Parliament.

**MWCEO:** Metropolitan Water Chief Executive Officer.

**MWP:** Metropolitan water plan.

## N

**N/A:** Not applicable.

**NABERS:** National Australian built environment rating system.

**Native ground cover:** all native vegetation below 1m in height, including all such species native to NSW (that is, not confined to species indigenous to the area).

**Native vegetation:** has the same meaning as in Part 5A of the *Local Land Service Act 2013* (NSW).

**NARCLiM:** NSW and ACT regional climate modelling.

**NCA:** Noise catchment area.

**NEAL:** National Environmental Alert List *Noxious Weeds Act 1993* (NSW).

**Nectarivorous:** Species feeding on nectar.

**NGER Act:** *National Greenhouse and Energy Reporting Act 2007* (Commonwealth).

**NH<sub>4</sub>:** Ammonium.

**NHL:** National heritage list.

**NHMRC:** National Health and Medical Research Council.

**NICTA:** National Information and Communication Technology Australia. Now Data61, a division of CSIRO.

**NL:** Not listed.

**NML:** Noise management level.

**NO<sub>2</sub>:** Nitrogen dioxide.

**NO<sub>3</sub>:** Nitrate.

**NOM:** Natural organic matter.

**NorBE:** Neutral or beneficial effect.



**NOx:** Oxides of nitrogen.

**NP:** National Park.

**NPI:** Noise policy for industry.

**NPW Act:** *National Parks and Wildlife Act 1974* (NSW).

**NPW Regulation:** National Parks and Wildlife Regulation 2009 (NSW).

**NPWS:** National Parks and Wildlife Service.

**NSOOS:** Northern Suburbs Ocean Outfall Sewer.

**NSW:** New South Wales.

**NT Act:** *Native Title Act 1993* (Commonwealth).

**NTU:** Nephelometric turbidity units.

**NVMP:** Noise and vibration management plan.

**NWQMS:** National water quality management strategy.

## O

**O&M Manual:** Operations and maintenance manual.

**Oberon LEP:** Oberon Local Environmental Plan 2013.

**OBPR:** Office of Best Practice Regulation.

**OEH:** Office of Environment and Heritage. Former NSW government agency. The EES Group, within DPIE includes the majority of the former OEH, with the Heritage function transferred to the Department of Premier and Cabinet.

**OEMP:** Operational environmental management plan.

**Offset requirement:** The number and type of biodiversity credits that are required to offset the remaining impacts of development on biodiversity values after all reasonable measures have been taken to avoid and minimise impacts.

**Onsite measures:** reasonable measures and strategies that are taken, or are proposed to be taken at a development site to avoid and minimise the direct and indirect impacts of the development on biodiversity values.

**OOH:** Out of hours.

**Open camp site:** An archaeological site situated within an open space (for example, archaeological material located on a creek bank, in a forest, on a hill, etc.).

## P

**PAD:** Potential archaeological deposit. A location considered to have a potential for subsurface archaeological material.

**PCD:** Psittacine circoviral disease.

**PCI:** Pavement condition index.

**PCT:** Plant community type. A plant community type is the master community-level typology used in NSW's planning and assessment tools and vegetation mapping programs.

**PEA:** Preliminary environmental assessment.

**Penrith LEP:** Penrith Local Environmental Plan 2010.

**pH:** A measure of acidity or alkalinity of a solution, numerically equal to seven for neutral solution, increasing

with increasing alkalinity and decreasing with increasing acidity.

**PIR:** Preferred infrastructure report.

**Place:** Defined by the Burra Charter as a geographically defined area. It may include elements, objects, spaces and views. A place may have tangible and intangible dimensions.

**PLDC:** Penrith Lakes Development Corporation.

**Plot:** an area within a vegetation zone in which site attributes are assessed.

**Pluviograph:** An instrument used for measuring and recording rainfall, usually in real time.

**PM peak hour:** This refers to trips travelling on the network during the average peak one hour in the PM peak period between 4.00 pm–6.00 pm on a weekday hour.

**PM:** Particulate matter.

**PM<sub>10</sub>:** Particulate matter 10 micrometres or less in diameter.

**PM<sub>2.5</sub>:** Particulate matter 2.5 micrometres or less in diameter.

**PMF:** Probable maximum flood. An estimate of the maximum flood magnitude possible in a catchment/particular location. The PMF is primarily used in design development and with regard to the Project, is unlikely to ever occur in nature due to the size of the Warragamba catchment.

**PMP:** Probable maximum precipitation.

**PMST:** Protected matters search tool.

**POEA Act:** *Protection of the Environment Administration Act 1991* (NSW).

**POEO Act:** *Protection of the Environment Operations Act 1997* (NSW).

**POEO Regulation:** Protection of the Environment Operations (Waste) Regulation 2014 (NSW).

**Potable water:** Water of quality suitable for human consumption.

**Potamodromous:** Fishes migrating within freshwater only.

**PPV:** Peak particle velocity.

**Propagule:** Plant material used for propagating a plant to the next stage of its life cycle, for example, a bud or spore.

**Putrescibles:** Materials that are liable to decay.

## Q

**Q&A:** Question and answer.

**QX disease:** Queensland unknown disease – a disease affecting Sydney rock oysters.

## R

**RAAF:** Royal Australian Air Force.

**RAIA:** Royal Australian Institute of Architects.

**RAP:** Registered Aboriginal Party.

**RBL:** Rating background level.

**RCP:** Representative concentration pathways.

**Rd:** Road.

**Receptor/receiver:** An environmental modelling term used to describe a map reference point where the impact is predicted. A sensitive receptor is a home, workplace, school or other place where people spend some time.

**Regeneration:** the proportion of over-storey species characteristic of the PCT that are naturally regenerating and have a diameter at breast height.

**Relict:** An organism that was abundant in a previous time, but now occurs in a small area.

**REP:** Regional environmental plan.

**Reservoir:** The body of water retained behind a dam wall.

**RFS:** Rural Fire Service.

**Rhizosphere:** The region of soil that is directly affected by secretions from plant roots.

**Riffle:** Formed in shallow areas of streams by coarser materials such as gravel deposits over which water flows.

**Riparian:** Relating to the banks of a natural waterway.

**Riparian buffer:** an area of land determined according to Appendix 2 of the FBA. Riparian buffer distances must be measured on both sides of the stream from the top of bank, if this is defined, otherwise from the edge of the stream and only from the centre of the stream if the edge is not defined. Where a stream has more than one bank on either side, the bank closest to the main channel must be used, to protect vegetation on and within the stream banks. The riparian buffer distances for various water bodies are set out in Table 7 of Appendix 2 of the FBA. Riparian buffer distances do not include the width of the water body.

**RL:** Reduced level. Refers to metres AHD unless otherwise stated. All levels in this EIS are reduced from Sea level unless stated otherwise.

**RMS:** Roads and Maritime Services.

**RNP:** NSW Road noise policy.

**RORB:** Interactive runoff and streamflow routing computer program developed by Monash University which is used to develop virtual waterflow models.

**RSA:** Road safety audit.

**RTA:** Roads and Traffic Authority. Former NSW Government agency, now RMS.

**RUBICON:** Hydrodynamic model software (computer program) used to quantify the hydraulic aspects of flood behaviour.

**Runoff:** The portion of water that drains away as surface flow.

**RV:** Recreational vehicle.

## S

**s170 Registers:** section 170 Heritage and Conservation Registers. s170 refers to section 170 of the *Heritage Act 1977* (NSW).

**SAII:** Serious and irreversible impacts.

**SCADA:** Supervisory control and data acquisition.

**SCARISS:** Sydney Catchment Aquatic Real-time Information Support System

**Sclerophyll:** Vegetation with hard leaves and short internodes, adapted to dry conditions and often low levels of soil phosphorus, usually with an over-storey of eucalypts.

**SCRAMS:** Sydney Catchment Aquatic Real-time Management System

**Scree:** A collection of broken rock fragments that form or cover a slope.

**SDGv4.0:** Transport for NSW Sustainable Design Guidelines v 4.0.

**SE:** Site establishment.

**SEARS:** Secretary's Environmental Assessment Requirements.

**sec:** Seconds.

**SECH:** Socio-economic, environmental and cultural heritage.

**Sedge:** A group of grass-like, flowering plants commonly found in wetlands and riparian areas.

**SEH:** South Eastern Highlands bioregion.

**SEIA:** Socio-economic impact assessment.

**SEIFA:** Socio-economic index for areas.

**Seismic:** Relating to vibrations of the earth and its crust.

**SEMC:** State Emergency Management Committee.

**Senescence:** Gradual deterioration of functional characteristics with age.

**SEPP:** State Environmental Planning Policy.

**SES:** State Emergency Service.

**Sessile:** Fixed in one place.

**SHI:** State Heritage Inventory.

**Shoal:** A naturally submerged ridge that rises from the bed of a body of water.

**SHR:** State Heritage Register.

**SIA:** Social impact assessment.

**Site attributes:** the matters assessed to determine site value. They include: native plant species richness, native overstorey cover, native mid-storey cover, native ground cover (grasses), native ground cover (shrubs), native ground cover (other), exotic plant cover (as a percentage of total ground and mid-storey cover), number of trees with hollows, proportion of over-storey species occurring as regeneration, and total length of fallen logs.

**Site value:** the condition of native vegetation assessed for each vegetation zone against the benchmark for the PCT.

**Site value score:** the quantitative measure of vegetation condition calculated in accordance with Equation 1 of the FBA (Determine the current site value score for a vegetation zone).

**SIS:** State Infrastructure Strategy 2012-2032.

**SMEC:** SMEC Australia Pty Limited.

**SMP:** Sustainability management plan.

**SO<sub>2</sub>:** Sulfur dioxide.

**SOC:** State-owned corporation.

**Species credits:** The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Species Profile Database.

**Speciose:** Rich in species.

**Spoil:** Surplus excavated material.

**SPRAT:** Species profiles and threats.

**SRGC:** Sydney region growth centres.

**SRTM:** Shuttle radar topography mission.

**SSD:** State significant development.

**SSI:** State significant infrastructure.

**SSTF:** Shale sandstone transition forest.

**State and Regional Development SEPP:** State Environmental Planning Policy (State and Regional Development) 2011.

**STIF:** Sydney turpentine-ironbark forest.

**Stochastic:** A randomly determined process.

**STP:** Sewage treatment plant.

**Stratum** (plural: *strata*): A layer or a series of layers of rock in the ground.

**Stream order:** Has the same meaning as in Appendix 2 of the FBA. In the Strahler stream order process the number begins at the top of a catchment with headwater flow paths assigned number one, where two first order flow paths join, the section downstream of the junction is order two. Where two second order streams join the waterway downstream of the junction is order three, and so on. As a lower order and a higher order waterways join they retain the higher order number (for example, order one joins order three, the waterway remains a third order).

**Study area:** the development site with a 50-metre buffer.

**Substrate:** An underlying substance or layer.

**Supratidal:** The area above the spring high tide line on coastlines and estuaries that is regularly sprayed but not submerged by seawater.

**Subject species:** Threatened species that are known or considered likely to occur in the study area.

**SYB:** Sydney basin bioregion.

**Sydney Drinking Water Catchment SEPP:** State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011.

**Sydney REP 20:** Sydney Regional Environmental Plan No. 20—Hawkesbury-Nepean River (No. 2—1997).

## T

**t:** Metric tonne(s).

**Talus:** The pile of loose rocks that accumulates at the base of a slope.

**TAPM:** The air pollution model (computer program).

**Taxon** (plural: *taxa*): Any group of organisms considered to be sufficiently distinct from other such groups to be treated as a separate unit (for example, species, genera, families).

**TEC:** Threatened ecological community.

**Terrestrial:** Occurring on dry land.

**TfNSW:** Transport for NSW.

**TG value:** The ability of a species to respond to improvement in site value or other habitat improvement at an offset site with management actions. TG is based on an assessment of effectiveness of management actions, life history characteristics, naturally very rare species, and very poorly known species.

**Thalweg:** The line of lowest elevation within a watercourse or valley.

**The 2013 Review:** *Hawkesbury-Nepean Valley Flood Management Review (2013)*.

**The Flood Strategy:** *Resilient Valley, Resilient Communities* Hawkesbury-Nepean Valley Flood Risk Management Strategy.

**the Forum:** Hawkesbury-Nepean River Management Forum.

**The Hills LEP:** The Hills Local Environmental Plan 2012.

**the Project:** Warragamba Dam Raising Project.

**The Taskforce:** The Hawkesbury-Nepean Valley Flood Management Taskforce.

**Thermocline:** Transition layer of water resulting from thermal stratification that separates the cold lower layer and warm upper layer.

**THM:** Trihalomethanes.

**Threatened species:** Critically endangered, endangered or vulnerable threatened species and populations as defined in Section 4(1) of the TSC Act, or any additional threatened species listed under Part 13 of the EPBC Act as critically endangered, endangered or vulnerable.

**TN:** Total nitrogen.

**Tor:** Freestanding rock outcrop.

**Torpor:** Period of low activity.

**TP:** Total phosphorus.

**Transect:** A path along which species are counted and recorded.

**TS Multiplier:** Threatened species offset multiplier.

**TSC Act:** *Threatened Species Conservation Act, 1995* (NSW) (repealed).

**TSP:** Total suspended particulates.

**TSPD:** Threatened species profile database.

**TSS:** Total suspended solids.

**Turbidity:** A measure of water clarity or murkiness.

**TWG:** Hawkesbury-Nepean Technical Working Group

## U

**UE:** Upstream environment.

**UK DEFRA:** Department of Environment, Food and Rural Affairs (United Kingdom).

**UNESCO:** United Nations Educational, Scientific and Cultural Organisation.

**URaP:** Urban Research and Planning.

**Urban design:** The process and product of designing human settlements, and their supporting infrastructure, in urban and rural environments.

**US EPA:** Environmental Protection Agency of the United States of America.

**USBR:** United States Bureau of Reclamation.

**USCS class:** Unified soil classification system class.

## V

**V:** Vulnerable.

**Vegetation class:** a level of classification of vegetation communities defined in Keith (2004)<sup>3</sup>. There are 99 vegetation classes in NSW.

**Vegetation formation:** a broad level of vegetation classification as defined in Keith (2004)<sup>3</sup>. There are 12 vegetation formations in NSW.

**Vegetation zone:** a relatively homogenous area of native vegetation on a development site that is the same PCT and broad condition state.

**Velocity:** The speed of an object moving in a given direction.

**VENM:** Virgin excavated natural material.

**VEPA:** Victorian Environment Protection Authority.

**VER:** Viral encephalopathy and retinopathy

**VHR:** Voluntary house raising.

**Viability:** the capacity of a species to successfully complete each stage of its life cycle under normal conditions so as to retain long-term population densities.

**Vibration dose:** A parameter that combines the magnitude of vibration and the time for which it occurs. When assessing intermittent vibration, it is necessary to use the vibration dose value, a cumulative measurement of the vibration level received over the time period of assessment, calculated with the units  $m/s^{1.75}$ .

**Viewshed:** The geographical area that is visible from a location.

**VIS:** Vegetation information system. The master vegetation community-level classification for use in vegetation mapping programs and regulatory biodiversity impact assessment frameworks in NSW. The VIS Classification Database is maintained by the NSW Government and available at [www.environment.nsw.gov.au/research/Visclassification.htm](http://www.environment.nsw.gov.au/research/Visclassification.htm).

**VOC:** Volatile organic compounds.

**VPH:** Vehicles per hour.

**VU:** Vulnerable.

## W

**WAE:** Work as executed.

**WARR Act:** *Waste Avoidance and Resource Recovery Act 2001* (NSW).

**WARR:** NSW Waste Avoidance and Resource Recovery Strategy 2014.

**Water NSW Act:** *Water NSW Act, 2014* (NSW).

**Water sharing plan:** *Water Sharing Plan for the Greater Metropolitan Region Unregulated River Water Sources 2011*.

**WATHNET model:** The computer model (computer program) used as a generic water balance model for strategic and technical planning of the Great Sydney Water supply system.

**WD:** Warragamba Dam.

**WDR:** Warragamba Dam Raising.

**Weir:** A low dam built across a river to raise the level of water upstream or to regulate its flow.

**WELS:** Water efficiency labelling scheme.

**Wetland:** Area of land that is wet by surface water or ground water, or both, for long enough periods that the plants and animals in it are adapted to, and depend on, moist conditions for at least part of their life cycle. Wetlands may exhibit wet and dry phases and may be wet permanently, cyclically or intermittently with fresh, brackish or saline water.

**WFP:** Water filtration plant.

**WHA:** World heritage area.

**WHL:** World heritage list.

**WHO:** World Health Organisation.

**WHS Act:** *Work Health and Safety Act 2011* (NSW).

**WHS:** Work health and safety.

**Wild rivers:** Rivers that are in near-pristine condition in terms of animal and plant life and water flow.

**Wilderness Act:** *Wilderness Act 1987* (NSW).

**WIRES:** Wildlife Information, Rescue and Education Service.

**WM Act:** *Water Management Act 2000* (NSW).

**Wollondilly LEP:** Wollondilly Local Environmental Plan 2011.



**WoNS:** Weed(s) of national significance.

**Woody native vegetation:** Native vegetation that contains an over-storey and/or mid-storey that predominantly consists of trees and/or shrubs.

**WQO:** NSW Water Quality Objectives.

**WRF:** Weather Research and Forecasting.

**WSIP:** Western Sydney Infrastructure Plan.

**WSLHD:** Western Sydney Local Health District.

**WSUD:** Water sensitive urban design.

**WTSBREP:** Wildlife and Threatened Species Bushfire Recovery Expert Panel

**WWTP:** Wastewater treatment plant.

## X

-/-

## Y

-/-

## Z

-/-

## Other

**°C:** degrees Celsius.

**µg/m³:** Micrograms per cubic metre.

**µg/L:** Microgram(s) per litre.

**2D:** Two dimensional.

**3D:** Three dimensional.

**4WD:** Four-wheel drive.

## local people global experience

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SMEC is recognised for providing technical excellence and consultancy expertise in urban, infrastructure and management advisory. From concept to completion, our core service offering covers the life-cycle of a project and maximises value to our clients and communities. We align global expertise with local knowledge and state-of-the-art processes and systems to deliver innovative solutions to a range of industry sectors.