WestConnex M4-M5 Link

Mainline Tunnel

Modification report

September 2018

Roads and Maritime Services

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Prepared for

Roads and Maritime Services

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AECOM Australia

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Glossary and terms of abbreviation

Term	Meaning
A	
Acid sulfate soils	Naturally occurring soils, sediments or organic substrates (eg peat) that are formed under waterlogged conditions. These soils contain iron sulfide minerals (predominantly as the mineral pyrite) or their oxidation products. In an undisturbed state below the water table, acid sulfate soils are benign. However if the soils are drained, excavated or exposed to air by a lowering of the water table, the sulfides react with oxygen to form sulfuric acid
ACM	Asbestos containing material
Acoustic louvre	Equipment that provides ventilation and reduces noise from operational facilities
ACTAQ	Advisory Committee on Tunnel Air Quality
Adit	A temporary access tunnel
ADT	Average daily traffic
AECOM	AECOM Australia Pty Ltd
AEP	Annual exceedance probability
Afflux	An increase in water level resulting from obstacles in the flow path
AHD	Australian Height Datum The standard reference level used to express the relative height of various features. A height given in metres AHD is the height above mean sea level
AHIMS	Aboriginal Heritage Information Management System A register of NSW Aboriginal heritage information maintained by the NSW Office of Environment and Heritage
AIP	NSW *Aquifer Inference Policy*
Alignment	The geometric layout (eg of a road) in plan (horizontal) and elevation (vertical)
Alluvium	Soil or sediment left by flowing water
AM peak hour	Unless otherwise stated, this refers to vehicle trips arriving at their destination during the average one hour peak in the AM peak period between 7.00 am and 9.00 am on a normal working weekday
ANZECC	Australian and New Zealand Environment Conservation Council
AQM	Air quality management
Aquifer	A groundwater bearing formation sufficiently permeable to transmit and yield groundwater or water bearing rock
ARI	Average recurrence interval An indicator used to describe the frequency of floods. The average period in years between the occurrence of a flood of a particular magnitude or greater. In a long period of say 1,000 years, a flood equivalent to or greater than a 100 year ARI event would occur 10 times. The 100 year ARI flood has a one per cent chance (ie a one-in-100 chance) of occurrence in any one year. Floods generated by runoff from the study catchments is referred to in terms of their ARI, for example the 100 year ARI flood
Artefact	Any object which has been physically modified by humans
Arterial roads	The main or trunk roads of the state road network that carry predominantly through traffic between regions
AS	Australian Standard
Asphalt or asphaltic concrete	A dense, continuously graded mixture of course and fine aggregates, mineral filler and bitumen usually produced hot in a mixing plant
At-grade	A road at ground level, not on an embankment or in a cutting
ATC	Automatic traffic count
ATN	Active transport network

Term	Meaning
AWS	Automatic weather station
AWT	Average weekday traffic
B	
Background concentration (air quality)	Describes all contributing sources of a pollutant concentration other than road traffic. It includes, for example, contributions from natural sources, industry and domestic activity
Background noise level	The ambient sound-pressure noise level in the absence of the sound under investigation exceeded for 90 per cent of the measurement period. Normally equated to the average minimum A-weighted sound pressure level
BAM	Beta attenuation monitor
Bank cubic metres	A measure of volume representing a cubic metre of unexcavated material. Once material is excavated, it expands to varying degrees depending on its constituents
Biodegradation	Decomposition or breakdown of a substance through the action of micro-organisms (such as bacteria or fungi) or other natural physical processes (such as sunlight)
Bioretention facility	Landscaped depression designed to treat stormwater runoff to remove contaminants and sediment
Blasting	Rock blasting is the controlled use of explosives and other methods such as gas pressure blasting pyrotechnics or plasma processes, to excavate, break down or remove rock
BOD	Biological oxygen demand
BTS	NSW Bureau of Transport Statistics
Bund	A small embankment designed to retain water
Bus lane	A traffic lane dedicated to buses, but which can also be used by taxis, bicycles and motorcycles
C	
Campbell Road civil and tunnel site	A construction ancillary facility for the M4-M5 Link project at St Peters
Campbell Road motorway operations complex	An area where operational ancillary facilities are established. Located within the St Peters interchange, south of Campbell Road at St Peters, on land occupied during construction by the Campbell Road civil and tunnel site
Campbell Road ventilation facility	Ventilation supply and exhaust facilities, axial fans, ventilation outlets and ventilation tunnels. Located at St Peters, within the St Peters interchange site
Capacity	The nominal maximum number of vehicles which has a reasonable expectation of passing over a given section of a lane or roadway in one direction during a given time period under prevailing roadway conditions
Carriageway	The portion of a roadway used by vehicles including shoulders and ancillary lanes
Catchment	The land area draining through the main stream, as well as tributary streams, to a particular site. It always relates to an area above a specific location
CEEC	Critically endangered ecological community A threatened ecological community with a 'critically endangered' listing status under environmental legislation
CEMP	Construction Environmental Management Plan A plan developed for the construction phase of the project to ensure that all contractors and sub-contractors comply with the environmental conditions of approval for the project and that the environmental risks are properly managed
CHL	Commonwealth Heritage List
CLM Act	*Contaminated Land Management Act 1997* (NSW)

Term	Meaning
CMA	Catchment management authority
CNVG	*Construction Noise and Vibration Guideline* (Roads and Maritime, 2016)
CNVIS	Construction Noise and Vibration Impact Statements
CNVMP	Construction Noise and Vibration Management Plan
CO	Carbon monoxide
Coffer dam	Temporary enclosure built within a body of water to allow the enclosed area to be pumped out
Concept design	Initial functional layout of a road/road system or other infrastructure. Used to facilitate understanding of a project, establish feasibility and provide basis for estimating and to determine further investigations needed for detailed design
Confluence	A point at which streams combine
Construction	Includes all physical work required to construct the project
Construction ancillary facilities	Temporary facilities during construction that include, but are not limited to construction sites (civil and tunnel), sediment basins, temporary water treatment plants, precast yards and material stockpiles, laydown areas, workforce parking, maintenance workshops and offices
Construction fatigue	Impact on receivers in the vicinity of concurrent and/or consecutive construction activities
Contributory item	Place within a Heritage Conservation Area that contributes to its heritage significance
CORTN	*Calculation of Road Traffic Noise* algorithms (UK Department of Transport 1988)
CSSI	Critical State significant infrastructure
CSWMP	Construction Soil and Water Management Plan
CTAMP	Construction Traffic and Access Management Plan
Cul-de-sac	A street or road that is open for vehicular traffic at one end only
Culvert	A structure that allows water to flow under a road
Cumulative impacts	Impacts that, when considered together, have different and/or more substantial impacts than a single impact assessed on its own
D	
dB	Decibel - sound level measurement
dBA	A-weighted decibels A-weighting is applied to instrument-measured sound levels in effort to account for the relative loudness perceived by the human ear, as the ear is less sensitive to low audio frequencies
dBL	Linear weighted decibels
DEC	NSW Department of Environment and Conservation (now OEH and EPA)
DECC	NSW Department of Environment and Climate Change (now OEH)
DECCW	NSW Department of Environment, Climate Change and Water (formerly DECC, now OEH)
Detailed design	The phase of the project following concept design where the design is refined, and plans, specifications and estimates are produced, suitable for construction
Detection limit	The lowest concentration of a chemical that can reliably be distinguished from a zero concentration
Detour	An alternative route, using existing roads, made available to traffic
Deviation	An alteration to the alignment of a portion of a road
DGA	Dense graded asphalt
DIN	German standard
DIRD	Australian Government Department of Infrastructure and Regional Development

Term	Meaning
Discharge	The rate of flow of water measured in terms of volume per unit time, for example, cubic metres per second (m^3/s). Discharge is different from the speed or velocity of flow, which is a measure of how fast the water is moving (eg metres per second (m/s))
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
Do minimum	A model scenario that does not incorporate the proposed project infrastructure
Do something	A model scenario that incorporates the proposed project infrastructure
Do something cumulative	A model scenario that incorporates the proposed project infrastructure and other relevant project infrastructure
DoEE	Australian Government Department of the Environment and Energy
DoP	NSW Department of Planning (now Department of Planning and Environment)
DP&E	NSW Department of Planning and Environment
DP&I	NSW Department of Planning and Infrastructure (now Department of Planning and Environment)
DPC	Department of Premier and Cabinet
DPI	NSW Department of Primary Industries
DPI-Fisheries	NSW Department of Primary Industries (Fisheries)
DPI-Water	NSW Department of Primary Industries (Water)
DPSW	NSW Department of Public Works and Services
Drainage	Natural or artificial means for the interception and removal of surface or subsurface water
Drawdown	Reduction in the height of the water table caused by changes in the local environment
DSEWPC	Australian Government Department of Sustainability, Environment, Water, Population and Communities
E	
Earthworks	All operations involved in loosening, excavating, placing, shaping and compacting soil or rock
EB	Eastbound
EC	Elemental carbon
Ecological community	An ecological community is a naturally occurring group of native plants, animals and other organisms that are interacting in a unique habitat
EDMS	(NSW) Emissions Data Management System
EF	Emission factor A quantity which expresses the mass of a pollutant emitted per unit of activity. For road transport the unit of activity is usually either distance (ie g/km) or fuel consumed (ie g/litre)
Egress	Exit
EHC Act	*Environmentally Hazardous Chemicals Act 1985* (NSW)
EIA	Environmental Impact Assessment
EIS	Environmental impact statement
Electrical conductivity	The measure of a material's ability to accommodate the transport of an electric charge
Embankment	An earthen structure where the road (or other infrastructure) subgrade level is about the natural surface
Emergency management	A range of measures to manage risks to communities and the environment. In the flood context it may include measures to prevent, prepare for, respond to and recover from flooding
EMF	Electromagnetic field

Term	Meaning
Emission rate	A quantity which expresses the mass of a pollutant emitted per unit of time (eg g/second)
Emissions scenario	A plausible representation of the future development of emissions of substances that are potentially radiatively active (eg greenhouse gases, aerosols) based on a coherent and internally consistent set of assumptions about driving forces (such as demographic and socio-economic development, technological change) and their key relationships (CSIRO and BoM 2015)
Enabling works	Works which are required to enable the commencement of the main construction works
ENMM	Environmental Noise Management Manual
Entry ramp	A ramp by which one enters a limited-access highway/tunnel
Environment	As defined within the *Environmental Planning and Assessment Act 1979* (NSW), all aspects of the surroundings of humans, whether affecting any human as an individual or in his or her social groupings
EOI	Expressions of interest
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EP&A Regulation	Environmental Planning and Assessment Regulation 2000 (NSW)
EPA	NSW Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
EPHC	Environment Protection Heritage Council
EPL	Environment Protection Licence under the *Protection of the Environment Operations Act 1997* (NSW)
Erosion	A natural process where wind or water detaches a soil particle and provides energy to move the particle
Exit ramp	A ramp by which one exits a limited-access highway/tunnel
Extreme rainfall	There is no consistent global definition for extreme rainfall. It can be defined by either relative rainfall at a location (amount relative to averages), or absolute rainfall amounts (eg over 100 millimetres in a single day). In this report, an extreme rainfall event is defined as the wettest day in 20 years
Extreme temperature	Definitions vary, however this report refers to extreme temperature as hot days (days above 35˚C) and very hot days (days above 40˚C)
F	
Feasible and reasonable	Consideration of standard or good practice taking into account the benefit of proposed measures and their technological and associated operational application in the NSW and Australian context. 'Feasible' relates to engineering considerations and what is practical to build. 'Reasonable' relates to the application of judgement in arriving at a decision, taking into account mitigation benefits and cost of mitigation versus benefits provided, community expectations and nature and extent of potential improvements
Flash flooding	Flooding which is sudden and unexpected. It is often caused by sudden local or nearby heavy rainfall. It is often defined as flooding which peaks within six hours of the rain event
Flood	Relatively high stream flow which overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or local overland flooding associated with major drainage before entering a watercourse, and/or coastal inundation resulting from super-elevated sea levels and/or waves overtopping coastline defences excluding tsunami
Flood prone land	Land susceptible to flooding by the probable maximum flood. Note that the flood prone land is also known as flood liable land

Term	Meaning
Flood storage area	Those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood. The extent and behaviour of flood storage areas may change with flood severity, and loss of flood storage can increase the severity of flood impacts by reducing natural flood attenuation. It is necessary to investigate a range of flood sizes before defining flood storage areas
Floodplain	Area of land which is inundated by floods up to and including the probable maximum flood event (ie flood prone land)
Floodplain Risk Management Plan	A management plan developed in accordance with the principles and guidelines in the NSW Floodplain development manual (DIPNR 2005). Usually includes both written and diagrammatic information describing how particular areas of flood prone land are to be used and managed to achieve defined objectives
FMS	Flood management strategy
FPL	Flood planning level
Fracture	Cracks within the strata that develop naturally or as a result of underground works
Freeboard	A factor of safety typically used in relation to the setting of floor levels, levee crest levels, etc. It is usually expressed as the difference in height between the adopted flood planning level and the peak height of the flood used to determine the flood planning level. Freeboard provides a factor of safety to compensate for uncertainties in the estimation of flood levels across the floodplain, such as wave action, localised hydraulic behaviour and impacts that are specific event related, such as levee and embankment settlement, and other effects such as 'greenhouse' and climate change. Freeboard is included in the Flood Planning Level
G	
GDE	Groundwater dependent ecosystem Refers to communities of plants, animals and other organisms whose extent and life process are dependent on groundwater, such as wetlands and vegetation on coastal sand dunes
Geomorphology	Physical features of the earth's surface and their relation to its geological structures
Geotechnical investigation	Below ground investigation including soil and groundwater sampling and testing
GHG	Greenhouse gas
GI	Ground integrity
GIS	Geographical information system
GLC	Ground-level concentration
GMP	Groundwater monitoring program
GPS	Global positioning system
Grade	The rate of longitudinal rise (or fall) with respect to the horizontal expressed as a percentage or ratio
Grade separation	The separation of road, rail or other traffic so that crossing movements at intersections are at different levels
Greenhouse gas	Greenhouse gases are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of terrestrial radiation emitted by the Earth's surface, the atmosphere itself, and by clouds. Water vapour (H_2O), carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4) and ozone (O_3) are the primary greenhouse gases in the Earth's atmosphere (CSIRO and BoM 2015)
Groundwater	Water that is held in rocks and soil beneath the earth's surface
Groundwater aggressivity	The extent to which groundwater may corrode or degrade materials
Groundwater gauging	Obtaining data from groundwater wells

Term	Meaning
GSV	Ground surface visibility
GVA	Gross value add
GVM	Gross vehicle mass
H	
ha	Hectare
Habitat	An area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic component (OEH 2014a)
Hazard	A source of potential harm or a situation with a potential to cause loss of human life or damage to physical assets
HCA	Heritage conservation area
HCV	Heavy commercial vehicle (interchangeable with HGV – see below)
HDV	Heavy-duty vehicle, which includes heavy goods vehicles, buses and coaches
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)
Heritage Council	Heritage Council of NSW
Heritage item	Any place, building or object listed on a statutory heritage register
HGV	Heavy goods vehicle (truck)
Hydraulic conductivity	A characteristic of soil that describes how easily water moves through it
Hydrogeochemical	Chemical characteristics of groundwater
Hydrogeology	The area of geology that deals with the distribution and movement of groundwater in soils and rocks
Hydrology	The study of rainfall and surface water runoff processes
Hz	Hertz. A measure of frequency
I	
ICNG	*Interim Construction Noise Guideline* (NSW DECC 2009a)
Impact	Influence or effect exerted by a project or other activity on the natural, built and community environment
In situ	In the natural or original position. Applied to a rock, soil, or fossil when occurring in the situation in which it was originally formed or deposited
Infiltration	The downward movement of water into soil and rock. It is largely governed by the structural condition of the soil, the nature of the soil surface (including presence of vegetation) and the antecedent moisture content of the soil
Infrastructure SEPP	*State Environmental Planning Policy (Infrastructure) 2007* (NSW)
Ingress	Enter
Inner West Council	The amalgamation of the former local government areas of Ashfield, Leichhardt and Marrickville, proclaimed on 12 May 2016
INP	Industrial Noise Policy
Inside shoulder	The area of pavement outside the traffic lanes that is closest to the 'fast' lane
Interchange	A grade separation of two or more roads with one or more interconnecting carriageways
Intrusive item	Place within a heritage conservation area that detracts from its heritage significance
J	
Just Terms Act	*Land Acquisition (Just Terms Compensation) Act 1991* (NSW)
K	
KFH	Key fish habitat
kL	Kilolitre

Term	Meaning
kL/day	Kilolitres per day
Km	kilometres
kN	Kilonewton
KTP	Key threatening process
L	
L/s/km	Litres per second per kilometre
L_{Aeq}	The 'energy average noise level'
L_{A90}	The "background noise level" in the absence of construction activities. This parameter represents the average minimum noise level during the daytime, evening and night-time periods respectively. The LAeq(15minute) construction Noise Management Levels (NMLs) are based on the LA90 background noise levels
L_{AFmax}	The maximum fast time weighted noise level from road traffic noise occurring at a particular location
LALC	Local Aboriginal land council
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
Landscape design	The design of the natural and built environment. Soft landscape design involves design using vegetative materials such as trees, shrubs, groundcovers. Hard landscape design involves design using hard materials such as pavement, walls and ramps
Lane	A portion of the carriageway allotted for the use of a single line of vehicles
LCV	Light commercial vehicle
LCZ	Landscape character zone
Leachate	Liquid that 'leaches' (drains) from a landfill or stockpile
LEP	Local environmental plan
LGA	Local government area
Licensed discharge point	A location where a licensed operation discharges water to the environment in accordance with conditions stipulated within the site environment protection licence (EPL)
Local road	A road or street used primarily for access to abutting properties
Localised flooding	Localised flooding occurs when components of the drainage system are undersized or blocked and cannot accommodate the incoming overland surface flows, resulting in the flooding of a localised area
LoS	Level of service
M	
m	Metres
m^2	Square metres
m^3	Cubic metres
M4 East Motorway/project	A component of the WestConnex program of works. Extension of the M4 Motorway in tunnels between Homebush and Haberfield via Concord. Includes provision for a future connection to the M4-M5 Link at the Wattle Street interchange
M4-M5 Link	The approved project that is subject to this proposed modification. A component of the WestConnex program of works
Mainline tunnels	The M4-M5 Link mainline tunnels connecting with the M4 East Motorway at Haberfield and the New M5 Motorway at St Peters
Mainstream flooding	Inundation of normally dry land occurring when water overflows the natural or artificial banks of a stream, river, estuary, lake or dam
Mean rainfall	The arithmetically averaged total amount of precipitation recorded during a calendar month or year

Term	Meaning
Median	The central reservation which separates carriageways from traffic travelling in the opposite direction
mg/L	Milligrams per litre
microSiemens per centimetre (mS/cm)	A measure of electrical conductivity. Commonly used to measure the salinity of water
Mid-block	Section of road between two intersections
MODFLOW	A three-dimensional finite-difference groundwater model
Motorway	Fast, high volume controlled access roads. May be tolled or untolled
MUSIC	Model for Urban Stormwater Improvement Conceptualisation
MVA	Megavolt-amp
N	
NB	Northbound
NCA	Noise catchment area
NCG	*Noise Criteria Guideline* (Roads and Maritime, 2015)
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
New M5 Motorway/project	A component of the WestConnex program of works. Located from Kingsgrove to St Peters (under construction)
NH_3	Ammonia
NHL	National heritage list
NIWA	National Institute of Water and Atmospheric Research (New Zealand)
NLA	National Library of Australia
NMG	*Noise Mitigation Guideline* (Roads and Maritime, 2015)
NML	Noise management level
Northcote Street civil site	An approved construction ancillary facility for the M4-M5 Link project located at Haberfield
Northcote Street civil and tunnel site	A construction ancillary facility for the M4-M5 project located at Haberfield which would be used as a civil and tunnel site for the proposed modification
NO_X	Oxides of nitrogen
NoW	NSW Office of Water
NPI	National Pollutant Inventory
NSW	New South Wales
NSW EPA	NSW Environment Protection Authority
NSW Health	NSW Department of Health
NWQMS	National Water Quality Management Strategy
NZ	New Zealand
O	
OC	Organic carbon
OCP	Organochlorine Pesticides
OEH	NSW Office of Environment and Heritage (Formerly DECCW)
OEMP	Operational Environmental Management Plan
OOHW	Out-of-hours work
ONVR	Operational Noise and Vibration Review
Overbridge	Bridge that conveys another road, rail or pedestrians over the described road
Overland flooding	Inundation by local runoff rather than overbank discharge from a stream, river, estuary, lake or dam
P	
Parcel of land	Refers to an individual lot number (lot) and deposited plan (DP)
Parramatta Road East civil site	An approved construction ancillary facility for the M4-M5 Link project at Haberfield
Parramatta Road West civil and tunnel site	An approved construction ancillary facility for the M4-M5 Link project at Ashfield (as described in the M4-M5 Link EIS)

Term	Meaning
Parramatta Road East civil site	A construction ancillary facility for the M4-M5 Link project at Haberfield which would be used as civil sites in accordance with condition of approval C19 and other conditions of the project approval for the proposed modification
Parramatta Road West civil site	A construction ancillary facility for the M4-M5 Link project at Haberfield which would be used as civil sites in accordance with condition of approval C19 and other conditions of the project approval for the proposed modification
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
PCU	Passenger car unit
Peak discharge	The maximum discharge occurring during a flood event
Peak flood level	The maximum water level occurring during a flood event
Permeability	Ability of a material to transmit water
pH	Numeric scale ranging from zero to 14 used to specify the acidity or alkalinity of an aqueous solution. Solutions with a pH less than seven are acidic and solutions with a pH greater than seven are alkaline. Pure water has a pH of seven and is neutral
Piezometer (monitoring well)	A non-pumping monitoring well, generally of small diameter that is used to measure the elevation of the water table or potentiometric surface. A piezometer generally has a short well screen through which water can enter
PM	(Airborne) particulate matter
PM_{10}	Airborne particulate matter with an aerodynamic diameter of less than 10 micrometres (µm)
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of less than 2.5 micrometres (µm)
PM peak hour	Unless otherwise stated, this refers to trips travelling on the network during the average one hour peak period between 3pm to 6pm on a weekday
PMF	Probable maximum flood The flood that occur as a result of the probable maximum precipitation on a study catchment. The probable maximum flood is the largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation coupled with the worst flood producing catchment conditions. Generally, it is not physically or economically possible to provide complete protection against this event. The probable maximum flood defines the extent of flood prone land (ie the floodplain)
PPV	Peak Particle Velocity
POEO Act	*Protection of the Environment Operations Act 1997* (NSW)
Pollutant	Any measured concentration of solid or liquid matter that is not naturally present in the environment
Portal	The entry and/or exit to a tunnel
ppm	Parts per million
ppmv	Parts per million by volume
Pre-construction	All work prior to, and in respect of the State significant infrastructure, that is excluded from the definition of construction
Probability	A statistical measure of the expected chance or likelihood of occurrence

Term	Meaning
Project	A new multi-lane road link between the M4 East Motorway at Haberfield and the New M5 Motorway at St Peters. The project would also include an interchange at Lilyfield and Rozelle (the Rozelle interchange) and a tunnel connection between Anzac Bridge and Victoria Road, east of Iron Cove Bridge (Iron Cove Link). In addition, construction of tunnels, ramps and associated infrastructure to provide connections to the proposed future Western Harbour Tunnel and Beaches Link project would be carried out at the Rozelle interchange
Project footprint	The land required to construct and operate the project. This includes permanent operational infrastructure (including the tunnels), and land required temporarily for construction
Property	Based on ownership, with the potential to contain more than one lot and DP
Proponent	The person or organisation that proposes to carry out the project or activity. For the purpose of the project, the proponent is NSW Roads and Maritime Services
Public transport	Includes train, bus (government and private), ferry (government and private) and light rail (government and private) services
PV	Passenger vehicle
Pyrmont Bridge Road civil and tunnel site	A construction ancillary facility for the M4-M5 Link project at Annandale
Q	
R	
RAP	Remedial action plan
RAP	Registered Aboriginal parties
RBL	Rating background levels
REF	Review of environmental factors
Residual land	Acquired land not required during operation of the project
Revegetation	Direct seeding or planting (generally with native species) within an area in order to re-establish vegetation that was previously removed from that area
RH	Relative humidity
Riparian	The part of the landscape adjoining rivers and streams that has a direct influence on the water and aquatic ecosystems within them
RNP	Road Noise Policy
Road reserve	A legally defined area of land within which facilities such as roads, footpaths and associated features may be constructed for public travel
Road Safety Strategy	National Road Safety Strategy for Australia 2011 – 2020
Road header	A commonly used machine for excavation in sandstone using picks mounted on a rotary cutter head attached to a hydraulically operated boom
Roads and Maritime	NSW Roads and Maritime Services
Roadside furniture	A general term covering all signs, street lights, protective devices for the control, guidance and safety of traffic and convenience of road users
RTA	NSW Roads and Traffic Authority (now NSW Roads and Maritime Services)
Runoff	The amount of rainfall that ends up as streamflow, also known as rainfall excess
RWR	Residential, workplace and recreational This term refers to all discrete receptor locations along the project corridor, and mainly covers residential and commercial land uses
S	
s	Second

Term	Meaning
S170	State Agency Section 170 Heritage and Conservation Register. Section 170 of the *Heritage Act 1977* (NSW) requires NSW Government agencies to keep a register of heritage items/assets owned, occupied or managed by that government agency
Salinity	The concentration of dissolved salts in water
SB	Southbound
SCATS	Sydney coordinated adaptive traffic system
SCR	Selective catalytic reduction
Scour	Removal of sediment such as sand and gravel from around bridge abutments or piers caused by moving water
SEARs	Secretary's Environmental Assessment Requirements Requirements and specifications for an environmental assessment prepared by the Secretary of the NSW Department of the Planning and Environment under section 115Y of the *Environmental Planning and Assessment Act 1979* (NSW)
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
Sedimentation basin	A stormwater detention system that promotes the settling of sediments trough the reduction of flow velocities and temporary detention. Key elements include purpose designed inlet and outlet structures, settling pond and high flow, overflow structures
Sensitive receiver/receptor	Includes residences, educational institutions (including preschools, schools, universities, TAFE colleges), health care facilities (including nursing homes, hospitals), religious facilities (including churches), child care centres, passive recreation areas (including outdoor grounds used for teaching), active recreation areas (including parks and sports grounds), commercial premises (including film and television studios, research facilities, entertainment spaces, temporary accommodation such as caravan parks and camping grounds, restaurants, office premises, retail spaces and industrial premises)
SEPP	State Environmental Planning Policy
SEPP 19	State Environmental Planning Policy No. 19 – Bushland in Urban Areas
SEPP 33	State Environmental Planning Policy No. 33 – Hazardous and Offensive Development
SEPP 55	State Environmental Planning Policy No. 55 – Remediation of Land
SER	Strategic Environmental Review
Settlement	Refers to how ground can move due to the construction of new infrastructure
SHI	NSW State Heritage Inventory database
SHPRC	Sydney Harbour and Parramatta River Catchment
SHR	State Heritage Register
SHWQIP	Sydney Harbour Water Quality Improvement Plan
Shotcrete	The spraying of concrete and mortar onto a surface at high velocity
Shoulder	The portion of the carriageway beyond the traffic lanes adjacent to and flush with the surface of the pavement
SMC	Sydney Motorway Corporation
SMCMA	Sydney Metropolitan Catchment Management Authority
SO_2	Sulfur dioxide
SO_X	Sulfur oxides
SOA	Secondary organic aerosol
Socio-economic	Involving combination of social and economic matters
Soil salinity	Salt content of soil
Span	The distance between the centres of adjacent supports of a bridge
Spoil	Surplus excavated material
SREP	Sydney Regional Environmental Plan

Term	Meaning
SREP 26	*Sydney Regional Environmental Plan No. 26 – City West*
SSI	State significant infrastructure
SSIAR	State significant infrastructure application report
St Peters interchange	A component of the New M5 project, located at the former Alexandria Landfill site at St Peters. Approved and under construction as part of the New M5 project. Additional construction works proposed as part of the M4-M5 Link project
Staging	Refers to the division of the project into multiple contract packages for construction purposes, and/or the construction or operation of the overall project in discrete phases
State and Regional Development SEPP	State Environmental Planning Policy (State and Regional Development) 2011
Stockpile	Temporary stored materials such as soil, sand, gravel, spoil/waste
Storativity	The volume of water an aquifer releases from, or takes into storage, per unit surface area of the aquifer per unit change in head. It is equal to the product of specific storage and aquifer thickness. In an unconfined aquifer the storativity is known as the specific yield
Strata	Geological layers below the ground surface
Stream order	A classification system which assigns an 'order' to waterways according to the number of additional tributaries associated with each waterway, to provide a measure of system complexity
Structure (soil)	The way soil particles group together to form aggregates
Stub tunnel	Driven tunnels constructed to connect to potential future motorway links
Surface road concentration (air quality)	Describes the contribution of pollutants from the surface road network. It includes not only the contribution of the nearest road at the receptor, but also the net contribution of the modelled road network at the receptor
Surface water	Water flowing or held in streams, rivers and other wetlands in the landscape
SW	Water quality monitoring sample ID
Sydney Gateway	A high-capacity connection between the St Peters interchange (under construction as part of the New M5 project) and the Sydney Airport and Port Botany precinct
Sydney Harbour Catchment SREP	*Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005*
T	
TBM	Tunnel boring machine
TEOM	Tapered Element Oscillating Microbalance
TEOM-FDMS	TEOM with Filter Dynamic Measurement System
TEQ	Toxicity equivalent
TEUs	20-foot equivalent units
The Blue Book	*Managing Urban Stormwater – Soils and Construction Volumes 1 and 2* (NSW Government 2004 and 2006)
THC	Total hydrocarbons
Topography	Surface features in an area of land
Total concentration (air quality)	The sum of the background, surface road and ventilation outlet concentrations. It may relate to conditions with or without the project under assessment
Toxicity	The degree of danger posed by a substance to human, animal or plant life
TPA	Transport Performance Analytics
Transport for NSW	NSW Government Department Transport for NSW
TRAQ	Tool for Roadside Air Quality
TRH	Total recoverable hydrocarbons
Truck and dog construction vehicle	A vehicle with 20 cubic metre capacity and maximum length of 19 metres
TSC Act	*Threatened Species Conservation Act 1995* (NSW)

Term	Meaning
TSP	Total suspended particulate (matter)
TSS	Total suspended solids
Tunnel boring machine	An excavation machine that 'bores' through soil or rock to create a tunnel with a circular cross section (as opposed to drilling and blasting methods)
Turbidity	A measure of light penetration through a water column containing particles of matter in suspension
Typical cross section	A cross section of a carriageway showing typical dimensional details, furniture locations and features of the pavement construction
U	
UDLP	Urban Design and Landscape Plan
UDLP land	Project land that has been identified as subject to the UDLP
UK	United Kingdom
Ultrafines	Particulate matter below 0.1 microns in diameter
UN	United Nations
Urban design	The process and product of designing human settlements, and their supporting infrastructure, in urban and rural environments
V	
V/C	Volume to capacity ratio
VDV	Vibration dose value
Ventilation facility	Facility for the mechanical removal of air from the mainline tunnels, or mechanical introduction of air into the tunnels. May comprise one or more ventilation outlets
VENM	Virgin excavated natural material
Ventilation outlet	The location and structure from which air within a tunnel is expelled
VIA	Visual impact assessment
Visual amenity	Pleasantness or attractiveness of a place or area
Vulnerable	As defined under the *Threatened Species Conservation Act 1995* (NSW), a species that is facing a high risk of extinction in NSW in the medium-term future
VWP	Vibrating wire piezometers
W	
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)
Wattle Street civil and tunnel site	A construction ancillary facility for the M4-M5 Link project located at Haberfield
Wattle Street interchange	An interchange to connect Wattle Street (City West Link) with the M4 East and the M4-M5 Link tunnels. Approved and under construction as part of the M4 East project. Additional construction works proposed as part of the M4-M5 Link project
Western Harbour Tunnel and Beaches Link	The Western Harbour Tunnel component would connect to the M4-M5 Link at the Rozelle interchange, cross underneath Sydney Harbour between the Birchgrove and Waverton areas, and connect with the Warringah Freeway at North Sydney. The Beaches Link component would comprise a tunnel that would connect to the Warringah Freeway, cross underneath Middle Harbour and connect with the Burnt Bridge Creek Deviation at Balgowlah and Wakehurst Parkway at Seaforth. It would also involve the duplication of the Wakehurst Parkway between Seaforth and Frenchs Forest
WestConnex program of works	A program of works that includes the M4 Widening, King Georges Road Interchange Upgrade, M4 East, New M5 and M4-M5 Link projects
WM Act	*Water Management Act 2000* (NSW)
WQIP	Water quality improvement plan

Term	Meaning
WQPMP	Water quality plan and monitoring program
WRTM	WestConnex Road Traffic Model
WSROC	Western Sydney Regional Organisation of Councils Ltd
WSUD	Water sensitive urban design
WQO	Water quality objective
Other	
β coefficient	Beta coefficient A measure of sensitivity
µg	microgram
µg/m^3	micrograms per cubic metre

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Executive summary

The approved project

The M4-M5 Link project (the project) is part of the WestConnex program of works that, together with the proposed future Sydney Gateway, would facilitate improved connections between western Sydney, Sydney Airport and Port Botany and south and south-west Sydney, as well as better connectivity between the important economic centres along Sydney's Global Economic Corridor and through local communities.

The project includes the construction and operation of a new multi-lane road link between the M4 East Motorway at Haberfield and the New M5 Motorway at St Peters, an interchange at Lilyfield and Rozelle (the Rozelle interchange) and a tunnel connection between Anzac Bridge and Victoria Road, east of Iron Cove Bridge (Iron Cove Link).

Approval for the construction and operation of the project was granted on 17 April 2018 by the NSW Minister for Planning (application number SSI 7485).

The approved project provides for the construction and operation of the project in two stages:

- Stage 1[1] - construction of the mainline tunnels between the M4 East Motorway at Haberfield and the New M5 Motorway at St Peters. These works are anticipated to commence in 2018 with the mainline tunnel opening to traffic in 2022.
- Stage 2[2] - construction of the Rozelle interchange and Iron Cove Link. Stage 2 works are expected to commence in 2019.

The Environmental Impact Statement (EIS) described and assessed 12 construction ancillary facilities and the Submissions and Preferred Infrastructure Report (SPIR) described and assessed an additional construction ancillary facility, White Bay civil site. Within the Haberfield and Ashfield area the EIS described and assessed two options for construction ancillary facilities (Option A and Option B). The EIS also stated that the number, location and layout of construction ancillary facilities would be finalised as part of construction planning during detailed design.

Condition of approval C19 provides that only one of two ancillary facility options (A or B) presented in Chapter 6 of the EIS can be implemented at Haberfield except if one site is used for parking and other works that do not exceed the 'noise affected' Noise Management Levels as identified in the Interim Construction Noise Guideline (NSW DECC, 2009) (ICNG).

Proposed modification

Construction design and planning has progressed since the assessment contained in the EIS and SPIR and a review of the concept design for the approved project has occurred. As a result, following ongoing construction design and planning, the proponent has further optimised the construction site arrangements assessed in the EIS and SPIR to reduce community impacts and to decrease the overall number of construction sites required for Stage 1 of the project.

The proponent proposes to:

- Remove the Darley Road civil and tunnel site (C4) from the project
- Proceed with Option A for the construction ancillary facilities proposed at Haberfield and Ashfield but with changes to some activities at a number of the construction ancillary facilities which arise from the removal of the Darley Road civil and tunnel site and the use of the Northcote Street site for tunnelling.

[1] M4-M5 Link Stage 1 (the mainline tunnel) is also commonly referred to as Stage 3A of the WestConnex program of works

[2] M4-M5 Link Stage 2 (the Rozelle interchange and Iron Cove Link) is also commonly referred to as Stage 3B of the WestConnex program of works

The proposed changes are summarised in Table 1**Table 1** and described further below.

Table 1 Change to construction ancillary facilities at Haberfield, Ashfield and Leichhardt

EIS and SPIR	Proposed modification
Wattle Street civil and tunnel site (C1a)	No change
Haberfield civil site (C2a/C2b)[1]	No change
Northcote Street civil site (C3a)	Northcote Street civil and tunnel site. Includes tunnelling, spoil handling and spoil haulage from this site
Parramatta Road West civil and tunnel site (C1b)	Parramatta Road West civil site[2] Inclusion of a temporary pedestrian walkway above Parramatta Road to link to the Parramatta Road East civil site.
Parramatta Road East civil site (C3b)	Parramatta Road East civil site[2] Inclusion of a temporary pedestrian walkway above Parramatta Road to link to the Parramatta Road West civil site.
Darley Road civil and tunnel site (C4)	Removal of site

Notes

1. The use and footprint of this site was amended in sections B11.6.8 and C6.1.3 of the SPIR to be as per the arrangement for the Haberfield civil site (C2b).
2. Condition C19 of the planning approval allowed use of the site for parking and other works that do not exceed the 'noise affected' Noise Management Levels as identified in the ICNG.

The proposed modification relates to Stage 1 of the approved project. The following points provide an overview of the proposed modification:

- The Northcote Street civil site (C3a) would become a civil and tunnel site. This would result in 24 hours, seven days a week tunnelling works being carried out from this location within an existing acoustic shed. The Northcote Street site is currently being used for tunnelling as part of the M4 East project. A construction access tunnel is to be provided from the Northcote Street site that utilises part of the existing access tunnel for the M4 East project. Two spoil haulage routes from this site are proposed, Route A (Wattle Street / Ramsay Street / Fairlight Street / Great North Road) and Route B (Wattle Street / G-loop). Relevant conditions of the project approval would apply to the use of this site for tunnelling and civil works to ensure potential impacts are managed consistently with the project approval
- The Parramatta Road West and Parramatta Road East civil sites (C1b and C3b) would be used as civil sites in accordance with condition of approval C19 and other conditions of the project approval. The sites would be used for site offices, light and heavy vehicle car parking, shuttle bus services, workshop and storage of equipment, materials and construction machinery. Both sites would operate 24 hours a day, seven days a week in accordance with the conditions of the project approval. No tunnelling, tunnel spoil stockpiling and handling or tunnel spoil haulage would occur at these sites
- A temporary pedestrian walkway would be constructed above Parramatta Road to connect the Parramatta Road East and Parramatta Road West civil sites. The pedestrian walkway would only be available for use by project staff during the construction phase of the project and would not be available for public use. The pedestrian walkway would be demobilised upon completion of the construction phase of the project
- Removal of the Darley Road civil and tunnel site (C4) from the project. No construction activities or permanent operational infrastructure would be provided at this location. The EIS provided for construction spoil to be removed from the Darley Road site. This spoil would now be removed from other tunnelling sites
- The relocation of the operational water treatment plant from the Darley Road motorway operations complex (as described in the EIS) to the Campbell Road motorway operations complex at the St Peters interchange.

As a result of the changes proposed in the modification, certain conditions of approval will need to be deleted or modified.

Consultation

The following consultation activities have been carried out for the proposed modification to date:

- Media releases to Sydney metro news organisations
- M4-M5 Link Community Update Brochure and Community Update Email
- Meetings with WestConnex Community Reference Groups
- Door knocking of stakeholders in the Ashfield, Haberfield and Leichhardt areas likely to be impacted by the modification and along the proposed haulage routes for the Northcote Street civil and tunnel site
- Meetings with the NSW Environment Protection Authority, Sydney Water, Inner West Council and City of Sydney Council.

The modification report will be exhibited for 14 days from 12 September 2018. The community and other stakeholders will be able to provide feedback on the modification to the NSW Department of Planning and Environment (DPE) as submissions.

Following exhibition of the modification Roads and Maritime will review the submissions received and respond to the issues raised in a Response to Submissions Report for the modification. This report will be provided to DPE and will be assessed prior to a determination being made. If during exhibition or during the response to submissions process further changes to the proposed modification are identified, these changes would also be described and assessed.

Environmental assessment

Potential environmental impacts associated with the proposed modification have been assessed in the modification report and compared to the environmental impacts assessed in the EIS. Key environmental impacts for the proposed modification are summarised below.

Traffic and transport

A construction traffic assessment was undertaken for the construction ancillary facilities in the Haberfield and Ashfield area, including the proposed spoil haulage routes from the Northcote Street civil and tunnel site. The assessment determined that there would be minimal impact on the mid-block roadway and intersection level of service through the Haberfield, Ashfield and Five Dock modelled road network.

The proposed spoil haulage routes for the Northcote Street civil and tunnel site would be more direct and less constrained by comparison to the proposed spoil haulage route for the Parramatta Road West civil and tunnel site described in the EIS and SPIR. The proposed spoil haulage routes would be restricted to state roads that are controlled by Roads and Maritime. Use of the G-loop would allow spoil haulage vehicles the option of using the M4 East motorway tunnels and, as a result, reduce impacts on the surface road network.

The proposed use of the Parramatta Road West and Parramatta Road East civil sites would result in reduction in heavy vehicle traffic impacts compared to the construction site arrangements proposed in the M4-M5 Link EIS and SPIR.

A preliminary assessment of parking provision for the construction ancillary facilities in the Haberfield and Ashfield area indicated that the proposed parking provision of around a total of 200 spaces would be able to meet the forecast construction workforce parking demand.

The construction of a temporary pedestrian walkway above Parramatta Road to connect the Parramatta Road East and Parramatta Road West civil sites is likely to have a minimal impact on traffic and transport. Impacts on the road network would occur primarily during establishment and decommissioning of the walkway structure and therefore over a short duration.

The relocation of the operational water treatment plant from Darley Road to the Campbell Road motorway operation complex (MOC5) at St Peters interchange is likely to have a negligible change in impact on traffic and transport users compared to the impact assessment in the M4-M5 Link EIS and SPIR, as no change in peak construction traffic volume or length of construction is forecast.

Noise and vibration

For the Northcote Street civil and tunnel site, minor noise impacts are predicted during the establishment and decommissioning of the site. These works would be conducted during standard daytime hours only and would be relatively short in duration. Tunnelling activities would occur largely within the existing acoustic shed and are predicted to result in minor to moderate impacts at surrounding receivers. A range of mitigation measures are available to mitigate these exceedances.

Minor noise impacts are predicted during site establishment and decommissioning of the G-loop, with some of these works likely to be undertaken outside of standard construction hours. These out of hours works would be of limited duration and managed by the mitigation measures in the M4-M5 Link SPIR and the relevant conditions of the project approval.

The two spoil haulage routes for the Northcote Street civil and tunnel site have been assessed and predicted noise from construction traffic is below the 2dB increase threshold for both spoil haulage routes. The project should consider the potential impact from maximum noise levels that heavy vehicles may have on surrounding receivers along Ramsay Street, Fairlight Street and Great North Road when finalising the routes for construction traffic during the night time period.

The new construction access tunnel at the Northcote Street civil and tunnel site will pass under a limited number of (less than 10) residential properties in the vicinity of Walker Avenue and Alt Street. Construction of the access tunnel will result in minimal ground-borne noise impacts to these properties when road headers are being used. During rock-breaker tunnelling works it is predicted that the night time criterion would be exceeded at a number of sensitive receivers in the vicinity of the access tunnel. A range of mitigation measures are available to mitigate these impacts.

A qualitative consistency assessment was undertaken for the proposed use of the Parramatta Road West and Parramatta Road East civil sites. The use of the sites is considered to be consistent with the assessment of noise impacts undertaken in the M4-M5 Link EIS and SPIR and would not result in a change to the mitigation measures proposed. The proposed modification would remove tunnelling activities from the site and is therefore expected to result in a reduction in the impact on nearby receivers previously predicted in association with tunnelling related activities.

A Construction Noise and Vibration Impact Statement (CNVIS) will be prepared based on the finalised construction methodology and will include consideration of the indicative revised layout and use of the site, including the location of specific items of plant. The CNVIS will include details of how the noise emissions from the sites will be managed to achieve compliance with the applicable noise management levels as required by condition of approval C19. Where non-compliances are predicted within the CNVIS, the contractor will explore a range of at source noise mitigation options.

Minor to moderate impacts are predicted at a small number of sensitive receivers during the limited night works to complete the lifting of the bridge span for the pedestrian walkway over Parramatta Road. The use of the pedestrian walkway by workers during the construction period is expected to result in negligible noise impacts.

Potential noise impacts associated with the construction of the water treatment plant would be consistent with the construction scenarios assessed in the EIS which did not identify any noise impacts at nearby receivers.

The water treatment plant at the Campbell Road motorway operations complex would include specific equipment designed to achieve compliance with the relevant noise criteria. The equipment and sound power levels modelled for the water treatment plant are indicative only and may be subject to change during the detailed design phase of the project.

Air quality

The construction air quality assessment involved the application of a semi-quantitative risk-based approach which was adapted for the proposed modification.

The assessment determined that without mitigation measures the risk of dust impacts due to construction activities was 'medium' to 'high'. However, if the identified mitigation measures are included in the relevant air quality management plans, construction dust is unlikely to represent a serious ongoing problem. Any effects would be temporary and relatively short in duration in the context of the total duration of the project. Provided that mitigation measures are implemented, the potential impacts are not considered to be significant.

Surface water and flooding

A surface water and flooding assessment was undertaken to assess potential construction and operational impacts in relation to surface water hydrology, surface water quality and flooding. The potential flood risk and localised drainage impacts associated with the modification are considered to be acceptable based on the mitigation measures in the M4-M5 Link SPIR and the relevant conditions of the project approval. The assessment of flood risk and mitigation measures identified will need to be refined as part of the future detailed design process.

Water quality impacts associated with construction phase discharges from the various construction sites and the proposed operational water treatment plant at the Campbell Road motorway operations complex have been assessed. Potential impacts on surface water quality during construction and operation of the modification are considered to be minor and manageable based on the mitigation measures in the M4-M5 Link SPIR and the relevant conditions of the project approval.

The relocated operational water treatment plant would be designed so that treated water would be in accordance with the discharge criteria specified in condition of approval E187 of the project approval. Treated water would be discharged to Alexandra Canal either via the proposed stormwater infrastructure for the New M5 project or via existing drainage infrastructure. Alternatively it would be discharged to sewer via a Trade Waste Agreement.

Potential scour and erosion impacts associated with releases to Dobroyd Canal, Alexandra Canal and Johnstons Creek are considered to be negligible. As potential scour impacts at Alexandra Canal are considered to be negligible, impacts on contaminated sediments in Alexandra Canal are also considered to be negligible beyond those assessed and approved as part of the New M5 project.

Other key benefits and impacts

The proposed modification would result in the following key benefits and impacts:

- The removal of the Darley Road civil and tunnel site from the project will ensure that potential noise, air quality, traffic and other impacts associated with tunnelling are avoided in this area. In addition potential ground-borne noise and vibration impacts associated with the proposed construction of a temporary access tunnel at this location would also be avoided
- The removal of the Darley Road civil and tunnel site from the project will result in tunnelling works at other project tunnelling sites being extended by around six months. This would result in an increase in the duration of traffic, air quality, noise and other impacts directly associated with tunnelling at these locations
- The use of the Northcote Street civil and tunnel site will extend tunnelling operations and associated noise, air quality, traffic and parking impacts at this site for a further four years. This site is being used for tunnelling by the M4 East project. This enables existing infrastructure at the site such as the acoustic shed, driveways, water treatment plant, site offices and other structures to be re-used thereby reducing impacts associated with site establishment activities
- The new construction access tunnel at the Northcote Street civil and tunnel site will be at a depth of over 30 metres where it passes under a limited number of residential properties in the vicinity of Walker Avenue and Alt Street. Predicted settlement impacts are minimal and well within accepted criteria

- The temporary overhead pedestrian walkway between the Parramatta Road West and Parramatta Road East civil sites would allow for the safe and efficient movement of construction workers over Parramatta Road. The walkway structure has been designed to achieve a clearance of six metres above Parramatta Road to allow for the safe movement of traffic. The visual impacts of the structure will be minimal when considered in the context of visual environment along this section of the Parramatta Road corridor
- The relocation of the operational water treatment plant to the Campbell Road motorway operations centre will occupy a small area of additional land at the St Peters interchange. However, the additional footprint would result in only a minimal impact on the proposed area of open space and landscaping on the southern side of Campbell Road that is being delivered as part of the New M5 project. The visual impact of the water treatment plant would be minimal.

Matters of national environmental significance

The nature of the modification activities means that no matters of national environmental significance under the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (EPBC Act) are likely to be impacted. As such, the modification application has not been referred to the Australian Government Department of the Environment and Energy for further assessment or approval under the EPBC Act.

Environmental management measures

The impacts associated with proposed modification can generally be accommodated by the existing environmental management measures provided in the EIS and SPIR. An additional environmental management measure has been recommended in relation the visual impacts associated with the relocation of the operational water treatment plant to St Peters. Some environmental management measures have been amended or deleted as a result of the removal of the Darley Road civil and tunnel site from the project.

Conditions of approval

Changes to a number of the conditions of approval have been proposed to accommodate the proposed modification. The proposed changes would provide certainty regarding the arrangement of construction ancillary facility sites at Haberfield and Ashfield and the removal of the Darley Road site at Leichhardt. All other conditions of approval would continue to apply to the project.

1 Introduction

1.1 Purpose of this report

This modification report provides the environmental assessment for the proposed modification to the M4-M5 Link project (the project) in accordance with section 5.25 of the *Environmental Planning & Assessment Act 1979* (NSW) (EP&A Act). This report includes:

- An overview of the approved project
- A description of the proposed modification to the approved project
- An assessment of the potential environmental impacts of the proposed modification
- Details of the changes to the conditions of the project approval required by the proposed modification
- Details of the changes to the approved environmental management measures required by the proposed modification
- Justification for the proposed modification.

1.2 Overview of M4-M5 Link project

Approval for the construction and operation of the project was granted on 17 April 2018 by the NSW Minister for Planning (application number SSI 7485). **Figure 1-1** provides an overview of the approved project.

The Environmental Impact Statement (EIS) describes construction and operation of the M4-M5 Link in two stages:

Stage 1[1], as described in the EIS included:

- Construction of the mainline tunnels between the M4 East Motorway at Haberfield and the New M5 Motorway at St Peters, stub tunnels to the Rozelle interchange (at the Inner West subsurface interchange) and ancillary infrastructure at the Darley Road motorway operations complex (MOC1) and Campbell Road motorway operations complex (MOC5)
- These works are anticipated to commence in 2018 with the mainline tunnel opening to traffic in 2022.

Stage 2[2] as described in the EIS, included:

- Construction of the Rozelle interchange and Iron Cove Link including connection to the stub tunnels at the Inner West subsurface interchange, connection to the surface road network at Lilyfield and Rozelle, and construction of tunnels, ramps and associated infrastructure as part of the Rozelle interchange to provide connections to the proposed future Western Harbour Tunnel and Beaches Link project. Ancillary infrastructure will be provided at Rozelle West motorway operations complex (MOC2), Rozelle East motorway operations complex (MOC3) and Iron Cove Link motorway operations complex (MOC4)
- Stage 2 works are expected to commence in 2019 with these components of the project opening to traffic in 2023.

The M4-M5 Link project is part of the WestConnex program of works that, together with the proposed future Sydney Gateway, would facilitate improved connections between western Sydney, Sydney Airport and Port Botany and south and south-west Sydney, as well as better connectivity between the

[1] M4-M5 Link Stage 1 (the mainline tunnel) is also commonly referred to as Stage 3A of the WestConnex program of works

[2] M4-M5 Link Stage 2 (the Rozelle interchange and Iron Cove Link) is also commonly referred to as Stage 3B of the WestConnex program of works

important economic centres along Sydney's Global Economic Corridor and through local communities.

A more comprehensive overview of the M4-M5 Link project, as well as other aspects of the WestConnex program of works, is provided within the EIS and the Submissions and Preferred Infrastructure Report (SPIR).

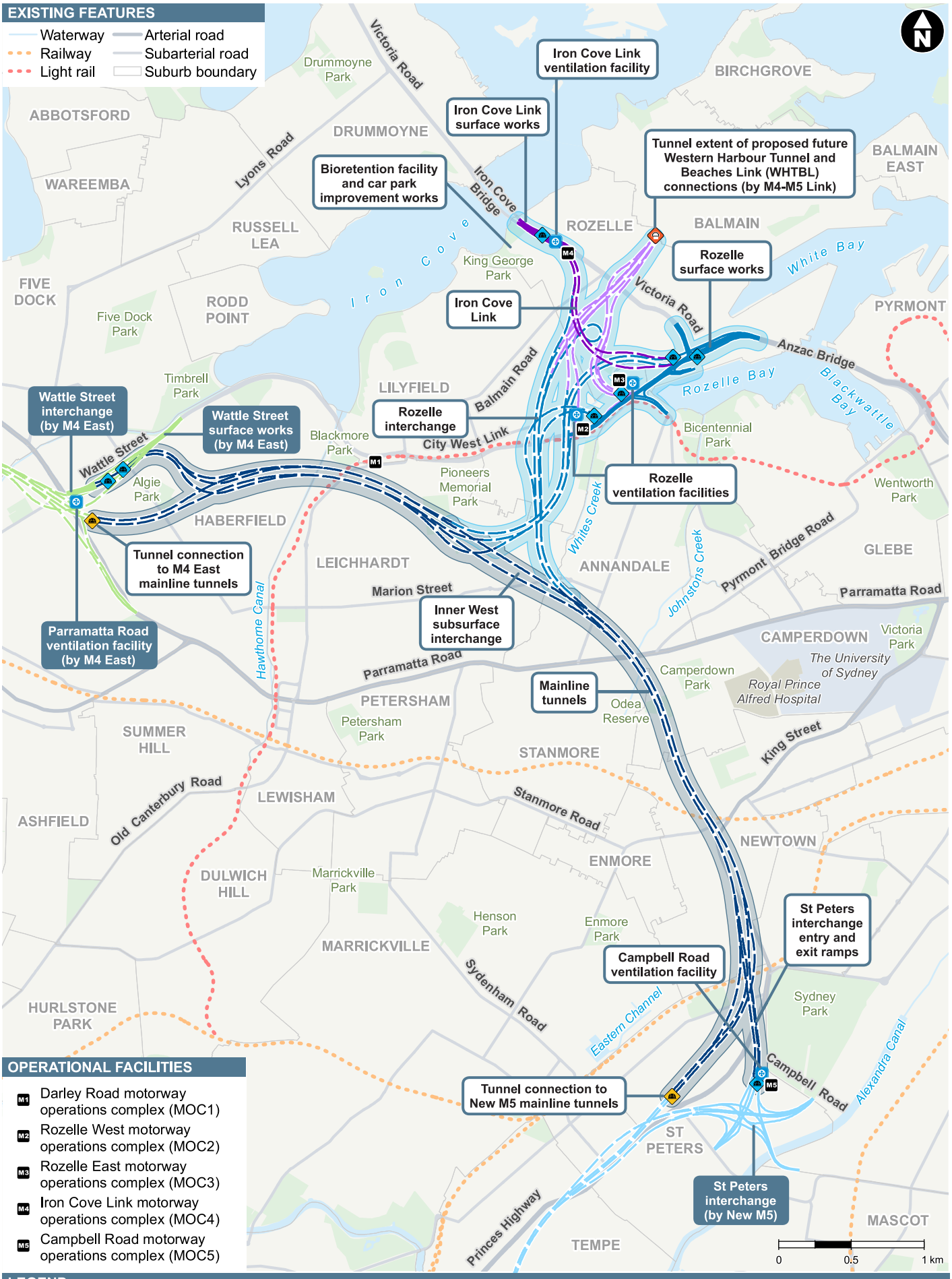

Figure 1-1 EIS overview of the M4-M5 Link project

1.3 Construction design and planning

The EIS for the project described and assessed 12 construction ancillary facilities. Part D of the SPIR described and assessed an additional construction ancillary facility, White Bay civil site (C11). Section 6.5.1 of the EIS stated that the number, location and layout of construction ancillary facilities would be finalised as part of detailed construction planning for the project.

Within the Haberfield and Ashfield area the EIS described and assessed two options for construction ancillary facilities (Option A and Option B as shown in **Table 1-1**).

Table 1-1 Possible construction ancillary facility combinations at Haberfield and Ashfield assessed in the EIS

Option A	Option B
Wattle Street civil and tunnel site (C1a)	Parramatta Road West civil and tunnel site (C1b)
Haberfield civil and tunnel site (C2a)	Haberfield civil site (C2b)
Northcote Street civil site (C3a)	Parramatta Road East civil site (C3b)

Section C6.1.3 of the SPIR clarified that the contractor may choose to use all or some of the construction ancillary facilities identified in the EIS, including any combination of the Option A and Option B facilities at Haberfield and Ashfield.

Condition of approval C19 provides that only one of two ancillary facility options (A or B) presented in Chapter 6 of the EIS can be implemented at Haberfield except if one site is used for parking and other works that do not exceed the 'noise affected' Noise Management Levels as identified in the Interim Construction Noise Guideline (NSW DECC, 2009) (ICNG).

Construction design and planning has progressed since the assessment contained in the EIS and SPIR and a review of the concept design for the approved project has occurred. As a result, following ongoing construction design and planning, the proponent has further optimised the construction site arrangements assessed in the EIS and SPIR to reduce community impacts and to decrease the overall number of construction sites required for Stage 1 of the project.

The proponent proposes to:

- Remove the Darley Road civil and tunnel site (C4) from the project
- Proceed with Option A for the construction ancillary facilities proposed at Haberfield and Ashfield but with changes to some activities at a number of the construction ancillary facilities which arise from the removal of the Darley Road civil and tunnel site and the use of the Northcote Street site for tunnelling.

The proposed changes are summarised in **Table 1-2** and described in **section 1.4** below.

Table 1-2 Change to construction ancillary facilities at Haberfield, Ashfield and Leichhardt

EIS and SPIR	Proposed modification
Wattle Street civil and tunnel site (C1a)	No change
Haberfield civil site (C2a/C2b)[1]	No change
Northcote Street civil site (C3a)	Northcote Street civil and tunnel site. Includes tunnelling, spoil handling and spoil haulage from this site
Parramatta Road West civil and tunnel site (C1b)	Parramatta Road West civil site[2] Inclusion of a temporary pedestrian walkway above Parramatta Road to link to the Parramatta Road East civil site.

EIS and SPIR	Proposed modification
Parramatta Road East civil site (C3b)	Parramatta Road East civil site[2] Inclusion of a temporary pedestrian walkway above Parramatta Road to link to the Parramatta Road West civil site.
Darley Road civil and tunnel site (C4)	Removal of site

Notes

1. The use and footprint of this site was amended in sections B11.6.8 and C6.1.3 of the SPIR to be as per the arrangement for the Haberfield civil site (C2b).
2. Condition C19 allowed use of the site for parking and other works that do not exceed the 'noise affected' Noise Management Levels as identified in the ICNG.

1.4 Overview of modification

The proposed modification relates to Stage 1 of the approved project. The following points provide an overview of the proposed modification:

- The Northcote Street civil site (C3a) would become a civil and tunnel site. This would result in 24 hours, seven days a week tunnelling works being carried out from this location within an existing acoustic shed. The Northcote Street site is being used for tunnelling as part of the M4 East project. A construction access tunnel is to be provided from the Northcote Street site that utilises part of the existing access tunnel for the M4 East project. Proposed spoil haulage routes to and from this site are identified in this modification report. Relevant conditions of the project approval would apply to the use of this site for tunnelling and civil works to ensure potential impacts are managed consistently with the project approval
- The Parramatta Road West and Parramatta Road East civil sites (C1b and C3b) would be used as civil sites in accordance with condition of approval C19 and other conditions of the project approval. The sites would be used for site offices, light and heavy vehicle car parking, shuttle bus services, workshop and storage of equipment, materials and construction machinery. Both sites would operate 24 hours a day, 7 days a week in accordance with the conditions of the project approval. No tunnelling, tunnel spoil stockpiling and handling or tunnel spoil haulage would occur at these sites
- A temporary pedestrian walkway would be constructed above Parramatta Road to connect the Parramatta Road East and Parramatta Road West civil sites. The pedestrian walkway would only be available for use by project staff during the construction phase of the project and would not be available for public use. The pedestrian walkway would be demobilised upon completion of the construction phase of the project
- Removal of the Darley Road civil and tunnel site (C4) from the project. No construction activities or permanent operational infrastructure would be provided at this location. The EIS provided for construction spoil to be removed from the Darley Road site. This spoil would now be removed from other tunnelling sites
- The relocation of the operational water treatment plant from the Darley Road motorway operations complex (as described in the EIS) to the Campbell Road motorway operations complex at the St Peters interchange.

Chapter 4 (Proposed modification) of this report provides a detailed description of the proposed modification.

The proposed modification would require changes to the conditions of the project approval. Proposed changes to the project approval are detailed in **Chapter 7** (Conditions of approval).

1.5 Need for modification

Since approval was granted for the M4-M5 Link, a contractor has been appointed to construct Stage 1 of the approved project on behalf of the proponent, NSW Roads and Maritime Services (Roads and Maritime).

Construction design and planning has progressed since the assessment contained in the EIS and SPIR and a review of the concept design for the approved project has occurred. As a result, the proponent has further optimised the construction site arrangements assessed in the EIS and SPIR to reduce environmental and community impacts and to decrease the overall number of construction sites required for the project. The main changes are described in **section 1.4** and in further detail in **Chapter 4** (Proposed modification).

However, not all of the changes proposed can be accommodated within the existing project approval. As such it is necessary to seek a modification to the project approval in accordance with Section 5.25 of the EP&A Act.

The approval of the modification would allow the contractor to construct the project using the approach summarised above.

1.6 Site establishment and/or construction works

Site establishment works (in accordance with an approved Site Establishment Management Plan) and/or construction works (in accordance with an approved Construction Environmental Management Plan) are proposed at a number of the project construction sites and will be carried out in accordance with the conditions of approval for the project.

1.7 Structure of this report

This report is structured as follows:

- **Chapter 1** (Introduction) provides an overview of the modification, its scope and purpose
- **Chapter 2** (Assessment process) outlines the statutory assessment requirements and explains the steps in the assessment and approval process
- **Chapter 3** (Approved project) provides a description of the approved project with a more detailed focus on the elements that are proposed to be changed by the modification
- **Chapter 4** (Proposed modification) provides a detailed description of the modification to the approved project
- **Chapter 5** (Consultation) outlines the consultation activities undertaken to date and in the future
- **Chapter 6** (Environmental assessment) identifies the relevant environmental issues, assesses the potential impacts of the modification and presents environmental management measures in response to those impacts
- **Chapter 7** (Conditions of approval) identifies the conditions of the project approval that are required to be amended as part of this modification
- **Chapter 8** (Environmental management measures) details changes to the approved environmental management measures as a result of this modification
- **Chapter 9** (Modification justification and conclusions) presents the justification for the modification
- **Appendix A** (Environmental assessment requirements for modification)
- **Appendix B** (Traffic and transport report)
- **Appendix C** (Noise and vibration report)
- **Appendix D** (Air quality report)
- **Appendix E** (Surface water and flooding report)
- **Appendix F** (Site photos).

2 Assessment process

This chapter describes the planning approval process and framework for the modification of the WestConnex M4-M5 Link (the project). The modification is related to Stage 1 of the project as described in **Chapter 1** (Introduction).

2.1 Approval framework

2.1.1 Project approval

The project was declared as State Significant Infrastructure (SSI) and Critical State Significant Infrastructure (critical SSI) and was therefore assessed and approved under Part 5 of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act). An Environmental Impact Statement (EIS) was prepared and placed on public exhibition from 18 August to 16 October 2017.

Following the public exhibition, a number of submissions (over 13,000) were received from the community and from NSW Government agencies and local councils. A submissions and preferred infrastructure report (SPIR) was produced to document the responses to the issues raised and to assess design changes in responses to the submissions received. The SPIR was lodged with the NSW Department of Planning and Environment (DPE) in January 2018.

Planning approval was granted by the NSW Minister for Planning on 17 April 2018 (application number SSI 7485) and was subject to a number of conditions relating to the construction and operation of the project.

2.1.2 Modification application

Since approval was granted for the M4-M5 Link, a contractor has been appointed to construct Stage 1 of the approved project on behalf of the proponent, NSW Roads and Maritime Services (Roads and Maritime).

Construction design and planning has progressed since the assessment contained in the EIS and SPIR and a review of the concept design for the approved project has occurred. As a result, the proponent has further optimised the construction site arrangements assessed in the EIS and SPIR to reduce environmental and community impacts and to decrease the overall number of construction sites required for Stage 1 of the project.

However, not all of the changes proposed can be accommodated within the existing project approval. As such Roads and Maritime as the proponent for the project, is proposing to modify project approval SSI 7485 under Section 5.25 of the EP&A Act. Section 5.25(2) of the EP&A Act states that "*the proponent may request the Minister to modify the Minister's approval for State significant infrastructure. The Minister's approval for a modification is not required if the infrastructure as modified will be consistent with the existing approval under this Division*".

Section 5.25(3) states that "*the request for the Minister's approval is to be lodged with the Planning Secretary. The Planning Secretary may notify the proponent of environmental assessment requirements with respect to the proposed modification that the proponent must comply with before the matter will be considered by the Minister*". Section 5.25(4) states that "*the Minister may modify the approval (with or without conditions) or disapprove of the modification*".

As a result of the changes proposed in the modification, certain conditions of approval will need to be deleted or modified. These changes are discussed further in **Chapter 7** (Conditions of approval).

2.2 Environmental planning instruments

Section 2.2 of the EIS provides an overview of the environmental planning instruments (EPIs) relevant to the project. This section notes that "*in general, section 115ZF(2) of the EP&A Act* (now section 5.22(2)) *excludes the application of environmental planning instruments to SSI projects (except as those instruments apply to the declaration of SSI or critical SSI*". Nevertheless a review of Section 2.2 of the EIS has confirmed that the discussion of the various EPIs relevant to the project remains valid for this modification application and as such it has not been repeated below. Indeed, as this

modification application applies to some areas of the project, certain EPIs (e.g. Sydney Regional Environmental Plan No. 26 – City West) are not relevant.

A review of current EPIs has identified that two new State Environmental Planning Policies (SEPPs) have been gazetted since lodgement of the EIS for the project. These are *State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017* (Vegetation SEPP) and *State Environmental Planning Policy (Coastal Management) 2018* (Coastal SEPP). A review of these SEPPs has confirmed that the Vegetation SEPP is not relevant for the modification application as no vegetation is likely to be impacted as a result of this modification.

The G-loop (refer to **Chapter 4** (Proposed modification) for further information) for the proposed modification is partially located within the Coastal Environment Area and Coastal Use Area mapped under the Coastal Management SEPP around Iron Cove Creek and Reg Coady Reserve.

Potential impacts to this area of Iron Cove Creek and Reg Coady Reserve are considered in **Chapter 6** (Environmental Assessment). The pedestrian path along the north side of Dobroyd Parade, which would be completed upon the opening of the M4 East project, would be realigned around the perimeter of the G-loop and existing access to the foreshore and adjacent open space areas would be maintained for pedestrians and cyclists. Works in this area would be located on waterfront land and would therefore be carried out in accordance with NSW Department of Primary Industries controlled activity guidelines as required by condition of approval E189 for the project.

On completion of construction of the M4-M5 Link project, the G-loop infrastructure would be removed and that part of Reg Coady Reserve would be rehabilitated in accordance with the M4 East Residual Land Management Plan.

2.3 Other NSW legislation

Section 2.3 of the EIS provides an overview of the other NSW legislation relevant to the project. A review of Section 2.3 of the EIS has confirmed that the discussion of the other NSW legislation relevant to the project remains valid for this modification application and as such it has not been repeated below. This includes the need for an Environment Protection Licence under Chapter 3 of the *Protection of the Environment Operations Act 1997* (NSW) (POEO Act). In accordance with clause 35 of Schedule 1 of the POEO Act, an Environment Protection Licence would be required for construction of the project.

2.4 Commonwealth legislation

Section 2.4 of the EIS provides an overview of Commonwealth legislation that is relevant to the project. It considered the requirements of the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (EPBC Act) and the *Airports Act 1996* (Commonwealth).

Consistent with the approved project described in the EIS and SPIR, the nature of the modification activities means that no matters of national environmental significance are likely to be impacted. As such, the modification application has not been referred to the Australian Government Department of the Environment and Energy for further assessment or approval under the EPBC Act.

The modification works would also not involve any changes to the design and operation of the mainline tunnels including any of the ventilation facilities, and therefore would not affect the air quality assessment in the EIS for the project. As such the modification activities would not be a controlled activity as defined in section 183 of the *Airports Act 1996* (Commonwealth).

3 Approved project

This chapter provides a general overview of the approved project with a focus on the specific project elements that are subject to the modification. The approved project is fully described in Chapter 5 and Chapter 6 of the Environmental Impact Statement (EIS) and Part D of the Submissions and Preferred Infrastructure Report (SPIR) for the WestConnex M4-M5 Link (the project).

3.1 General description of approved project

Approval for the construction and operation of the project was granted by the NSW Minister for Planning on 17 April 2018. The project approval provides for the construction and operation of a new multi-lane road link between the M4 East Motorway at Haberfield and the New M5 Motorway at St Peters which is Stage 1 of the project. The project also includes an interchange at Lilyfield and Rozelle (the Rozelle interchange) and a tunnel connection between Anzac Bridge and Victoria Road, east of Iron Cove Bridge (Iron Cove Link), which is Stage 2 of the project. Stage 2 also includes the construction of tunnels, ramps and associated infrastructure to provide connections to the proposed future Western Harbour Tunnel and Beaches Link project at the Rozelle interchange.

Together with the other components of the WestConnex program of works and the proposed future Sydney Gateway, the project will facilitate improved connections between western Sydney, Sydney Airport and Port Botany and south and south-western Sydney, as well as better connectivity between the important economic centres along Sydney's Global Economic Corridor and between local communities.

The key components of the project are shown in **Figure 3-1**. In summary the approved project comprises:

- Twin mainline motorway tunnels between the M4 East at Haberfield and the New M5 at St Peters
- Connection of the mainline tunnels to the M4 East project, comprising tunnel-to-tunnel connections and entry and exit ramps connections between the mainline tunnels and the Wattle Street interchange at Haberfield
- Connection of the mainline tunnels to the New M5 project, comprising tunnel-to-tunnel connections to the New M5 mainline tunnels and entry and exit ramp connections between the mainline tunnels and the St Peters interchange
- The Inner West subsurface interchange (underground interchange at Leichhardt and Annandale) that will link the mainline tunnels with the Rozelle interchange and the Iron Cove Link
- A new interchange at Lilyfield and Rozelle (the Rozelle interchange) that will connect the M4-M5 Link mainline tunnels with City West Link, Anzac Bridge, Iron Cove Link and the proposed future Western Harbour Tunnel and Beaches Link
- Twin tunnels that will connect Victoria Road near the eastern abutment of Iron Cove Bridge and Anzac Bridge (the Iron Cove Link). Underground entry and exit ramps will also provide a tunnel connection between the Iron Cove Link and the New M5 project (via the M4-M5 Link mainline tunnels)
- Motorway operational infrastructure including substations, water treatment plans, ventilation facilities and outlets, offices, on-site storage and parking for employees. Tunnel ventilation systems, including ventilation supply and exhaust facilities, axial fans, ventilation outlets and ventilation tunnels.

The EIS describes the construction and operation of the project in two stages.

Stage 1 as described in the EIS:

- Construction of the mainline tunnels between the M4 East Motorway at Haberfield and the New M5 Motorway at St Peters, stub tunnels to the Rozelle interchange (at the Inner West subsurface interchange) and ancillary infrastructure at the Darley Road motorway operations complex (MOC1) and Campbell Road motorway operations complex (MOC5)
- These works are anticipated to commence in 2018 with the mainline tunnel opening to traffic in 2022.

Stage 2 as described in the EIS:

- Construction of the Rozelle interchange and Iron Cove Link including connection to the stub tunnels at the inner West subsurface interchange, connection to the surface road network at Lilyfield and Rozelle, and construction of tunnels, ramps and associated infrastructure as part of the Rozelle interchange to provide connections to the proposed future Western Harbour Tunnel and Beaches Link project. Ancillary infrastructure will be provided at Rozelle West motorway operations complex (MOC2), Rozelle East motorway operations complex (MOC3) and Iron Cove Link motorway operations complex (MOC4)
- Stage 2 works are expected to commence in 2019 with these components of the project open to traffic in 2023.

At the time of the planning approval for the project, the total construction period for both stages of the project was expected to be around five years. This included commissioning that will occur concurrently with the final stages of construction.

Chapter 6 of the EIS and the SPIR provide more detail regarding the indicative construction work and strategy for the project.

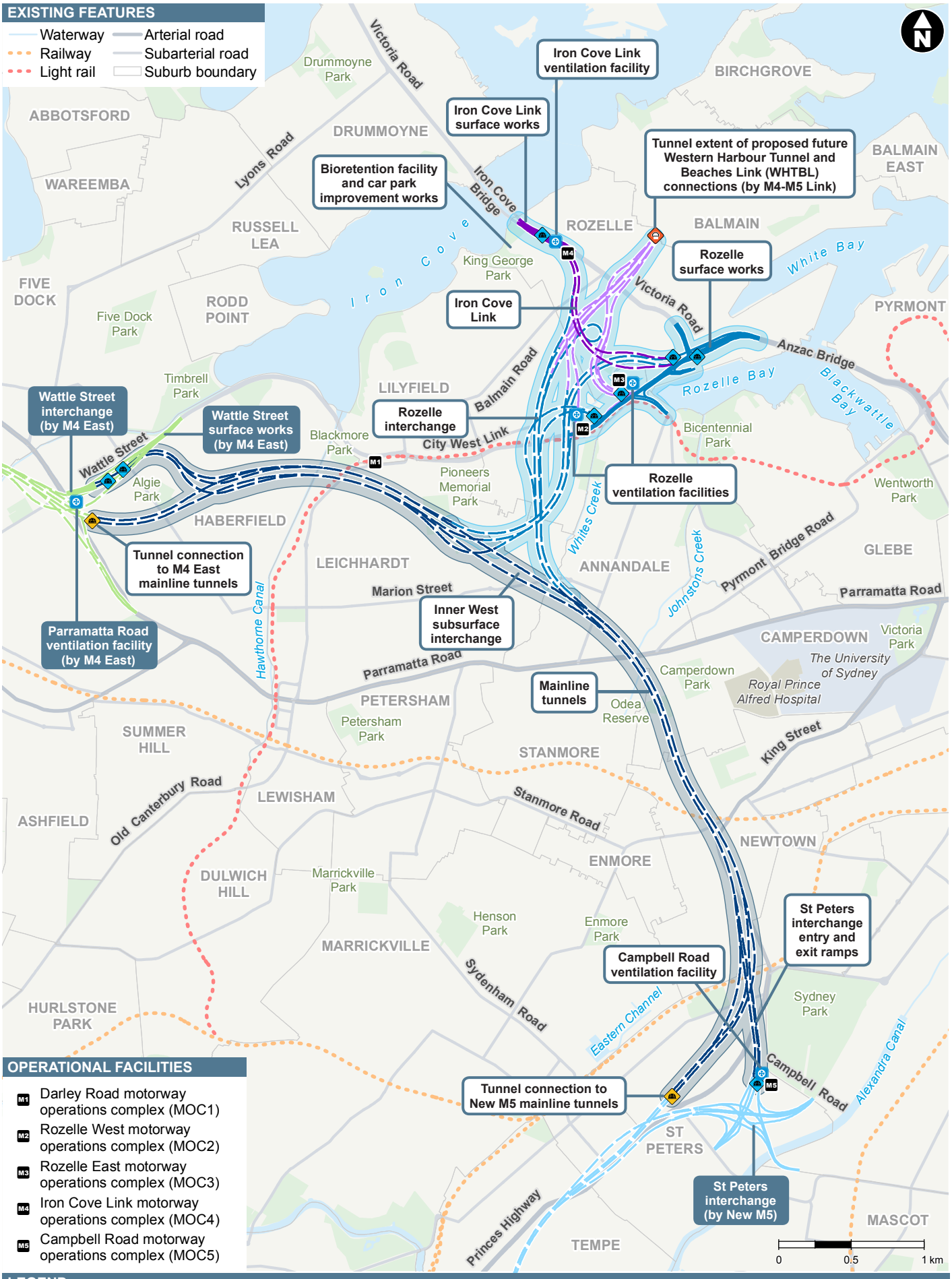

Figure 3-1 EIS Overview of approved project

3.2 Haberfield and Ashfield

The EIS described and assessed 12 construction ancillary facilities. Part D of the SPIR described and assessed an additional construction ancillary facility, White Bay civil site (C11). The EIS provided indicative site layouts arrangements and details of potential activities that will be provided at each site, subject to detailed construction planning.

Section 6.5.1 of the EIS stated that the number, location and layout of construction ancillary facilities would be finalised as part of construction planning during detailed design. The environmental performance outcomes stated in the EIS and the SPIR as well as the criteria identified in relevant conditions of approval would be considered as part of this process.

Within the Haberfield and Ashfield area two options for combinations of construction ancillary facilities were described and assessed in the EIS. The two options are identified in **Table 3-1**.

Table 3-1 Possible construction ancillary facility combinations at Haberfield and Ashfield assessed in EIS

Option A	Option B
Wattle Street civil and tunnel site (C1a)	Parramatta Road West civil and tunnel site (C1b)
Haberfield civil and tunnel site (C2a)	Haberfield civil site (C2b)
Northcote Street civil site (C3a)	Parramatta Road East civil site (C3b)

The SPIR clarified that the contractor may choose to use all or some of the construction ancillary facilities identified in the EIS, including any combination of the Option A and Option B facilities at Haberfield/Ashfield.

The planning approval for the project (condition C19) specified that only one of the two ancillary facility options is to be implemented at Haberfield except if one site is used for parking and other works that do not exceed the 'Noise affected' Noise Management Levels as identified in the *Interim Construction Noise Guideline* (DECC, 2009).

Below is a description of the sites listed in **Table 3-1** that are relevant to the proposed modification. The description below is based on how the sites were described and assessed in the EIS and approved for use as part of the project approval.

3.2.1 Northcote Street civil site

The Northcote Street civil site (C3a) at Haberfield is located between Wattle Street and Wolseley Street at Haberfield and was assessed in the EIS as a construction ancillary facility. The site is currently being used as a civil and tunnel site for the M4 East project.

The indicative EIS site layout under the existing project approval is provided in **Figure 3-2**. The EIS described and assessed the use of this site for construction workforce parking of around 150 spaces and to support construction activities at nearby civil and tunnel sites, including laydown and storage of materials.

The EIS described the entry and exit arrangements for heavy vehicles using the site from Parramatta Road. Light vehicles were to enter the site from Wolseley Street and exit onto Wattle Street. Northcote Street was to be closed at the intersection with Parramatta Road with the construction site occupying a section of Northcote Street (around 100 square metres). Upon completion of construction works, the EIS stated that this section of Northcote Street and the intersection with Parramatta Road would reopen.

The EIS described the use of the site for civil construction during standard construction work hours and acknowledged that some works outside of standard construction hours may be required. The EIS described construction workforce parking occurring 24 hours a day, seven days a week. Feasible and reasonable management strategies would be investigated to minimise potential noise impacts associated with out-of-hours construction activities at the site, including minimising the volume of heavy vehicles using the laydown area at night and the provision of temporary noise barriers along the boundary with adjoining residential properties.

At the completion of construction works, as described in the EIS, the site was to be rehabilitated in preparation for a future use that would be determined in accordance with the M4 East Residual Land Management Plan as required under the M4 East conditions of approval (SSI 6307).

The program for works to be carried out at the site was provided in Table 6-8, section 6.5.4 of the EIS.

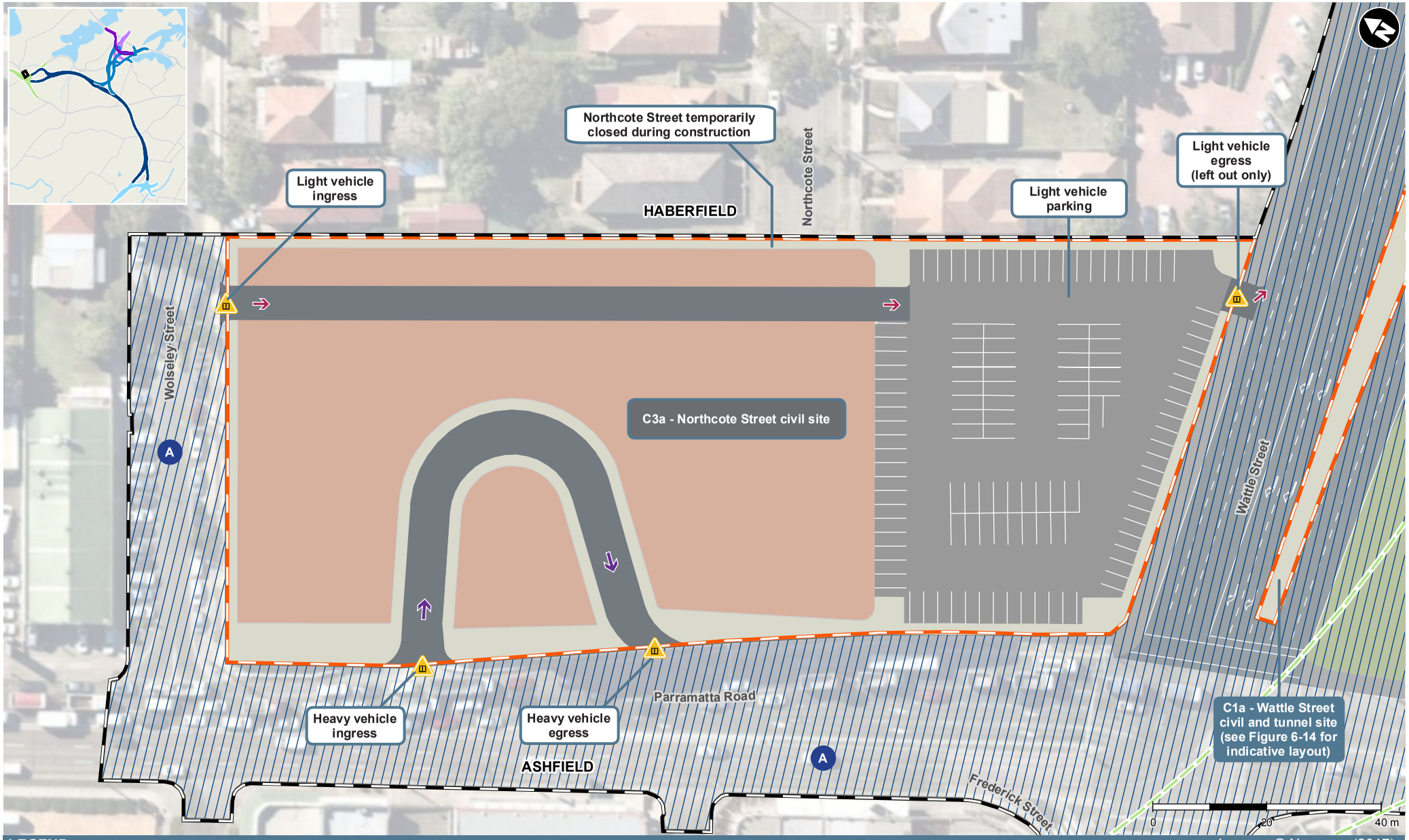

Figure 3-2 EIS Indicative Northcote Street civil site (C3a) layout

3.2.2 Parramatta Road West civil and tunnel site

The Parramatta West civil and tunnel site (C1b) is located west of Parramatta Road, between north of Alt Street and Bland Street at Ashfield. The site is mostly vacant and is comprised of a former car dealership, servicing workshop and several smaller commercial premises on the western side of Parramatta Road near Bland Street. The site consists of land owned by Roads and Maritime and one commercial property to be acquired.

The EIS identified that the site was to be used for tunnelling during construction and included an acoustic shed, temporary site offices, a workshop and storage facilities, a laydown area, entry and exit points for construction traffic, a temporary substation, temporary ventilation for the tunnels, a temporary water treatment plant and sediment pond, workforce amenities and car parking.

The EIS identified that site establishment works would include provision of temporary noise attenuation measures, construction of a temporary access tunnel, utility works, and establishment of site offices. Some of the site establishment works such as construction of a temporary access tunnel would be carried out in accordance with a Construction Environmental Management Plan (CEMP) that would be subject to approval.

The EIS described that construction activities would be undertaken within the acoustic shed, 24 hours a day, seven days a week. These activities included tunnelling, spoil handling and spoil haulage. All spoil stockpiling will be within the acoustic shed. Construction traffic would enter and exit the site to and from the western (northbound) carriageway of Parramatta Road via new driveways. Other activities that were to occur outside of the acoustic shed included laydown, storage of materials, and delivery of materials. Once works were completed the site was to be demobilised to prepare the site for a future use in accordance with the M4-M5 Link Residual Land Management Plan.

The EIS described a power supply connection for the site. The power connection was to be provided to the site from the Croydon Zone substation. The maximum demand of 10 Mega Volt Amp (MVA) would require two High Voltage Connections (HVCs) connected by underground cables to the Ausgrid (high voltage) network. The route of the connection was detailed in Appendix F (Utility Management Strategy) of the EIS.

The indicative EIS site layout is provided in **Figure 3-3** below and an indicative program of works was provided in Table 6-9 in section 6.5.5 of the EIS.

3.2.3 Parramatta Road East civil site

The Parramatta Road East civil site is located east of Parramatta Road at Haberfield between land north of Alt Street and Bland Street. The site is mostly vacant and is comprised of a former car dealership. The site is owned by Roads and Maritime.

The EIS identified that this site would be used to support tunnelling construction activities and to provide workforce parking with around 140 parking spaces provided. The site would include temporary site offices, ingress and egress of light vehicles, workforce amenities and car parking.

The key construction activities that were to be carried out at and supported by this site were to include establishment of site offices, amenities and temporary infrastructure including temporary noise attenuation measures and fencing, utility works, support for tunnelling construction activities. No tunnelling works were proposed from this site.

Upon the completion of construction works the site was to be demobilised and prepared for a future use in accordance with the M4-M5 Link Residual Land Management Plan.

Section 6.5.7 of the EIS provided a more detailed description of the site as well an indicative construction program in Table 6-11. An indicative EIS site layout is provided in **Figure 3-3** below.

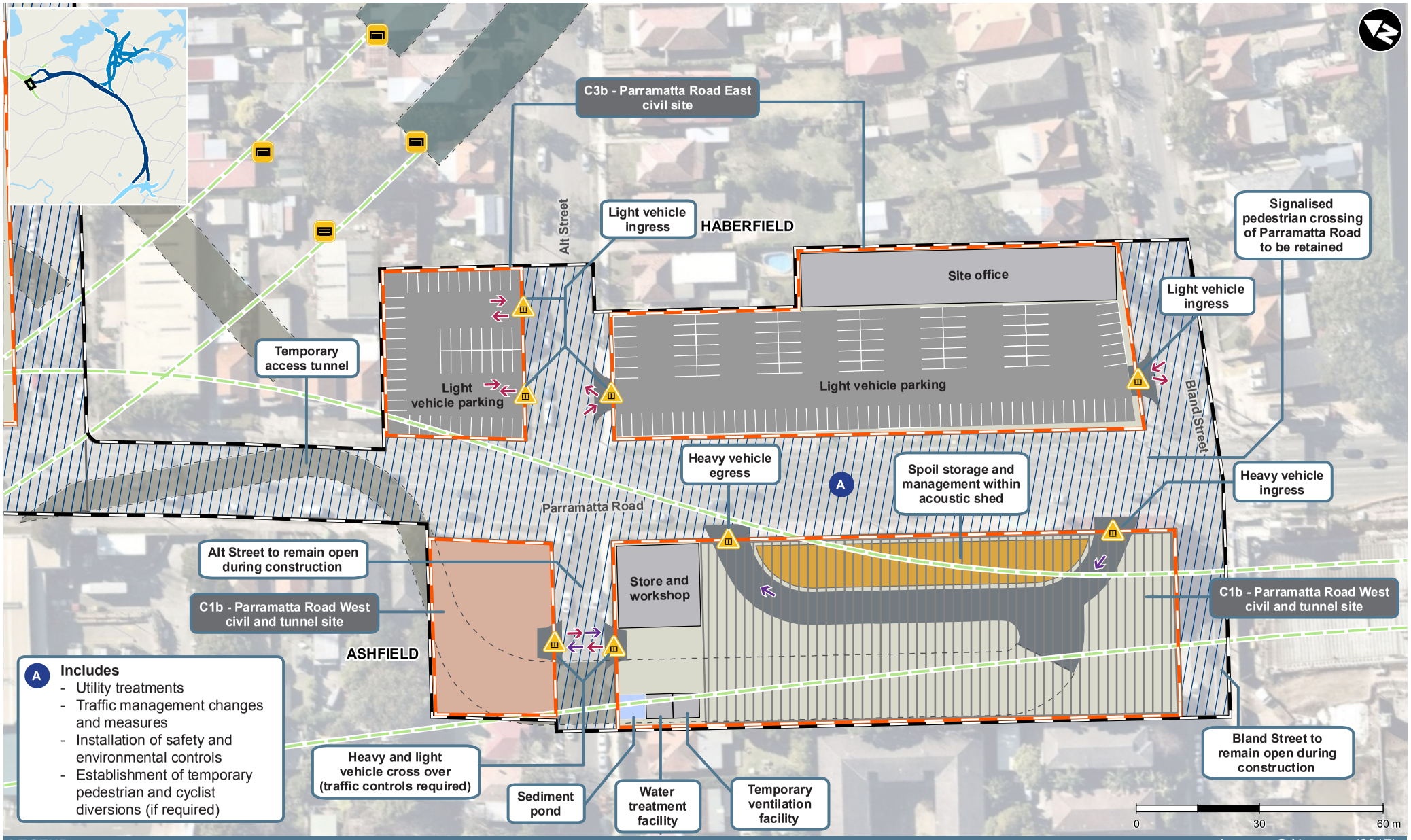

Figure 3-3 EIS Indicative Parramatta Road West civil and tunnel site (C1b) and Parramatta Road East civil site (C3b) layout

3.3 Leichhardt

3.3.1 Darley Road civil and tunnel site

The Darley Road civil and tunnel site (C4) is located at Leichhardt between the Inner West Light Rail Line to the north and Darley Road to the south. The site is currently occupied by a commercial premise that was to be demolished to facilitate construction. Immediately adjacent in the northeast corner of the site is the Leichhardt North light rail stop.

The site was described and assessed within the EIS, and approved for use as a tunnelling site subject to conditions of approval. During construction the site was to be provided with a temporary site office, a workshop and storage facilities, a laydown area, entry and exit points for construction traffic, an acoustic shed, a temporary substation, temporary ventilation for the tunnels, a temporary water treatment plant and sediment pond, workforce amenities and car parking.

The key construction activities proposed for the site included demolition of existing buildings and structures, establishment of temporary noise attenuation measures, utility works, establishment of site office, laydown and storage of materials, delivery of materials, construction of acoustic shed, construction of temporary access tunnel, tunnel excavation and construction of the Darley Road motorway operations complex including a substation and water treatment plant.

Spoil from tunnel excavation was to be stockpiled within the acoustic shed prior to transport from the site to a suitable disposal or reuse site. The EIS described that heavy vehicles would access the site via City West Link, James Street and Darley Road and exit the site via Darley Road and then City West Link. Spoil haulage from the site was to occur during standard construction hours.

Prior to demobilisation, rehabilitation and works to prepare the remaining project land on the site for a future use were to be carried out in accordance with the M4-M5 Link Residual Land Management Plan.

Section 6.5.8 of the EIS provided a detailed description of the construction activities proposed at the Darley Road civil and tunnel site with an indicative construction program provided in Table 6-12 of the EIS. **Figure 3-4** below provides the indicative EIS site layout.

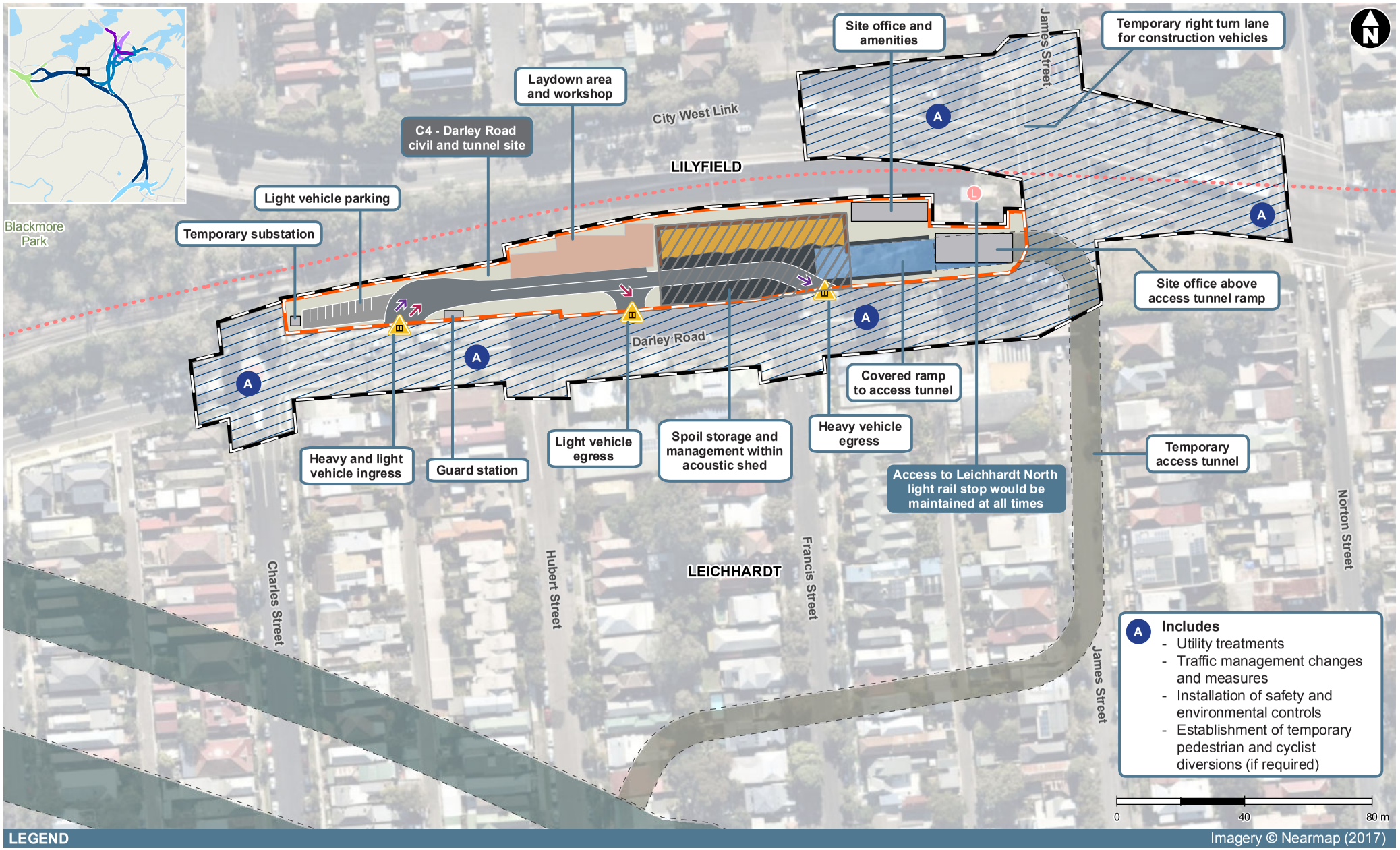

Figure 3-4 EIS Indicative Darley Road civil and tunnel site (C4) layout

3.3.2 Darley Road motorway operations complex

A motorway operations complex (MOC) was proposed at Darley Road for the project. The motorway operations complex was identified as MOC1 within the EIS. The operational ancillary infrastructure to be provided as part of the motorway operations complex was to primarily include a water treatment plant, substation and associated car parking.

Figure 3-5 below provides an indicative site layout for the Darley Road motorway operations complex (MOC1). It included an operational water treatment plant to treat groundwater collected within the project tunnels prior to discharge. Options for the discharge of treated water from the Darley Road water treatment plant included:

- Direct discharge to Hawthorne Canal, which would require a pipe to be installed along Canal Road and the construction of a new outlet in the wall of the Hawthorne Canal
- Direct discharge to the existing stormwater pipework in an adjoining road (i.e. Canal Road), which would require a pipe to be installed to connect to existing piped drainage
- Direct discharge into the sewer system located on the site, which would require a Trade Waste Agreement with Sydney Water.

The overall design, capacity and discharge of the water treatment plant was detailed in section 2.4.2 of Appendix Q (Surface Water and Flooding) of the EIS.

3.4 St Peters

3.4.1 Campbell Road motorway operations complex

The Campbell Road motorway operations complex (MOC5) at St Peters is located within the St Peters interchange, south of Campbell Road at St Peters, on land occupied during construction by the Campbell Road civil and tunnel site.

The operational ancillary facilities that were described at the Campbell Road motorway operations complex primarily included a ventilation facility, motor control room, substation and associated car parking.

Figure 3-6 below provides the EIS site layout and position of the Campbell Road motorway operations complex.

Figure 3-5 EIS Darley Road motorway operations complex (MOC1)

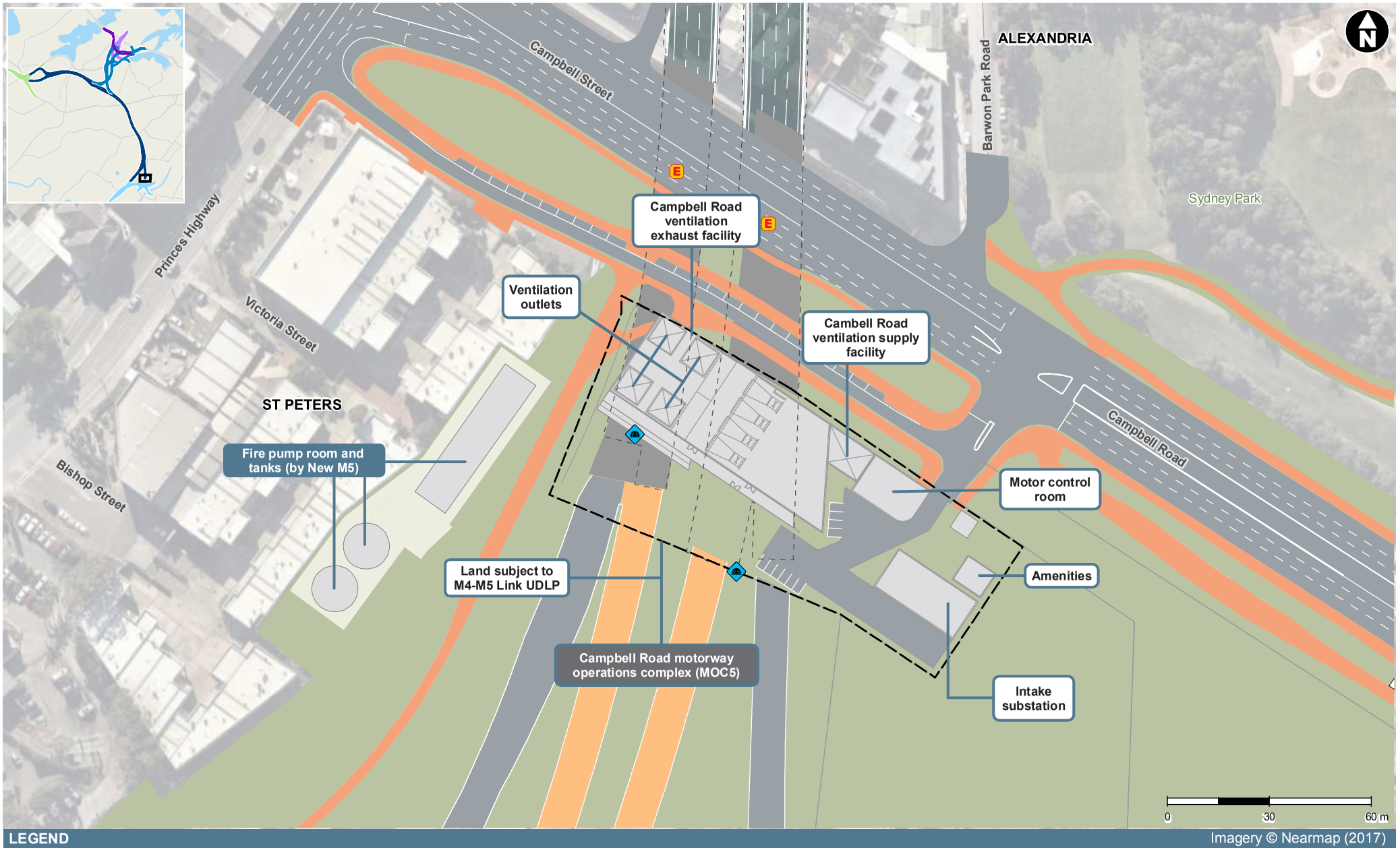

Figure 3-6 EIS Campbell Road motorway operations complex (MOC5)

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4 Proposed modification

This chapter describes the proposed modification to the M4-M5 Link project approval.

4.1 Overview of the proposed modification

NSW Roads and Maritime Services (Roads and Maritime) is seeking to modify the existing approval for the construction and operation of the WestConnex M4-M5 Link project (the project). Approval for the project was granted by the NSW Minister for Planning on the 17 April 2018 (application number SSI 7485).

Condition of approval C19 provides that only one of two ancillary facility options (A or B) presented in Chapter 6 of the EIS can be implemented at Haberfield except if one site is used for parking and other works that do not exceed the 'noise affected' Noise Management Levels as identified in the Interim Construction Noise Guideline (NSW DECC, 2009) (ICNG).

A contractor has been appointed to construct stage 1 of the project on behalf of the proponent, Roads and Maritime. Stage 1 comprises the mainline tunnels between Haberfield and St Peters.

Construction design and planning has progressed since the assessment contained in the EIS and SPIR and a review of the concept design for the approved project has occurred. As a result, following ongoing construction design and planning, the proponent has further optimised the construction site arrangements assessed in the EIS and SPIR to reduce community impacts and to decrease the overall number of construction sites required for Stage 1 of the project.

The proponent proposes to:

- Remove the Darley Road civil and tunnel site (C4) from the project
- Proceed with Option A for the construction ancillary facilities proposed at Haberfield and Ashfield but with changes to some activities at a number of the construction ancillary facilities which arise from the removal of the Darley Road civil and tunnel site and the use of the Northcote Street site for tunnelling.

The proposed changes are summarised in **Table 4-1**.

Table 4-1 Change to construction ancillary facilities at Haberfield, Ashfield and Leichhardt

EIS and SPIR	Proposed modification
Wattle Street civil and tunnel site (C1a)	No change
Haberfield civil site (C2a/C2b)[1]	No change
Northcote Street civil site (C3a)	Northcote Street civil and tunnel site. Includes tunnelling, spoil handling and spoil haulage from this site.
Parramatta Road West civil and tunnel site (C1b)	Parramatta Road West civil site[2] Inclusion of a temporary pedestrian walkway above Parramatta Road to link to the Parramatta Road East civil site.
Parramatta Road East civil site (C3b)	Parramatta Road East civil site[2] Inclusion of a temporary pedestrian walkway above Parramatta Road to link to the Parramatta Road West civil site.
Darley Road civil and tunnel site (C4)	Removal of site

Notes

1. The use and footprint of this site was amended in sections A3.3.1, B11.6.8 and C6.1.3 of the SPIR to be as per the arrangement for the Haberfield civil site (C2b).
2. Condition C19 allowed use of the site for parking and other works that do not exceed the 'noise affected' Noise Management Levels as identified in the ICNG.

The proposed modification relates to Stage 1 of the approved project. The following points provide an overview of the proposed modification:

- The Northcote Street civil site (C3a) would become a civil and tunnel site. This would result in 24 hours, seven days a week tunnelling works being carried out from this location within an existing acoustic shed. The Northcote Street site is being used for tunnelling as part of the M4 East project. A construction access tunnel is to be provided from the Northcote Street site that utilises part of the existing access tunnel for the M4 East project. Proposed spoil haulage routes to and from this site are identified in this modification report. Relevant conditions of the project approval would apply to the use of this site for tunnelling and civil works to ensure potential impacts are managed consistently with the project approval
- The Parramatta Road West and Parramatta Road East civil sites (C1b and C3b) would be used as civil sites in accordance with condition of approval C19 and other conditions of the project approval. The sites would be used for site offices, light and heavy vehicle car parking, shuttle bus services, workshop and storage of equipment, materials and construction vehicles. Both sites would operate 24 hours a day, 7 days a week in accordance with the conditions of the project approval. No tunnelling, tunnel spoil stockpiling and handling or tunnel spoil haulage would occur at these sites
- A temporary pedestrian walkway would be constructed above Parramatta Road to connect the Parramatta Road East and Parramatta Road West civil sites. The pedestrian walkway would only be available for use by project staff during the construction phase of the project and would not be available for public use. The pedestrian walkway would be demobilised upon completion of the construction phase of the project
- Removal of the Darley Road civil and tunnel site (C4) from the project. No construction activities or permanent operational infrastructure would be provided at this location. The EIS provided for construction spoil to be removed from the Darley Road site. This spoil would now be removed from other tunnelling sites
- The relocation of the operational water treatment plant from the Darley Road site (as described in the EIS) to the Campbell Road motorway operations complex at the St Peters interchange.

The construction footprint for the proposed modification in Haberfield and Ashfield is shown in **Figure 4-1**.

The following sections provide a more detailed description of the proposed modifications to the project.

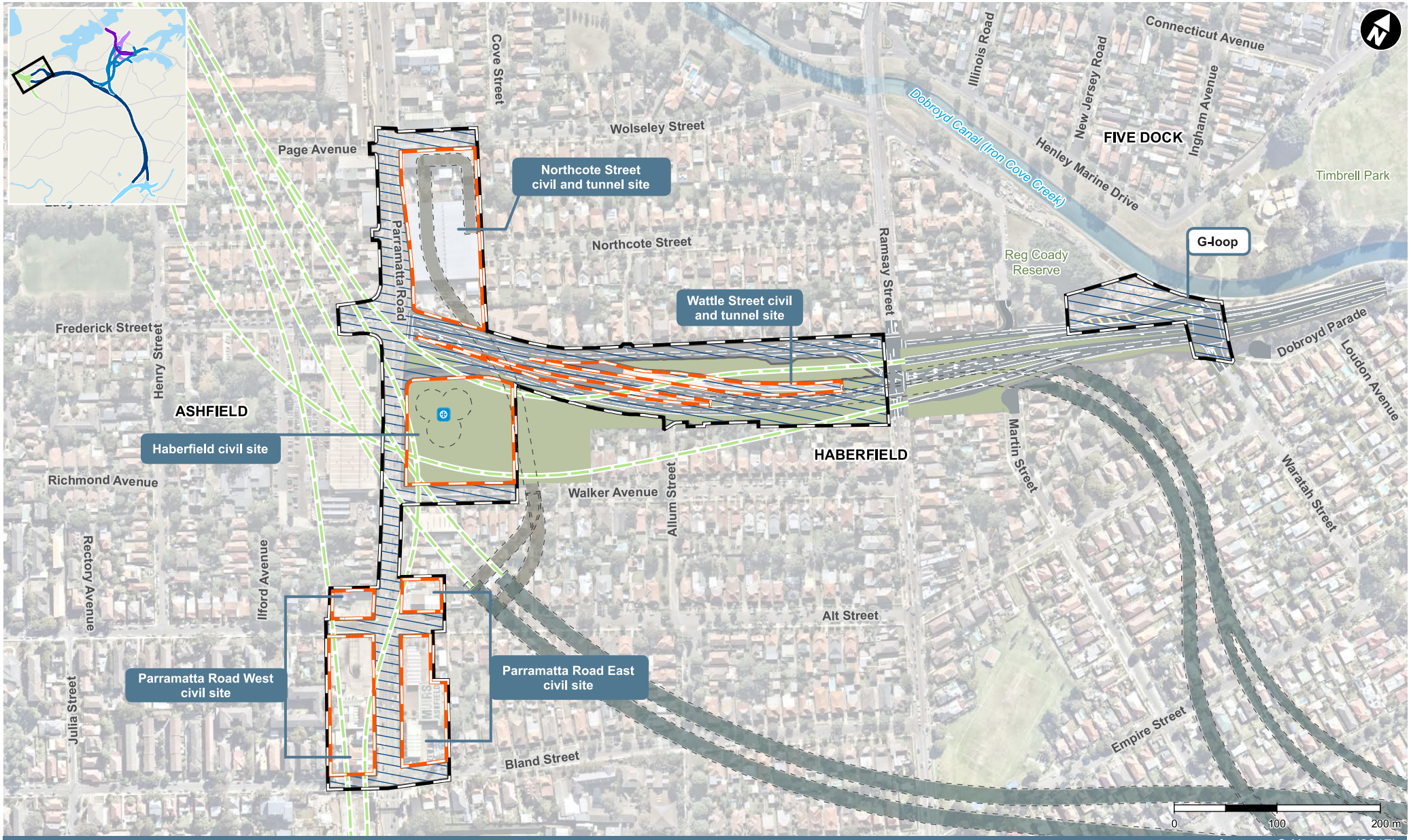


Figure 4-1 Construction project footprint at Haberfield/ Ashfield

4.2 Change of use at the Northcote Street civil and tunnel site

The Northcote Street site is located between Wattle Street and Wolseley Street at Haberfield. The site is currently being used as a tunnelling site for the M4 East project and was approved for use as a civil site during construction of the M4-M5 Link project.

The Northcote Street site is proposed to be used as a civil and tunnel site for the project. Once construction works for the M4 East project are completed at this site, the site would be altered to make it suitable for use by the M4-M5 Link project. Existing construction infrastructure that is currently being used for the M4 East project would, where required, be retained and used for the project. This includes hoarding, offices, access gates, noise walls, the acoustic shed structure and part of the construction access tunnel.

4.2.1 Site layout

The proposed indicative site layout is provided in **Figure 4-2**. Key elements that would be consistent with the existing layout for the M4 East project include the vehicle entry and exit locations, the acoustic shed and the entry to the temporary access tunnel. Infrastructure not required for construction of the M4-M5 Link project would be removed from the site. The final layout for this site would be confirmed during detailed design and detailed in the approved Site Establishment Management Plan (SEMP) and/ or approved Construction Environmental Management Plan (CEMP).

The existing acoustic shed is located in the middle of the site with tunnelling activities being undertaken inside the shed. The acoustic shed would be used to enclose most noise-generating and dust-generating activities associated with tunnelling works. Within the acoustic shed, the main construction activities proposed are spoil handling, stockpiling of spoil material along with the loading of spoil material onto haulage vehicles for transportation to designated landfill or reuse sites.

Spoil haulage vehicles would access the site from Parramatta Road city bound via a left turn movement using the existing vehicle crossing and site access gate prior to entering the acoustic shed. Space would be provided within the site to allow for some queuing of vehicles once they enter the site from Parramatta Road. Within the acoustic shed, spoil haulage vehicles would be loaded with spoil before exiting the site via a left turn movement into Wattle Street eastbound using the existing vehicle crossing. Space would also be provided within the site to allow for some queuing of vehicles before they exit the site to Wattle Street.

It is anticipated that around 566,300 cubic metres of spoil would be extracted via the Northcote Street civil and tunnel site over the duration of the project.

Table 4-2 provides indicative heavy and light construction vehicle numbers for the Northcote Street civil and tunnel site. The heavy vehicle numbers include both spoil haulage and other construction heavy vehicles.

Table 4-2 Indicative construction vehicle numbers – Northcote Street civil and tunnel site

Northcote Street civil and tunnel site									
Daily Vehicles		AM peak hour				PM peak hour			
(one way)		(7.30-8.30am)				(4.15-5.15pm)			
Heavy	Light	Heavy vehicles		Light vehicles		Heavy vehicles		Light vehicles	
		Arrive	Depart	Arrive	Depart	Arrive	Depart	Arrive	Depart
143	20	8	8	7	4	8	8	4	7

It is anticipated that around 140 heavy vehicles including spoil haulage vehicles would access the site per day. In addition it is anticipated that there would be a smaller number of light vehicles and general deliveries using the site each day.

Within the acoustic shed, two stockpile areas would be provided to allow the storage of spoil material prior to being removed from the site. The two stockpile areas have a combined capacity of around 7,000 cubic metres.

Outside of the acoustic shed, various ancillary facilities would be provided on the site. This would include a workforce shuttle bus and truck turning area and temporary utilities including compressors,

vents and fans. The existing water treatment plant for the M4 East project which is located outside the acoustic shed would be modified to meet the requirements of the M4-M5 Link project during construction.

Other facilities would include a mechanical workshop, store and offices. The existing noise wall along the eastern boundary of the site would be retained.

The proposed Northcote Street civil and tunnel site would require a new power supply connection. The power supply connection would be provided to the site from the Croydon Zone substation. The maximum demand of 10 Mega Volt Amp (MVA) would require two High Voltage Connections (HVCs) connected by underground cables to the Ausgrid (High Voltage) network.

The route of the power supply connection from the substation to Parramatta Road would generally be consistent with the approved route outlined in Appendix F Utility Management Strategy of the EIS. The main change would be the provision of a connection into the site from the western side of Parramatta Road and crossing to the eastern side of Parramatta Road into the site, near the intersection with Wattle Street.

The connection would be included in the updated Utility Management Strategy as required by condition of approval E140.

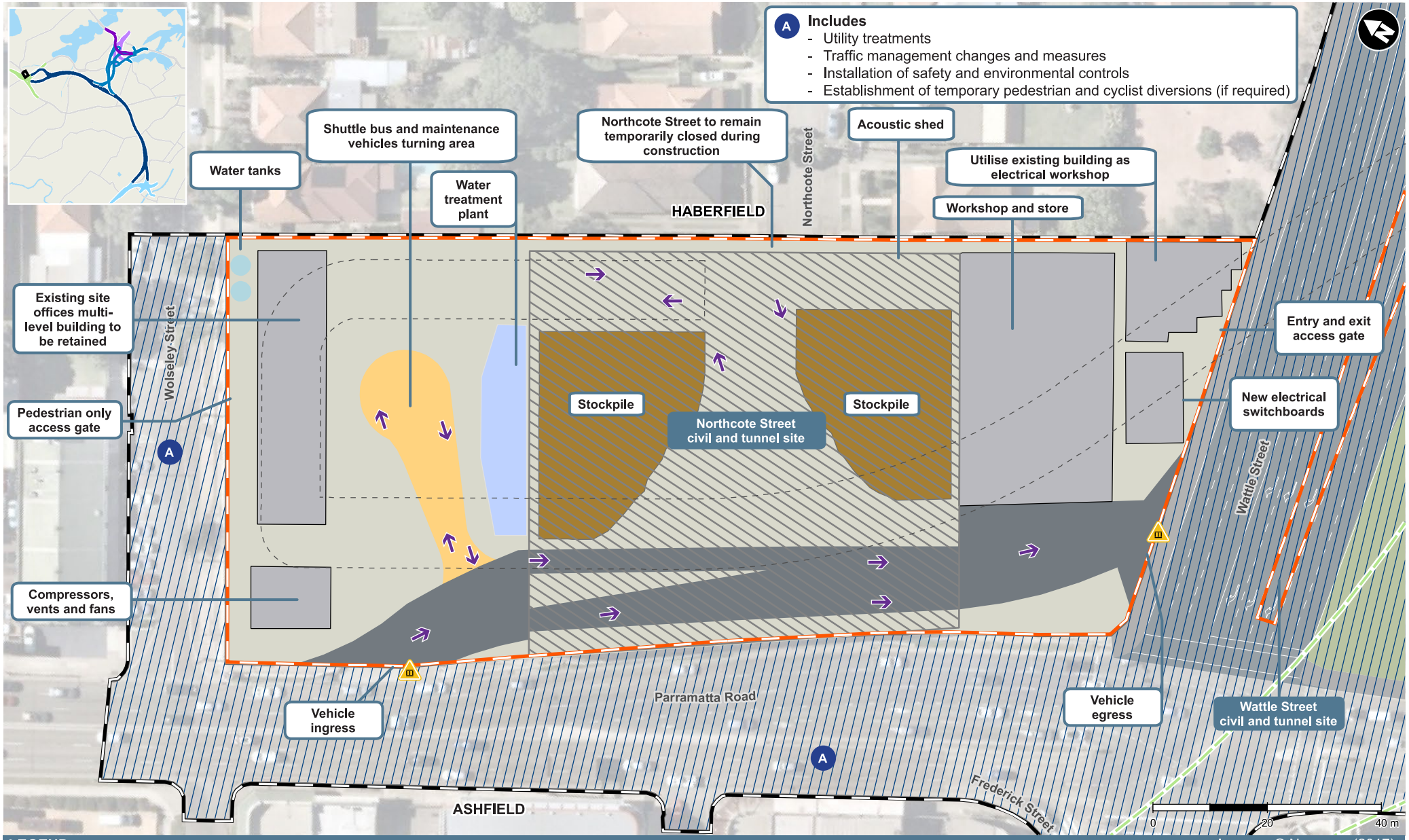


Figure 4-2 Indicative Northcote Street civil and tunnel site layout

4.2.2 Operating hours

Construction activities would operate 24 hours a day, seven days a week at the Northcote Street civil and tunnel site. Activities would predominately include tunnelling, spoil handling and spoil haulage and the delivery of shotcrete and concrete and general construction vehicles. The proposed hours of operation would be consistent with the operating hours used by the M4 East project at this site.

4.2.3 Construction access tunnel

The existing construction access tunnel located at the northern end of the site would be altered to meet the needs of the M4-M5 Link project. At present the access tunnel heads west under Parramatta Road to join the M4 East mainline tunnel. On completion of the M4 East project, demobilisation will occur, with some elements being retained for the M4-M5 Link project. Part of the existing M4 East access tunnel will be retained and blocked off adjacent to the eastern side of Parramatta Road. This will enable construction of the M4-M5 Link access tunnel.

For the M4-M5 Link project, the new construction access tunnel would head generally in a south eastern direction beneath Wattle Street, to the north of the Haberfield civil site and beneath a small number of residential properties (less than 10 properties) in Walker Avenue and Alt Street to connect with the M4-M5 Link mainline tunnels. This route has been selected as it would provide the most direct route from the access tunnel to the M4-M5 Link mainline tunnels. The route avoids the M4 East Motorway tunnels and Parramatta Road ventilation facility and ventilation tunnels. **Figure 4-3** shows the indicative alignment of the access tunnel with **Figure 4-4** providing an indicative cross section.

The access tunnel would have an average grade of around 14 per cent with a maximum depth of around 50 metres and will be around 430 metres in length. The access tunnel would connect to the mainline tunnels at around 30 metres below ground. The access tunnel would have an average width of 12 metres to allow two heavy construction vehicles to comfortably travel side by side in the access tunnel.

Two options are provided for how the construction access tunnel connects with the mainline tunnels. Both options would connect to the mainline tunnels under residential properties situated between Walker Avenue and Alt Street. The two options are shown on **Figure 4-3**.

For the construction of the access tunnel, roadheaders would be used to cut the top heading with a roadheader, surface miner or excavators with breakers used to excavate the bench. To support the access tunnel, steel rock bolts, mesh and shotcrete would be used. Spoil would be removed by off road articulated trucks to the surface where it would be stockpiled in the acoustic shed until transported to a disposal or reuse site. Construction of the access tunnel would take around nine months. Once construction works are complete the construction access tunnel would be backfilled.

Figure 4-3 Indicative alignment of construction access tunnel

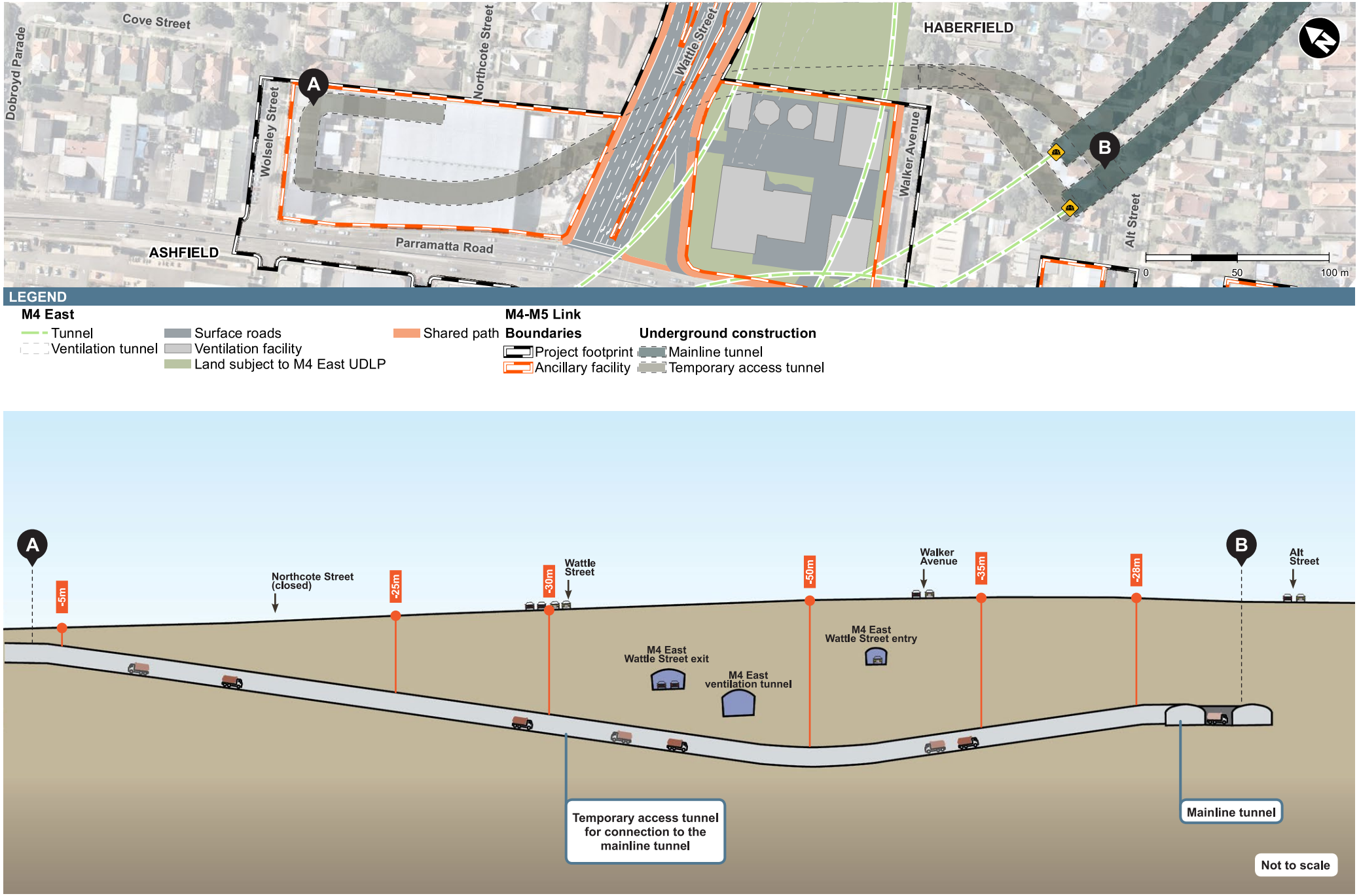


Figure 4-4 Indicative cross section of construction access tunnel

4.2.4 Spoil haulage routes

Two spoil haulage routes are proposed to be used in association with the Northcote Street civil and tunnel site. **Table 4-3** describes each proposed route for spoil haulage. **Figure 4-5** shows the proposed spoil haulage routes.

Table 4-3 Indicative spoil haulage routes for Northcote Street civil and tunnel site

Route	Spoil haulage route
Route A	Entry: via Parramatta Road city bound and then left turn into the site
	Exit: via left turn from site onto Wattle Street, then left turn into Ramsay Street/ Road, then left turn into Fairlight Street, then left turn into Great North Road, then right turn into Parramatta Road
Route B	Entry: via Parramatta Road city bound and then left turn into the site
	Exit: via left turn from site onto Wattle Street, then left turn onto the dedicated temporary construction vehicle turning lane (known as the G-loop) at the intersection of Dobroyd Parade and Waratah Street within part of the Reg Coady Reserve. Right turn onto Wattle Street from truck turning facility toward M4 East Motorway tunnels or Parramatta Road. The G-loop has been used during the construction of the M4 East project.

Traffic signals are provided at intersections where vehicle turning is required for both Route A and Route B. All of the roads included in the proposed haulage routes are state roads managed by Roads and Maritime. Generally, all roads along the proposed routes have two traffic lanes in each direction with some on street parking and are heavily trafficked.

The G-loop at the intersection of Dobroyd Parade and Waratah Street was established in the M4 East project and would be utilised for the proposed Route B. M4 East construction traffic and public motorists are able to use the G-loop during construction of the M4 East project. The access to the G-loop for public motorists was provided because the construction of the M4 East project removed the ability to turn right into Waratah Street when travelling eastbound on Dobroyd Parade.

Minor changes would be required to the proposed intersection design at Dobroyd Parade and Waratah Street (after completion of the M4 East project at the end of Q1 2019) to allow Route B to be used, including:

- Adjustments to the kerb and channel, including protection of new drainage infrastructure, along the north side of Dobroyd Parade at the entry and exit to the G-loop
- A short section of the median designed to separate the eastbound traffic on Dobroyd Parade from the eastbound traffic using the M4 East tunnel exit ramp would be removed to allow heavy vehicles to exit the G-loop and turn right onto Dobroyd Parade westbound
- A section of the pedestrian path along the north side of Dobroyd Parade would be realigned around the perimeter of the G-loop to avoid potential conflict between heavy vehicles and pedestrians
- Upgrade the traffic light phasing at this intersection to accommodate the G-loop traffic
- Signage and line marking associated with the above.

Use of the G-loop for the proposed modification would be restricted to M4-M5 Link construction vehicles. This restriction would be communicated through appropriate signage and line marking. Public motorists would not be able to use the G-loop. However, the completed M4 East project will provide a right turn lane from the M4 East eastbound lanes into Waratah Street at this location and a right turn lane from the Wattle Street eastbound lanes into Ramsay Street.

On completion of construction of the M4-M5 Link project, the G-loop infrastructure would be removed and that part of Reg Coady Reserve would be rehabilitated in accordance with the M4 East Residual Land Management Plan.

Once the G-loop is in operation, Route B would be the preferred spoil haulage route and would be available for use 24 hours a day and 7 days a week in accordance with condition of approval E70.

Route A would also be used as a spoil haulage route. However, in response to feedback received from stakeholders during the consultation process associated with the preparation of this modification report (refer **section 5.4**), it is proposed that Route A would generally only be used between 7am and 6pm Monday to Friday and 8am to 6pm on Saturdays except in the following circumstances and in accordance with the relevant conditions of the project approval:

- During the early stages of construction until such time as the works to facilitate operation of the G-loop were completed and the G-loop was functional
- In the event of heavy traffic congestion, an incident or maintenance works on the arterial road and/or motorway network which has the potential to detrimentally impact on the efficient use of the G-loop and result in delays for spoil haulage vehicles.

A spoil haulage protocol would be developed by the contractor in consultation with Roads and Maritime and the Transport for NSW Traffic Management Centre to manage spoil haulage movements on Routes A and B. The protocol would be documented in the Construction Traffic Transport and Access Management Sub-Plan.

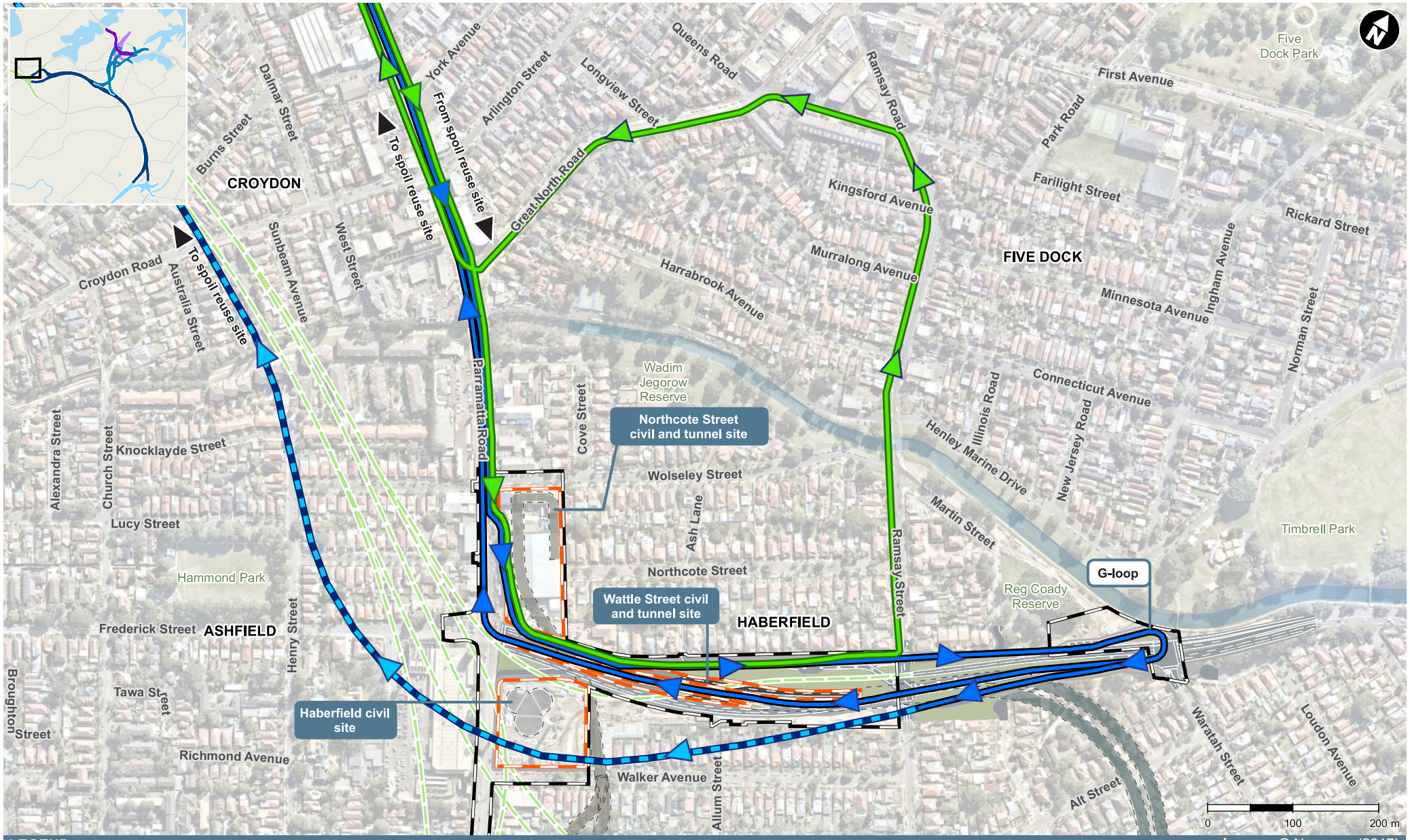


Figure 4-5 Proposed spoil haulage routes

4.2.5 Car parking

Limited car parking would be provided at the Northcote Street civil and tunnel site due to space constraints. Car parking for the construction workforce would primarily be provided at the Parramatta Road West and Parramatta Road East civil sites with around a total of 200 spaces being provided at these two sites. **Section 4.3** provides further information on the use of the Parramatta Road West and Parramatta Road East civil sites.

A shuttle bus would be provided to transport the majority of construction workforce to and from designated parking areas, which are anticipated to be predominantly at the Parramatta Road East and Parramatta Road West civil sites and the Northcote Street civil and tunnel site. Where possible, the workforce will be encouraged to walk between the Northcote Street, Parramatta Road and Wattle Street sites.

4.2.6 Program

An indicative program of works for the Northcote Street civil and tunnel site is shown in **Table 4-4**. The program shows that the construction activity at the Northcote Street site commences in Q2 2019 and continues through to end of Q1 2023. Once construction works are complete, construction facilities would be demobilised and the site would be rehabilitated in accordance with the M4 East Residual Land Management Plan. It is expected that Northcote Street would be reinstated, as provided for under the M4 East project approval.

Table 4-4 Indicative program of works - Northcote Street civil and tunnel site

Construction Activity	Indicative construction timeframe																							
	2018				2019				2020				2021				2022				2023			
Refurbishment and traffic management						■	■																	
Site establishment						■	■																	
Construct temporary access tunnel							■	■	■															
Tunnelling										■	■	■	■	■	■	■	■							
Civil and mechanical fitout											■	■	■	■	■	■	■	■						
Testing and commissioning																■	■	■	■	■				
Site demobilisation and rehabilitation																	■	■	■	■	■			

4.3 Parramatta Road West and Parramatta Road East civil sites

The Parramatta Road West and East civil sites are located on the western and eastern sides of Parramatta Road between around Alt Street and Bland Street at Ashfield and Haberfield.

The Parramatta Road West and Parramatta Road East civil sites would be used in accordance with condition of approval C19 and other conditions of the project approval. The sites would be used for parking and other works that do not exceed the 'noise affected' Noise Management Levels as identified in the ICNG.

The sites would be used for site offices, light and heavy vehicle car parking, shuttle bus services, workshop and storage of equipment, materials and construction machinery. Both sites would operate 24 hours a day, 7 days a week in accordance with the conditions of the project approval.

The sites would be used to support civil and tunnelling construction activities at other project construction sites, primarily within the Haberfield and Ashfield area. No tunnelling, tunnel spoil stockpiling and handling or tunnel spoil haulage would occur at these sites.

4.3.1 Site layout

The proposed indicative site layout for Parramatta Road West and Parramatta Road East civil sites is provided in **Figure 4-6**. The layout for the sites would be confirmed during detailed design and in the approved Site Establishment Management Plan (SEMP) and/or approved Construction Environmental Management Plan (CEMP).

Some existing buildings on the sites may be retained and used. Site establishment works would be carried out which would include demolition of buildings and structures, vegetation clearing and removal, establishment of vehicle entry and exit points, establishment of temporary noise attenuation measures and utility works. These site establishment works were assessed in the EIS.

Vehicle access points are provided for Parramatta Road West civil site from Parramatta Road, Bland Street and Alt Street. The entry along Parramatta Road would only be accessible for west-bound traffic with a left turn into the site. Exit onto Parramatta Road would be left turn out to travel west-bound. Entry and exit points are also proposed onto Bland Street and Alt Street to allow traffic to access between the sites or onto Parramatta Road as shown in **Figure 4-6**.

Light and heavy vehicle access points for the Parramatta Road East civil site would be from Parramatta Road and Alt Street. Entry would be left turn in, only available for east bound traffic. Exit would be left turn out to travel east bound along Parramatta Road. Vehicle access points would not be provided from Bland Street for this site.

Table 4-5 provides indicative heavy and light vehicle numbers for the Parramatta Road West and Parramatta Road East civil sites.

Table 4-5 Indicative construction vehicle numbers

Parramatta Road West and Parramatta Road East civil sites										
Site	Daily Vehicles		AM peak hour				PM peak hour			
	(one way)		(7.30-8.30am)				(4.15-5.15pm)			
	Heavy	Light	Heavy vehicles		Light vehicles		Heavy vehicles		Light vehicles	
			Arrive	Depart	Arrive	Depart	Arrive	Depart	Arrive	Depart
West	25	306	7	7	18	5	7	7	5	31
East	25	210	1	1	12	4	1	1	4	20

It is proposed that the existing bus stop on the western side of Parramatta Road north of the intersection with Bland Street would be relocated to avoid conflict between buses and heavy vehicles attempting to access the nearby Parramatta Road West civil site. The bus stop would be moved to a new location around 150 metres to the north on Parramatta Road. The relocation of the bus stop would be subject to on-going consultation with Transport for NSW, Transit Services and other stakeholders and would be detailed in the Traffic and transport and access CEMP Sub-Plan.

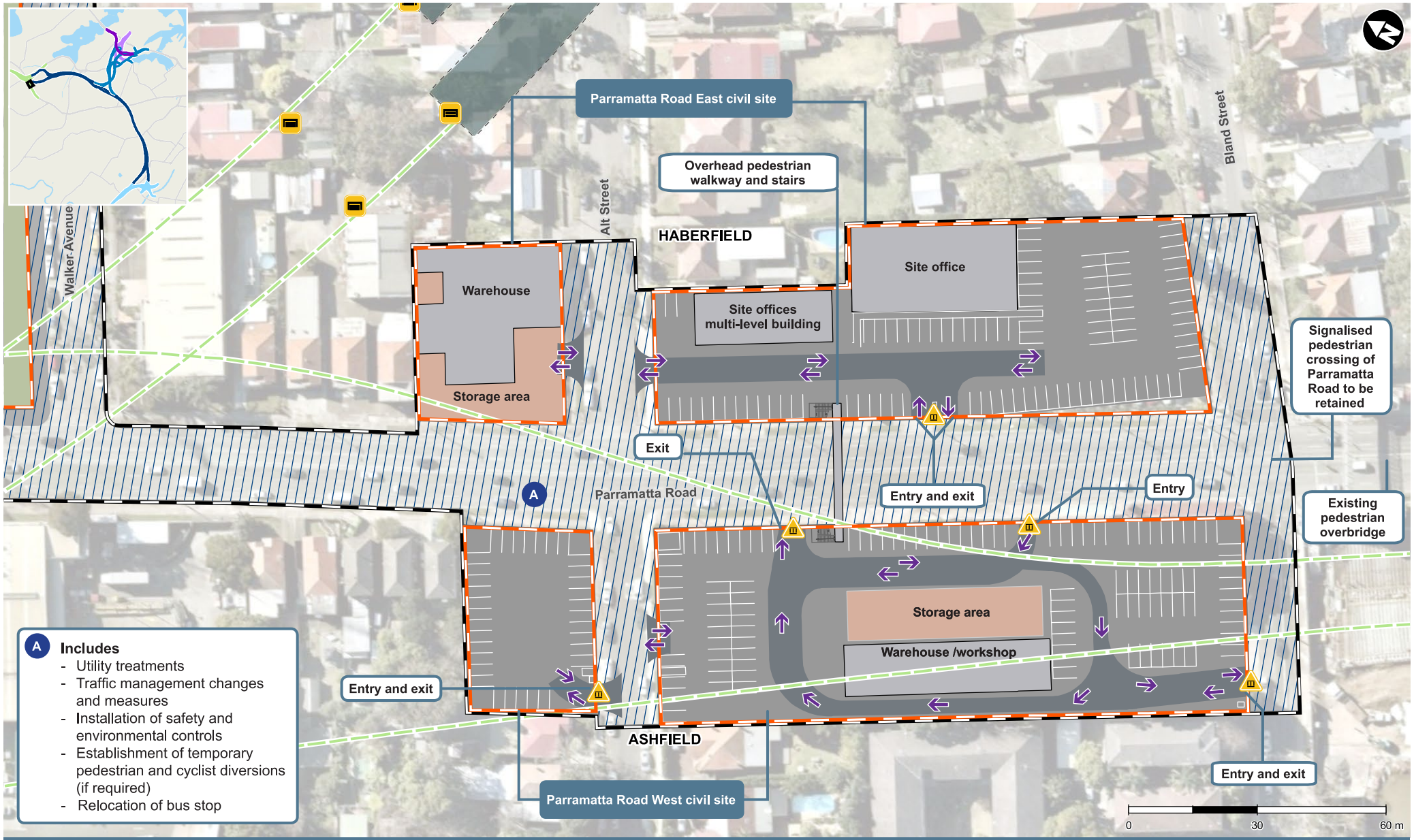


Figure 4-6 Indicative Parramatta Road West and East civil sites layouts

4.3.2 Operating hours

The Parramatta Road West and Parramatta Road East civil sites would be used 24 hours a day, seven days a week to support civil and tunnelling construction activities at other project construction sites, primarily within the Haberfield and Ashfield area. No tunnelling, tunnel spoil stockpiling and handling or tunnel spoil haulage would occur at these sites.

Site establishment works would generally occur during standard construction hours of 7.00 am to 6.00 pm Monday to Friday and 8.00 am to 6.00 pm on Saturdays (as permitted by conditions of approval E68 and E69 of the project approval) or as provided for in other conditions of approval and the project Environment Protection Licence (EPL).

4.3.3 Car parking

A total of around 200 car parking spaces would to be provided at the Parramatta Road West and Parramatta Road East civil sites for the construction workforce. The parking spaces would be used by construction workforce staff working at other project construction sites and for some heavy vehicle parking. A shuttle bus service would be provided to transport the majority of the construction workforce to and from construction sites. Where possible the workforce would be encouraged to walk between sites. As required by condition of approval E54, a Construction Parking and Access Strategy would be prepared by the contractor to assist with managing parking demand for the project.

The site would also be used for heavy vehicle parking. The type of heavy vehicles likely to use the sites for parking would include rigid and articulated trucks dropping off or picking up materials or equipment from laydown areas, vehicles or equipment to be serviced at the workshop and short term layover of trucks across working shifts. No tunnel spoil trucks would use these sites.

4.3.4 Program

An indicative program of works for Parramatta Road West and Parramatta Road East civil sites is provided in **Table 4-6**. The construction program shows construction activities commencing in Q3 2018 and continuing through to the end of Q1 2023. Once construction activities are complete, construction facilities would be removed and the site would be rehabilitated in accordance with the Residual Land Management Plan for the project.

Table 4-6 Indicative program of works - Parramatta Road West and East civil sites

Construction Activity	Indicative construction timeframe																							
	2018				2019				2020				2021				2022				2023			
Site establishment and utility works			■	■	■	■																		
Site operations – offices, warehouse/storage, workshop and parking				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■						
Site demobilisation and rehabilitation																		■	■	■	■			

4.4 Parramatta Road West and East civil sites – pedestrian walkway

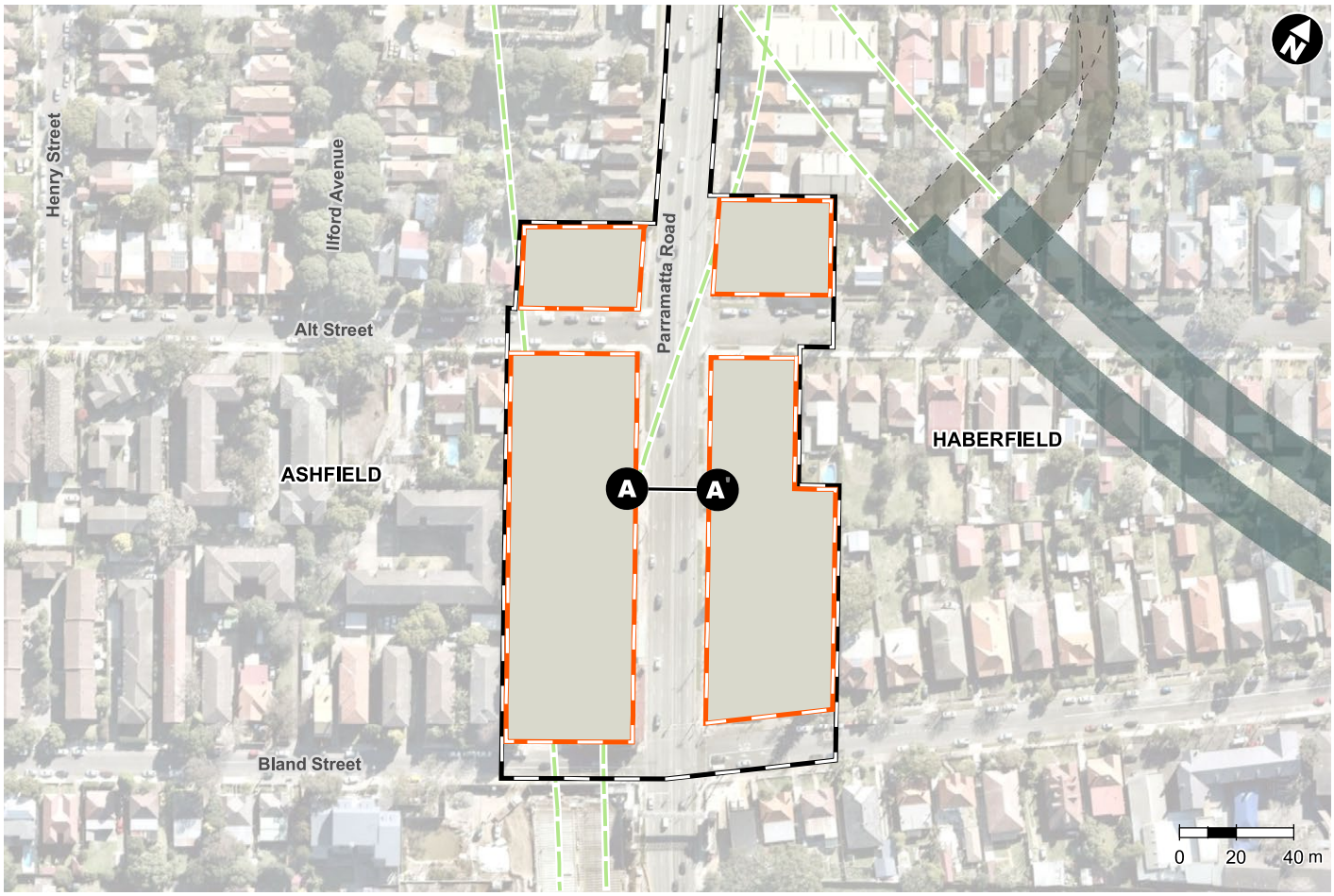
This modification proposes to link the Parramatta Road West and Parramatta Road East civil sites with a temporary overhead pedestrian walkway above Parramatta Road which would only be used by the construction workforce and would not be available for public use. Access to the walkway would be via stairs at either end located within the work sites. The pedestrian walkway is provided to allow the construction workforce to easily move between the two sites without the need to use the existing at-grade pedestrian crossing on Parramatta Road at the traffic signals.

The structure would provide sufficient clearance for vehicles travelling along Parramatta Road with the base of the walkway being around six metres above Parramatta Road. The overall height of the walkway structure would extend to around 10 metres above Parramatta Road. Both the walkway and access towers would be enclosed to provide weather protection for users and enable use 24 hours a

day, seven days a week. Lighting would be provided to allow the walkway to be used after daylight hours.

The bridge structure would be fabricated offsite in sections that are of suitable size for transportation to the site. The sections would be welded or bolted together at the Parramatta Road sites. The supporting steel towers would be assembled on site and mounted on concrete foundations to support the pedestrian walkway. The bridge would be a single span and would be lifted into position by a crane. Installation of the span would be carried out at night with full road closure of Parramatta Road and traffic detours provided. A Road Occupancy Licence from the Transport for NSW Traffic Management Centre would be required for the installation of the pedestrian walkway, allowing for the temporary closure of Parramatta Road. Once the walkway span is in place the roof and deck would be installed.

The pedestrian walkway is expected to be in place from around late 2018 to end of Q1 in 2023. Once construction works are complete, the pedestrian walkway would be removed following a similar process to that described above, but in reverse. A site layout showing the location of the walkway and elevation plan of the pedestrian walkway are provided in **Figure 4-7**.



Imagery © Nearmap (2017)

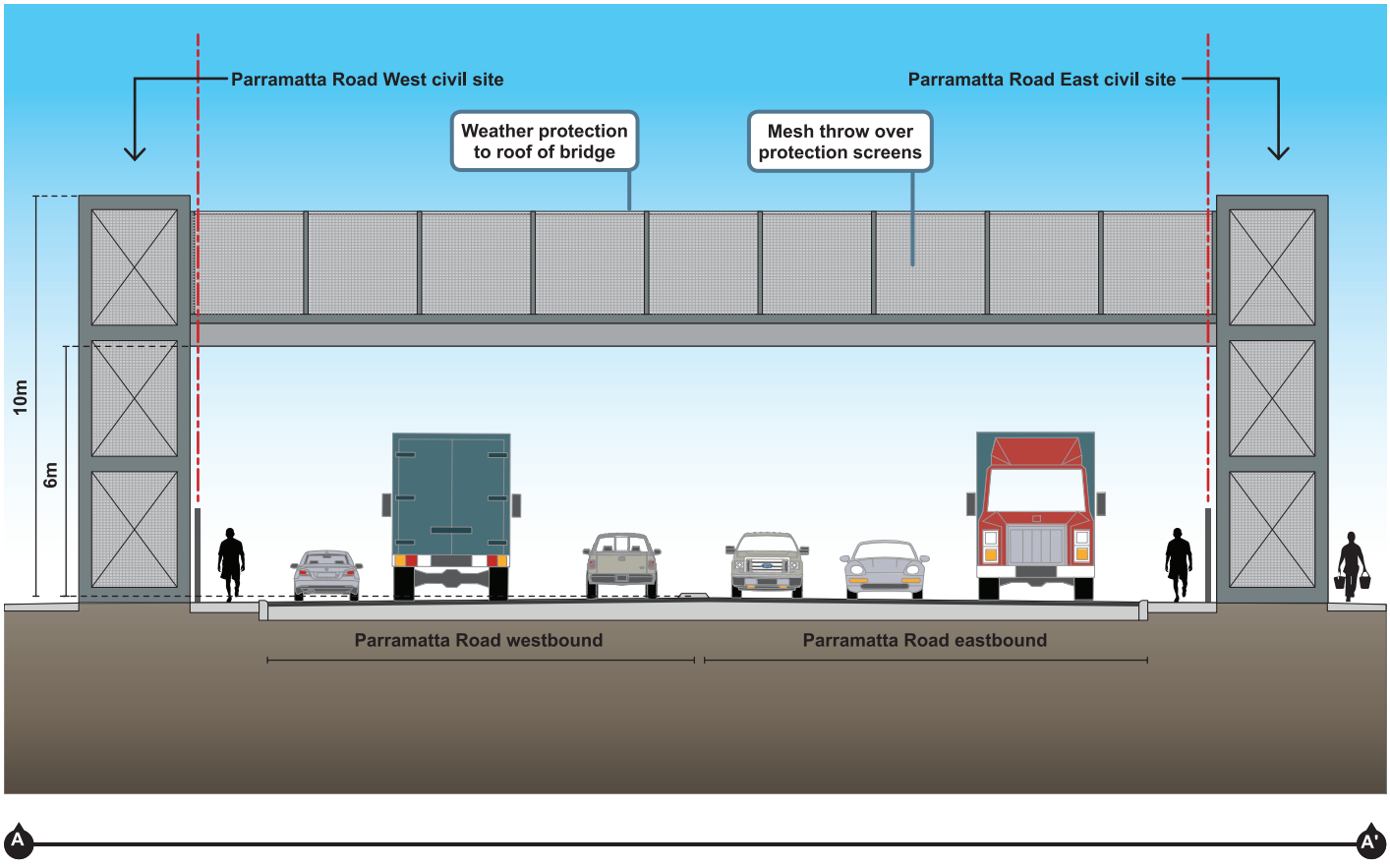


Figure 4-7 Indicative overhead pedestrian walkway over Parramatta Road.

4.5 Removal of Darley Road site from project

The EIS identified the site as the Darley Road civil and tunnel site (C4) for the construction of the project and as the Darley Road motorway operations complex (MOC1) for the operation of the project.

Ongoing construction design and planning has determined that the Darley Road site is no longer required to support the construction and operation of the project.

4.5.1 Relocation of construction activities

Construction activities would not be carried out at the Darley Road civil and tunnel site. The construction activities proposed for Darley Road civil and tunnel site as described in the EIS would be accommodated at other project construction sites.

The approved project involved the removal and transportation of around 550,300 cubic metres of tunnel spoil from the Darley Road civil and tunnel site as described in section 23.3.2 of the EIS. Given that the length of the mainline tunnel would not change for the proposed modification, this spoil volume would be required to be removed from other tunnelling sites.

The overall intensity (rate) of spoil removal at approved tunnelling sites is not expected to change, however the additional spoil to be removed would require the extension of the tunnelling component of the overall construction program by around six months.

4.5.2 Relocation of operational ancillary infrastructure

The EIS described that an operational water treatment plant and substation would be located at the Darley Road motorway operations complex. The removal of the Darley Road site from the project would result in the relocation of the operational water treatment plant to the Campbell Road motorway operations complex at St Peters interchange. The relocation of the operational water treatment plant is described in **section 4.6** below.

The permanent substation proposed at the Darley Road site in the EIS is no longer required. As described in the EIS, permanent power for Stage 1 of the M4-M5 link project will be supplied via the intake substation at the Campbell Road motorway operations complex at the St Peters interchange. Section 5.10.1 of the EIS and section 4.2.4 of Appendix F (Utilities Management Strategy) of the EIS provide further details on the proposed arrangements to provide electricity to the project.

The removal of the motorway operation complex from Darley Road would result in no permanent infrastructure for the project being located at this location.

4.6 Relocation of operational water treatment plant to St Peters

The proposed relocation of the operational water treatment plant to the Campbell Road motorway operations complex would result in the operational footprint of the motorway operations complex at St Peters being increased.

Figure 4-8 provides an indicative site layout for the Campbell Road motorway operations complex at St Peters interchange which includes an indicative location for the operational water treatment plant. The motorway operation complex is located on the cut and cover structure above the M4-M5 Link ramps at the St Peters interchange which is being constructed by the New M5 project and on land to the immediate east. The motorway operations complex as described in the EIS includes ventilation facilities and a substation. Additional land adjacent to, and to the immediate south east of the motorway operations complex would be required to accommodate the operational water treatment plant.

The increase in footprint of the motorway operations complex would have only a minimal impact on the total area of proposed open space on the southern side of Campbell Road at the St Peters interchange that is being delivered as part of the New M5 project. The increase in footprint will also have some impact on the proposed landscaping area for the St Peters interchange to be provided in this location.

The overall design, capacity and discharge rate of the water treatment plant would remain similar to the proposed water treatment plant to be located at Darley Road (as detailed in section 2.4.2 of

Appendix Q (Surface water and flooding) of the EIS). The water treatment plant would be designed so that discharge would be in accordance with the condition of approval E187. The final design for the water treatment plant would be confirmed during detailed design and would be subject to the relevant M4-M5 Link Urban Design and Landscape Plan for the project.

For the proposed modification three options would be considered for the discharge of treated wastewater from the mainline tunnel drainage system:

- Option 1: Wastewater would be pumped to the water treatment plant at the Campbell Road motorway operations complex. Treated water would discharge to the stormwater basin and/or drainage network within the St Peters interchange site being constructed by the New M5 project. This drainage network would then discharge to Alexandra Canal
- Option 2: Wastewater would be pumped to the water treatment plant at the Campbell Road motorway operations complex .Treated water would be discharged to the existing drainage network and then to Alexandra Canal
- Option 3: Wastewater would be discharged to Sydney Water's sewage system in accordance with a Trade Waste Agreement.

The detailed design for the water treatment plant may include a combination of the above options.

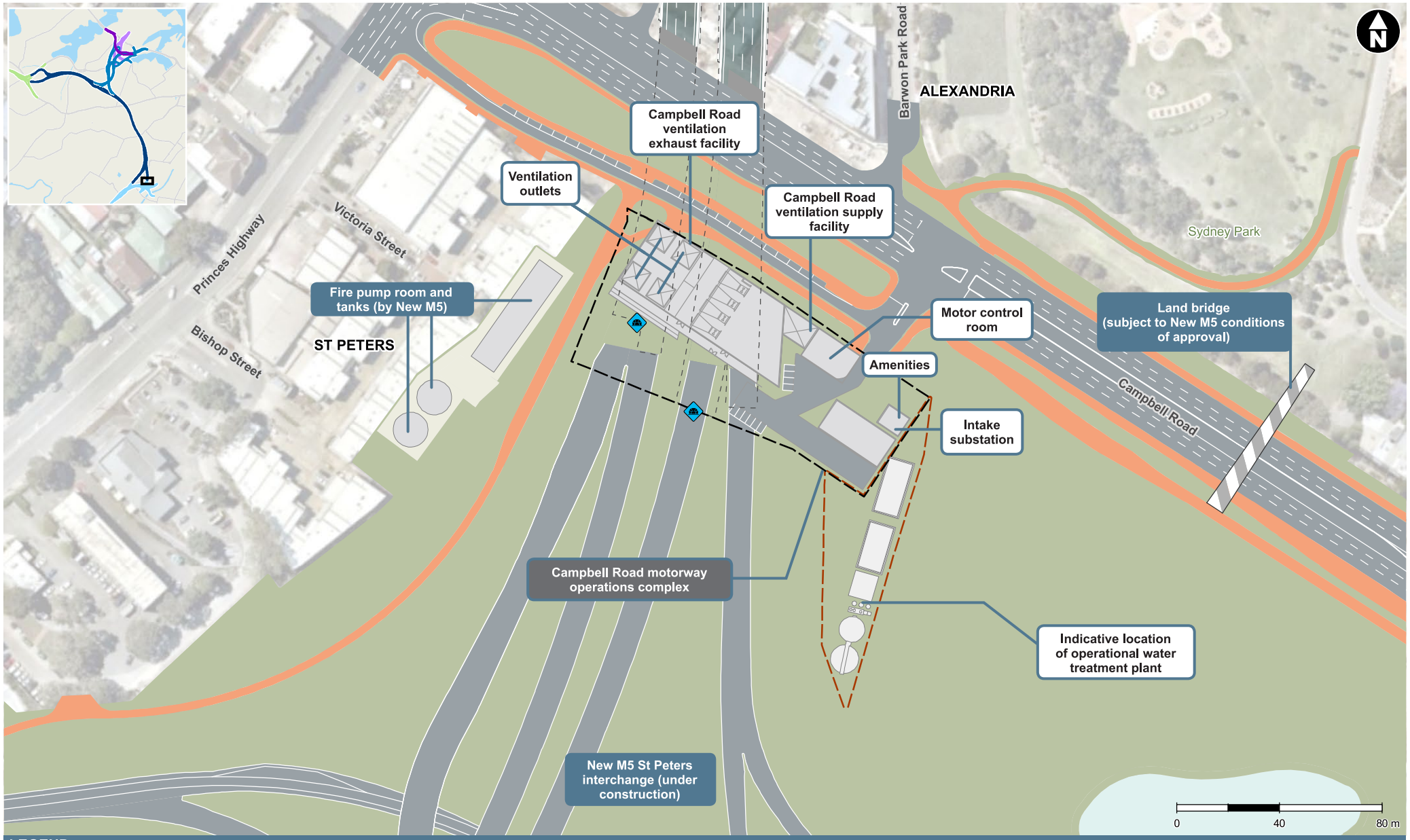


Figure 4-8 Indicative Campbell Road motorway operations complex layout including proposed water treatment plant

4.7 Conditions of approval

The proposed modification would require some of the conditions of the project approval to be amended as a number of the proposed changes would not be consistent with the existing project approval. **Chapter 7** (Conditions of approval) provides a review of the relevant conditions in relation to the modification and details the changes that are proposed.

4.8 Site establishment and/or construction works

Site establishment works (in accordance with an approved Site Establishment Management Plan) and/or construction works (in accordance with an approved Construction Environmental Management Plan) are proposed at a number of the project construction sites and will be carried out in accordance with the existing conditions of approval for the project.

5 Consultation

This chapter provides an outline of the consultation carried out for the proposed modification to the M4-M5 Link project (the project).

5.1 Introduction

Approval for the project was granted by the NSW Minister for Planning on the 17 April 2018 (application number SSI 7485). Since approval was granted for the project, a contractor has been appointed to construct Stage 1 of the approved project on behalf of the proponent, NSW Roads and Maritime Services (Roads and Maritime). Stage 1 comprises the construction of mainline tunnels between the M4 East Motorway at Haberfield and the New M5 Motorway at St Peters.

Construction design and planning has progressed since the assessment contained in the EIS and SPIR and a review of the concept design for the approved project has occurred. As a result, following ongoing construction design and planning, the proponent has further optimised the construction site arrangements assessed in the EIS and SPIR to reduce community impacts and to decrease the overall number of construction sites required for Stage 1 of the project.

The proponent proposes to:

- Remove the Darley Road civil and tunnel site (C4) from the project
- Proceed with Option A (as described in the EIS and SPIR) for the construction ancillary facilities proposed at Haberfield and Ashfield but with changes to some activities at a number of the construction ancillary facilities which arise from the removal of the Darley Road civil and tunnel site and the use of the Northcote Street site for tunnelling.

Chapter 4 (Proposed modification) of this report provides a detailed description of the proposed modification.

This chapter provides:

- An overview of the consultation tools used to engage with the community and stakeholders
- A summary of the consultation completed to date for the project and the modification
- An outline of the consultation and engagement activities that will occur in the future.

5.2 WestConnex communication and engagement, channels and tools

A range of permanent channels were established for the WestConnex program of works, to seek input from stakeholders and communities and to support engagement on an ongoing basis. **Table 5-1** details some of the key consultation channels and tools used for the WestConnex program of works.

In addition, community and key stakeholders have been encouraged to contact the proponent at any time to discuss the project via phone, email or post, or by visiting the local information centres.

Table 5-1 Consultation channels and tools

Activity/tool	Details	Timing
Community updates	Providing community updates regularly when project milestones occur. Community information has been and will continue to be tailored to meet the needs of the community and each stakeholder group.	Updates distributed when project milestones occur and when required

Activity/tool	Details	Timing
Community works notifications	Keeping the community and key stakeholder groups informed of construction works, traffic changes and potential impacts is a key priority. Notifications provided via doorknock and letterbox drops.	Minimum 5 days prior to work starting
Electronic and online information	Website contains up to date information on the project including approval documents and plans. All community information (notifications, leaflets, construction and traffic updates) will be uploaded on the WestConnex website www.westconnex.com.au .	Ongoing
Social media	Content and timely responses to enquiries and feedback received through social media channels including Facebook and Twitter.	Ongoing
Project enquiries through email	The following address - info@westconnex.com.au is used as central point of email contact for project enquiries and complaints. The email address is monitored 9.00am – 5.00pm Monday to Friday. Each component project of the WestConnex program of works has a dedicated email address to which enquiries and complaints can be directed.	Ongoing
Email subscription service	A project specific subscription service enabling interested parties to receive regular email updates on the entire program or specific projects. People can register for this service at information sessions, using the available contact points, or by signing up online. https://www.westconnex.com.au/contact-us	Ongoing
One-on-one stakeholder meetings	One-on-one meetings are used to inform, consult, facilitate feedback and identify and manage potential impacts and issues. If required, street meetings are held with local residents near the project to update them on activities in their area and address their concerns.	Ongoing
Doorknocking	Undertaken to advise local residents and businesses of project impacts and proposed mitigation measures. Calling cards ('*sorry we missed you*') are distributed to promote the project contact details and sources of electronic information.	Prior to work starting and ongoing during construction
Free-call 1800 Community information line	Toll-free information line 1800 660 248 which operates 24 hours, seven days a week with fielding initial community contact and directing the caller to the relevant team. The number is promoted on the project website, public information and notification materials and on the WestConnex M4-M5 Link Community Contact Card.	Ongoing
Postal address	The following address - (GPO Box 3905, Sydney NSW 2001) is used to receive written feedback regarding the Project.	Ongoing

Activity/tool	Details	Timing
M4-M5 Link Community Contact Card	The Project Community Contact Card includes the toll-free 1800 community information line, email and website details.	Ongoing
Translation and interpreting services	A translation and interpreting service is available to assist non-English speaking stakeholders.	Ongoing
Community contact database (Consultation Manager)	Record all stakeholder interactions, contact details, correspondences, type of event and a summary of issues raised and project responses/actions to resolve the matter.	Ongoing
WestConnex Acquisition Assistance Line	The WestConnex Acquisition Line is also available to provide information and support the community subject to property acquisition.	Ongoing

5.3 M4-M5 Link project consultation overview

Consultation with the community, State and local government agencies, utility service providers, special interest groups and relevant industry stakeholders has been undertaken at various stages of the project, including prior to and during the preparation of the EIS and during exhibition of the EIS. Consultation will also continue through construction and operation of the project as detailed in **section 5.5.**

An overview of the project consultation process is provided in **Figure 5-1.**

Figure 5-1 Overview of the project consultation process

5.3.1 Consultation during design and EIS preparation

Communication and consultation on the project has been carried out at a program level since 2012 and at a project level since the State Significant Infrastructure Assessment Report (SSIAR) was lodged in January 2016, with SSIAR addendums following in September 2016 and March 2017. A summary of consultation during design and EIS preparation is provided in **Table 5-2**.

Table 5-2 Summary of consultation during design and EIS preparation

Timing	Key consultation purpose or outcome
Mid 2012 to January 2016 – pre-State significant infrastructure application report (SSIAR) lodgement	• Development of the WestConnex Strategic Environmental Review • Broad program consultation • Consultation on other WestConnex projects undergoing assessment • Publication of the *WestConnex Updated Strategic Business Case* and updated Strategic Environmental Review
January 2016 to July 2016 – SSIAR lodgement	Key stakeholder consultation
July 2016 to November 2016 – ongoing design development	Consultation on early design to inform the design development
November 2016 to May 2017 – ongoing design development and changes	• Announcement of a significant design changes • Continued engagement with stakeholders and community members to seek feedback
May 2017 to August 2017 – NSW Government release of the M4-M5 Link Project Design Report	Early consultation on concept design prior to the EIS exhibition phase in response to feedback from community

5.3.2 Consultation during EIS exhibition

During the public exhibition of the EIS, a variety of consultation activities were undertaken including community information sessions, a series of briefings and meetings with key stakeholders, and distribution of a range of project information materials such as fact sheets. Consultation activities undertaken during the public exhibition included:

- Static display of the EIS: the EIS and supporting materials were made available to view and download on the NSW Department of Planning and Environment (DPE) website, the project website and in hardcopy form at 19 locations including local libraries and council offices
- Advertisements in local and metropolitan publications: newspaper advertisements were placed to announce the EIS public exhibition period and to promote the community information sessions for the project
- Community information sessions: five community information sessions were held during the EIS public exhibition period to provide opportunities for the community and stakeholders to discuss the EIS with technical specialists and members of the project team
- Meetings and briefings with stakeholders and the community: during the exhibition period, meetings and briefings were held to provide stakeholders with an overview of the EIS and discuss issues of interest
- Toll-free 1800 number and project email: the project phone number and email were available prior to and during the EIS exhibition period as channels for the community and stakeholders to find out more information and ask further questions
- Other consultation activities included:
  - Notification to email subscribers
  - Provision of a community guide to the EIS
  - Provision of project fact sheets and brochures

- Distribution of a community update to around 130,000 residences
- Website updates
- Social media updates.

5.3.3 Consultation during the preparation of the submissions and preferred infrastructure report

After the public exhibition of the EIS and during the preparation of the Submission and Preferred Infrastructure Report (SPIR), a series of briefings and meetings with key stakeholders was undertaken. This consultation included the following stakeholders:

- DPE
- Sydney Water
- NSW Environment Protection Authority
- Office of the NSW Chief Scientist and Engineer
- NSW Health (Sydney Local Health District)
- Department of Primary Industries – Water
- Port Authority of NSW
- Inner West Council
- City of Sydney.

5.3.4 Post approval consultation requirements

Approval for the construction and operation of the project was provided on 17 April 2018 by the NSW Minister for Planning (application number SSI 7485). Schedule 2, Part B of the conditions of approval provides conditions related to community information and reporting for the project. Community information and reporting requirements relate to:

- Community information, consultation and involvement, including:
  - Preparation of a Communication Strategy
  - The appointment of a Public Liaison Officer
  - The operation of the WestConnex Acquisition Assistance Line
- Complaints management, including:
  - Preparation of a Complaints Management System including a Complaints Register
  - Nomination of an independent Community Complaints Mediator
- The provision of electronic information, including the establishment of a website providing information in relation to the project.

Roads and Maritime is implementing the community information and reporting measures outlined above within the specified timeframes as required by the conditions of approval for the project.

5.4 Consultation during preparation of the modification

5.4.1 Consultation overview

A contractor for Stage 1 of the project was appointed in June 2018. Following their appointment, Roads and Maritime agreed to a number of potential changes to the project. These changes were first communicated to the community on 28 June 2018.

Since that time, Roads and Maritime has engaged and consulted with the community, councils, community representatives, government agencies, and other relevant stakeholders. **Section 5.4.2** below provides a summary of the various consultation tools used to communicate the proposed

modification to the community. It also provides a summary of the consultation completed with local, state and commonwealth government agencies, elected representatives and other stakeholders.

5.4.2 Summary of key consultation activities and consultation tools

The following section details the key consultation activities and tools used to consult on the proposed modification to date. **Table 5-3** provides a summary of the community notifications that were provided. **Table 5-4** provides a summary of the community engagement that has occurred and the relevant feedback received.

Table 5-3 Community notification summary for the modification to date

Activity/Tool	Timing	Details
Media releases issued to Sydney metro news organisations	28 June 2018	Sydney Morning Herald and Inner West Courier were sent a media release detailing the proposed modification. https://www.westconnex.com.au/news-media/delivery-improvements-reduce-impact-m4-m5-link-construction
M4-M5 Link Community Update Brochure	Across a seven day period from 28 June 2018	This brochure was letterbox dropped to 60,000 households across the M4-M5 Link corridor. Information included the proposed removal of the Darley Road site, the proposed change in use of the Northcote Street site and the proposed use of the Parramatta Road West and East sites generally in accordance with condition of approval C19.
M4-M5 Link Community Update Brochure	Live from 28 June 2018	Uploaded to the WestConnex website. https://www.westconnex.com.au/sites/default/files/M4-M5%20Link_Community%20Update_June%202018_FA_Digital.pdf Information included the proposed removal of the Darley Road site, the proposed change in use of the Northcote Street site and the proposed use of the Parramatta Road West and East civil sites generally in accordance with condition of approval C19.
M4-M5 Link Community Update Email	29 June 2018	Email sent to 4,571 registered stakeholders on the WestConnex database. Information included the proposed removal of the Darley Road site, the proposed change in use of the Northcote Street site and the proposed use of the Parramatta Road West and East civil sites generally in accordance with condition of approval C19.

Table 5-4 Community engagement summary for the modification to date

Activity/Tool	Timing	Details	Feedback and comments	Response
WestConnex Community Reference Group - Southern	12 June 2018	Attended by City of Sydney (CoS) Council, Inner West Council (IWC) and DPE. General update on the status of the M4-M5 Link project provided.	• No specific feedback relating to the modification	n/a
WestConnex Community Reference Group - Western	19 June 2018	Attended by IWC and DPE. A general update on the M4-M5 Link provided including the announcement of a preferred contractor.	• No specific feedback relating to the modification	n/a
Door Knock	29 June 2018	Over 400 stakeholders in the Ashfield, Haberfield and Leichhardt area who could potentially be impacted by the proposed changes to the project were doorknocked. Community engagement teams from Roads and Maritime and SMC engaged with stakeholders informing them of the proposed change in use of the construction sites that would be required for the project, including the removal of Darley Road tunnel site. Properties along the following streets were doorknocked: • Parramatta Road • Northcote Street • Darley Road • Alt Street • Bland Street • Walker Street • Wattle Street • Wolseley Street • Ash Lane	• The information was well received by the majority of stakeholders especially stakeholders around Darley Road who were satisfied the Darley Road construction site would not be required • Some stakeholders around Northcote Street welcomed the decision to keep the Northcote construction zone for the M4-M5 Link mainline tunnel construction as it means the road remains closed to traffic from Parramatta Road. • The main issues raised during the doorknock included: – Query regarding whether the community would have an opportunity to comment on the proposed changes – Concern regarding the spoil haulage route for the Northcote Street civil and tunnel site – Concerns about construction workers at the Northcote Street site parking on residential streets and worker behaviour during out of hours periods – Concerns regarding the impact of vibration on property – General concerns regarding tunnelling – Query regarding the traffic movements in and out of the Parramatta Road site	Concerns regarding potential impacts associated with the proposed modification have been assessed as part of this modification report in **Chapter 6** (Environmental assessment)

Activity/Tool	Timing	Details	Feedback and comments	Response
WestConnex Community Reference Group - Central	29 June 2018	Attended by IWC, DPE and the contractor. General update on the project provided including the announcement of preferred contractor.	• No specific feedback relating to the modification	n/a
Extraordinary WestConnex Community Reference Group	12 July 2018	Attended by IWC and DPE. Provided update on the M4-M5 Link project, including: • Removal of Darley Road as a construction site • The use of the Northcote Street site as a civil and tunnel site • The use of the Parramatta Road West and East sites as civil sites (they will not be used for tunnelling) • The temporary overpass between the Parramatta Road West and East (Muirs) civil sites • A modification to the SSI Application under the NSW *Environmental Planning and Assessment Act 1979* is required and will include an assessment of the proposed changes.	• No specific feedback relating to the modification	n/a
Door Knock	7 - 8 September 2018	Around 200 stakeholders along the Northcote Street proposed haulage routes were doorknocked. Community engagement teams from Roads and Maritime engaged with stakeholders along both Route A and B.	• The feedback on using these routes for M4-M5 Link concerned construction traffic impacts, particularly existing intersections where congestion is already heavy. • Feedback was generally considered neutral	

5.4.3 Consultation with local, state and commonwealth government agencies elected representatives and other industry and stakeholder consultation

Table 5-5 provides a summary of the consultation activities undertaken with local, state and Commonwealth Government agencies, elected representatives and other stakeholders prior to the modification going on public display. In addition to these meetings, regular phone and email correspondence has taken place with these stakeholders.

Table 5-5 Stakeholder engagement summary for the modification to date

Meeting/Briefing	Timing	Details
Briefing for Anthony Albanese Member of Parliament (MP)	13 June 2018	Provided overview of the M4-M5 Link project announcement, including the required construction sites. Indicated that the contractor would commence preparing their plans for DPE approval in line with the conditions of approval.
Briefing for Ron Hoenig MP	26 June 2018	
Briefing for Inner West Councillors	28 June 2018	
Briefing for Inner West Council staff	3 July 2018	
Briefing for City of Sydney Councillors and Council staff	4 July 2018	Provided overview of the M4-M5 Link project announcement, including the required construction sites, new contractor and the upcoming modification exhibition.
Briefing for Tanya Plibersek MP	5 July 2018	

Meeting/Briefing	Timing	Details
NSW Environment Protection Authority (EPA)	6 August 2018	A presentation was provided to the NSW EPA giving an update on the proposed modification. At the meeting: • NSW EPA was generally supportive of the decision to remove the Darley Road construction site and the proposed use at the Parramatta Road West site • NSW EPA questioned the potential noise impacts associated with the use of Northcote Street site for tunnelling and the proposed 24/7 operation of the Parramatta Road West and East sites • NSW EPA raised concerns about the extended duration of construction noise impacts in the Haberfield/Ashfield area as a result of both the M4 East and M4-M5 Link construction works. EPA questioned whether the 'construction fatigue' condition of approval E88 would be impacted by the proposed modification • NSW EPA requested that the modification detail the acoustic treatments that have already been implemented or are proposed in the vicinity of the Northcote Street tunnel site, the Wattle St ramps, the G-loop and the Parramatta Rd West and East sites. EPA stressed the importance of bringing forward proposed noise treatments to the commencement of construction (as per condition of approval E90) • NSW EPA expressed a preference for use of the G-loop as a spoil haulage route from the Northcote Street site particularly if spoil is to be removed 24 hours a day, seven days per week. • NSW EPA suggested that Roads and Maritime undertake proactive consultation with the local community prior to and during the public exhibition period • NSW EPA suggested that Roads and Maritime use the existing community forums such as the WestConnex Community Reference Group to discuss the detail of the proposed modification and receive preliminary feedback.

Meeting/Briefing	Timing	Details
Sydney Water	10 August 2018	A presentation was provided to Sydney Water giving an update on the proposed modification. At the meeting: • Sydney Water stressed the importance of protecting their existing assets during the construction phase and ensuring that options are available for haulage routes should an emergency arise • In relation to the proposed water treatment plant (WTP) at St Peters, Sydney Water noted that proposed discharges into the existing or proposed (New M5) stormwater network would need to demonstrate that the infrastructure has adequate capacity • Sydney Water noted that, if proposed, a new stormwater connection to Alexandra Canal would require a Sydney Water construction licence and an EPA approval given the potential to disturb contaminated sediments in the canal. They also noted that a new stormwater outlet would require a heritage assessment as the canal is a state listed heritage item • Sydney Water noted they would be comfortable with the contractor seeking a Trade Waste Agreement for WTP discharges • Sydney Water noted that they had recently met with the contractor regarding the project and provided feedback on a number of their draft management plans. Roads and Maritime indicated that a further update to Sydney Water would be provided regarding the relevant environmental assessment findings for the modification in September 2018.

Meeting/Briefing	Timing	Details
Inner West Council and City of Sydney Council	30 August 2018	A presentation was provided to IWC and CoS giving an update on the proposed modification. At the meeting: • IWC was interested in the provision of off-street car parking in the Haberfield/Ashfield area for construction workers • IWC queried the number of heavy vehicle movements from the Northcote Street civil and tunnel site and Parramatta Road West and Parramatta Road East civil sites and the time of day these movements would occur • IWC suggested that Roads and Maritime should consult with Canada Bay Council regarding the Ramsay Street haulage route given the route is located partly within its Local Government Area (LGA) boundary • CoS queried the drainage design for the operational water treatment plant at St Peters • IWC queried the expected discharge quality from the operational water treatment plant at St Peters • IWC asked for clarification regarding the responsibility of Roads and Maritime, Sydney Motorway Corporation and the contractor for consultation regarding the modification • IWC questioned whether the modification would impact proposed legacy land at Haberfield and Ashfield including at Reg Coady Reserve following the completion of the M4 East project • IWC questioned whether the G-loop would be available for general commuter traffic to use and, if not, how this would be regulated (signage, line marking and cameras) • IWC questioned how groundwater inflows to the tunnels would be managed • IWC noted that pedestrians crossing Ramsay Street in locations where there are no traffic lights (eg in the vicinity of Northcote Street and Wolseley Street) may be impacted by proposed heavy vehicle movements • IWC questioned whether bus stops on Parramatta Road would be relocated and the impact this would have on pedestrian safety • IWC was concerned about the extended duration of tunnelling at the Northcote Street site and the impact this would have on adjacent residential properties (eg potential noise, dust, traffic and car parking impacts) • IWC noted that they had previously received complaints about the impact of the M4 East G-loop on the safety of school children crossing Dobroyd Parade to get to Timbrell Park • IWC questioned whether the contractor was considering the use of larger spoil haulage vehicles (under the Roads and Maritime's voluntary Safety, Productivity & Environment Construction Transport Scheme (SPECTS)) to improve tunnelling efficiencies and noted that use of these larger vehicles on local roads would require Notice to travel on local council roads • IWC noted that they had no major issues with the proposed modification as it would result in several improvements including the removal of the Darley Road construction site.

There have been a number of other meetings with key State government agencies and local council stakeholders and the contractor to discuss post-approval management plans required by conditions of the project approval.

5.5 Future consultation for the modification

Consultation would take place before, during and after public display of the proposed modification. Consultation for the proposed modification would be generally consistent with the consultation process undertaken for the EIS. The following is an outline of the future consultation that will be undertaken for the proposed modification.

5.5.1 Consultation before public display of modification

During preparation of the modification, various consultation activities occurred up to lodgement of the modification. Consultation activities that are planned to occur just prior to lodgement will include further consultation with residents door knocked regarding the proposed haulage routes for the Northcote Street civil and tunnel site, further communications with key stakeholders in the lead up to the display of the modification and responding to queries related to any potential concerns and issues.

The outcomes of this consultation will be discussed in the Response to Submissions report for the modification.

5.5.2 Consultation during exhibition of modification

The environmental assessment for the modification will be exhibited for 14 days from 12 September 2018. The consultation activities planned during the exhibition period will provide community and stakeholders with an opportunity to find out detailed information about the proposed modification. The community and other stakeholders will also be able to provide feedback on the modification to DPE as submissions.

Consultation activities that will occur during the exhibition of the modification include:

- Provision of a ''Community Guide to the M4-M5 Link modification' factsheet to residents, businesses and other stakeholders that could be potentially impacted by the proposed modification. This factsheet will be distributed just after exhibition of the modification. It will outline how to make a submission and will focus on the potential impacts related to the modification. It will be issued to residents, businesses and other stakeholders located close to the Northcote Street civil and tunnel site and proposed haulage routes, the Parramatta Road West and Parramatta Road East civil sites and the Campbell Road motorway operations complex at St Peters where the relocated WTP is proposed
- Doorknocking potentially impacted residents, businesses and other stakeholders to explain the proposed modification and gather any feedback
- Sending direct emails to registered stakeholders, including residents, landowners, stakeholders, businesses and community groups
- Providing webpage updates about the modification. These updates will be published on www.westconnex.com.au and will include information on how to make a submission.

All feedback will be collated and presented in the Response to Submissions Report for the modification.

5.5.3 Consultation during and following DPE assessment

Following exhibition of the modification Roads and Maritime will review the submissions received and respond to the issues raised in a Response to Submissions Report for the modification. This report will be provided to DPE and will be assessed prior to a determination being made. If during exhibition or during the response to submissions process further changes to the proposed modification are identified, these changes would also be described and assessed.

During DPE's assessment of the modification and up to and following determination, Roads and Maritime, SMC and the contractor will continue to consult with the community and relevant

stakeholders in line with the existing and modified (if approved) conditions of approval, the Communications Strategy and established communication and complaints processes.

Communication and consultation with stakeholders and the community during construction would focus on providing updates on construction activities and program, responding to enquiries and concerns in a timely manner and minimising potential impacts where possible. Further detail of consultation with stakeholders and the community during construction is provided in section 7.6.2 of the EIS.

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6 Environmental Assessment

6.1 Introduction

This chapter provides an environmental assessment of the proposed modification to Stage 1 of the M4-M5 Link project (the project). The assessment identifies potential issues and provides a comparison with the impacts assessed in the Environmental Impact Statement (EIS) and the Submissions and Preferred Infrastructure Report (SPIR) for the approved project. The assessment has been prepared to address the environmental assessment requirements for the modification as described in **Appendix A** (Environmental assessment requirements).

6.2 Environmental scoping

A scoping assessment has been completed for the proposed modification. The scoping assessment identifies the likely potential environmental impacts associated with the proposed modification.

The scoping assessment has been carried out at the following locations:

- Northcote Street civil and tunnel site, including the proposed construction access tunnel and spoil haulage routes (see **section 6.2.1**)
- Parramatta Road West and Parramatta Road East civil sites (see **section 6.2.2**)
- Removal of the Darley Road civil and tunnel site from the project (see **section 6.2.3**)
- Relocation of the operational water treatment plant to St Peters (see **section 6.2.4**).

A scoping assessment at these locations has been developed to identify potential environmental impacts associated with the proposed modification.

As described in **Chapter 4** (Proposed modification), the proposed modification relates primarily to the use of construction sites for Stage 1 of the project, with the exception of the relocation of the operational water treatment plant to St Peters. Therefore, potential impacts associated with the operation of Stage 1 of the project generally would not change.

A number of issues for the proposed modification would be generally consistent with the EIS and do not require further assessment. Issues that do not require further assessment include:

- Traffic and transport (operation)
- Air quality (operation)
- Human health (construction and operation)
- Social and economic (operation)
- Contamination (construction and operation)
- Groundwater (operation)
- Biodiversity (construction and operation)
- Non-Aboriginal heritage (operation)
- Aboriginal heritage (construction and operation)
- Hazard and risk (construction and operation)
- Greenhouse gas (construction and operation).

These issues would be managed in accordance with the existing environmental management measures as summarised in Part E of the SPIR and relevant conditions of approval for the project. Impacts to human health during construction are considered as part of the assessment of potential air quality and noise and vibration assessments for the proposed modification.

6.2.1 Northcote Street civil and tunnel site

As described in **Chapter 5** (Proposed modification), the Northcote Street site is proposed to be used as a civil and tunnel site. Potential environmental impacts associated with this change of use that require assessment are identified in **Table 6-1**.

Table 6-1 Scoping assessment for the Northcote Street civil and tunnel site

Issue	Potential environmental impacts	Where addressed
Traffic and transport	Potential impact to car parking in the wider Haberfield/ Ashfield precinct	**Section 6.3.1** and **section 6.3.7**
	Potential traffic impact to the road network from construction workforce shuttle bus movements	
	Potential traffic impacts associated with heavy vehicle and light vehicle movements to and from the civil and tunnel site	
	Potential impacts to intersection and mid-block performance along proposed spoil haulage routes	
	Other potential traffic and transport impacts including access, on-street parking, pedestrians and cyclists, public transport and traffic crashes	
	Potential traffic impacts associated with reconfiguration works required for the dedicated temporary construction vehicle turning lane (the G-loop)	
Air quality	Potential air quality including dust impacts associated with the use of the site for tunnelling and associated activities during the construction period	**Section 6.3.2** and **section 6.3.7**
	Potential air quality impacts associated with reconfiguration works required to facilitate use of the G-loop	
Noise and vibration (amenity and structural)	Potential noise and vibration impacts including sleep disturbance associated with the use of the site for tunnelling and associated activities during the construction period	**Section 6.3.2** and **section 6.3.7**
	Potential traffic noise impacts including sleep disturbance for sensitive receivers fronting the proposed spoil haulage routes	
	Potential noise and vibration impacts associated with the construction of the construction access tunnel	
	Potential ground borne noise and vibration impacts associated with construction of the proposed construction access tunnel	
	Potential noise impacts associated with reconfiguration works required to facilitate use of the G-loop	
Visual amenity	Potential visual impacts associated with the proposed construction infrastructure at site (e.g. retention of the existing M4 East acoustic shed, site offices and workshop) when viewed from nearby sensitive receptors and public vantage points including traffic along this section of Parramatta Road	**Section 6.3.6** and **section 6.3.7**
	Potential visual amenity impacts associated with reconfiguration works and use of the G-loop	
Land use and property	Proposed construction of the access tunnel resulting in potential settlement impacts to properties and infrastructure located above the tunnel alignment	**Section 6.3.5**
	Changes to utility connections required to provide power for construction tunnelling activities at the site	
	Potential impacts from the continued use of the G-loop and ongoing occupation of part of Reg Coady Reserve during construction	
Non-Aboriginal heritage	Proposed construction of the access tunnel resulting in potential settlement impacts on properties within the Haberfield Conservation Area	**Section 6.3.9**

Issue	Potential environmental impacts	Where addressed
Groundwater	Potential groundwater impacts associated with construction of the temporary access tunnel	**Section 6.3.8**
Surface water, flooding and drainage	Potential flooding and drainage impacts associated with proposed use of the site, including potential impacts on the construction access tunnel.	**Section 6.3.4**

6.2.2 Parramatta Road West and Parramatta Road East civil sites

As described in **Chapter 4** (Proposed modification), the Parramatta Road West and East civil sites are located on the western and eastern sides of Parramatta Road between around Alt Street and Bland Street at Ashfield and Haberfield.

The Parramatta Road West and East civil sites would be used in accordance with condition of approval C19 and other conditions of the project approval. The sites would be used for parking and other works that do not exceed the 'noise affected' Noise Management Levels as identified in the Interim Construction Noise Guideline (ICNG).

The sites would be used for site offices, light and heavy vehicle car parking, shuttle bus services, workshop and storage of equipment, materials and construction machinery. Both sites would operate 24 hours a day, 7 days a week in accordance with the conditions of the project approval.

The sites would be used to support civil and tunnelling construction activities at other project construction sites, primarily within the Haberfield and Ashfield area. No tunnelling, tunnel spoil stockpiling and handling or tunnel spoil haulage would occur at these sites.

Potential environmental impacts associated with the proposed use of these sites that require assessment are identified in **Table 6-2**.

Table 6-2 Scoping assessment for Parramatta Road West and East civil sites

Issue	Potential environmental impacts	Where addressed
Transport and traffic	Potential impacts to car parking in the wider Haberfield/ Ashfield precinct	**Section 6.4.1**
	Potential impact to the local traffic network	
	Potential safety impacts associated with the temporary overhead pedestrian walkway to pedestrians and traffic (including public transport and over-height vehicles) using Parramatta Road	
	Potential traffic impacts associated with construction of the temporary overhead pedestrian walkway including any impacts to traffic using this section of Parramatta Road	
Air quality	Potential air quality including dust impacts associated with the use of the sites	**Section 6.3.2**
Noise and vibration (amenity and structural)	Potential noise and vibration impacts associated with construction of the temporary overhead pedestrian walkway	**Section 6.3.3**
	Potential noise and vibration impacts (amenity) associated with use of the sites	
	Potential noise impacts associated with the on-going use of the temporary overhead pedestrian walkway during the construction period (for construction workforce use only)	
Visual Amenity	Potential visual impacts associated with the proposed use of the two sites	**Section 6.4.6**
	Potential visual impacts (including lighting impacts) associated with the temporary overhead pedestrian walkway when viewed from nearby sensitive receptors and public vantage points including traffic along this section of Parramatta Road	

Issue	Potential environmental impacts	Where addressed
Heritage	Potential impact of the temporary overhead pedestrian walkway on the visual setting of the adjacent Haberfield Heritage Conservation Area	**Section 6.4.8**
Surface water, flooding and drainage	Potential surface water, flooding and drainage impacts associated with the proposed use of the two sites	**Section 6.4.4**
Social and economic	Potential social and economic impacts associated with the proposed use of the two sites and the temporary pedestrian walkway connection.	**Section 6.4.7**
Land use	Potential land use impacts associated with the proposed use of the two sites and the temporary pedestrian walkway.	**Section 6.4.5**

6.2.3 Removal of the Darley Road civil and tunnel site from the project

As described in **Chapter 4** (Proposed modification), construction activities would not be carried out at the Darley Road civil and tunnel site for the proposed modification. The construction activities proposed for Darley Road civil and tunnel site as described in the EIS and SPIR would be accommodated at other project construction sites.

The approved project involved the removal and transportation of around 550,300 cubic metres of tunnel spoil from the Darley Road civil and tunnel site as described in Section 23.3.2 of the EIS. Given that the length of the mainline tunnel would not change for the proposed modification, this spoil volume would be required to be removed from other approved tunnelling sites.

The overall intensity (rate) of spoil removal at approved tunnelling sites is not expected to change, however the additional spoil to be removed would require the extension of the tunnelling component of the overall construction program by around six months. As a result the overall construction program for the mainline tunnels would continue through until around the end of Q1 2023.

The duration of the potential environmental impacts associated with tunnelling activities would therefore increase for the proposed modification. However, the rate of spoil removal and associated haulage vehicle movements (daily and peak hour) are expected to remain generally similar to the EIS.

The removal of Darley Road would result in groundwater ingress during construction being directed to construction water treatment plants located at other tunnelling sites. As a result, the rate of discharge at the Pyrmont Bridge Road civil and tunnel site and Northcote Street civil and tunnel site is expected to increase.

Potential environmental impacts associated with the removal of the Darley Road civil and tunnel site from the project that require assessment are identified in **Table 6-3**.

Table 6-3 Scoping assessment for removal of the Darley Road civil and tunnel site from the project

Issue	Potential environmental impacts	Where addressed
Traffic and transport	Extended duration of potential traffic impacts at other tunnelling sites	**Section 6.5.1**
Air quality	Extended duration of potential air quality impacts at other tunnelling sites	**Section 6.5.2**
Noise and vibration	Extended duration of potential noise and vibration impacts at other tunnelling sites	**Section 6.5.3**
Social and economic	Potential social and economic impacts on the local community including residents, local businesses and community facilities as a result of the extended tunnelling duration	**Section 6.5.4**

Issue	Potential environmental impacts	Where addressed
Visual	Potential visual impacts associated with additional utility infrastructure such as pumps required for other construction water treatment plants to compensate for the removal for the construction water treatment plant at Darley Road	**Section 6.5.5**
Surface water, flooding and drainage	Potential impacts on the receiving environment (waterways) arising from any changes in discharge volumes, rates and water quality at other construction water treatment plants to compensate for the removal for the construction water treatment plant at Darley Road	**Section 6.5.6** and **section 6.6.4**
Resource use and waste	The distribution of spoil volumes at tunnelling sites would change as a result of the removal of Darley Road	**Section 6.5.6**

6.2.4 Relocation of operational water treatment plant to St Peters

As described in **Chapter 4** (Proposed modification), the Darley Road operational water treatment plant would be relocated to the Campbell Road motorway operations complex at the St Peters interchange. Potential environmental impacts associated with this change that require assessment are identified in **Table 6-4**.

The construction footprint of the project at St Peters interchange would not be increased to allow for the construction of the operational water treatment plant. The operational footprint for the project would need to be increased to accommodate the operational water treatment plant.

Table 6-4 Scoping assessment for the relocation of the operational water treatment plant to St Peters

Issue	Potential environmental impacts	Where addressed
Transport and traffic	Potential traffic impacts associated with construction of the water treatment plant	**Section 6.6.1**
Construction air quality	Potential air quality (dust) impacts associated with construction of the water treatment plant	**Section 6.6.2**
Construction noise and vibration (amenity and structural)	Potential noise impacts associated with construction of the water treatment plant	**Section 6.6.3**
	Potential operational noise impacts associated with the operation of the water treatment plant	**Section 6.6.3**
Visual amenity	Potential visual impacts associated with the water treatment plant when viewed from nearby sensitive receptors and public vantage points, including from the proposed open space area to the east of the site	**Section 6.6.6**
Land use and property	Potential impact of the water treatment plant on proposed land uses including the New M5 St Peters interchange and associated landscape areas and the proposed open space area to the east of the site	**Section 6.6.5**
Surface water, flooding and drainage	Potential impacts from the increased discharge flows from the water treatment plant into Alexandra Canal including scour potential and potential to disturb contaminated sediments within the canal	**Section 6.6.4**
	Potential impact of discharge from the water treatment plant on the existing stormwater network and receiving environment (waterways)	
	Potential flooding and drainage impacts during construction and operation	
Non-Aboriginal heritage	Potential impact of the required works on the significance of listed heritage items (e.g. Alexandra Canal)	**Section 6.6.8**

6.3 Northcote Street civil and tunnel site

The following is an assessment of the issues relevant to Northcote Street civil and tunnel site as identified in **Table 6-1**.

6.3.1 Traffic and transport

Assessment methodology

An assessment of potential construction traffic impacts associated with the proposed modification was carried out and is included in **Appendix B** (Traffic and transport report). This section summarises the construction traffic assessment associated with the Northcote Street civil and tunnel site and taking into account changed construction traffic volumes at the Parramatta Road West and Parramatta Road East civil sites.

The traffic impacts of the proposed modification were assessed using existing traffic models previously used to assess construction impacts for the M4 East and M4-M5 Link projects. The assessments were undertaken on the surrounding road network during the AM and PM peak hours in the forecast peak construction year (2021). The impact of shuttle buses from the Parramatta Road civil sites was included in this assessment.

The construction impact assessment was undertaken at locations where construction traffic is forecast to pass through the network in significant volumes. The intersections assessed were grouped into two clusters as identified in **Table 6-5** and shown in **Figure 6-1**.

Table 6-5 List of intersections assessed for the proposed modification

Cluster 1 (Haberfield and Ashfield)	Cluster 2 (Five Dock)
Parramatta Road/Harris Road	Ramsay Road/Fairlight Street
Parramatta Road/Croydon Road/Arlington Street	Great North Road/Queens Road/Fairlight Street
Parramatta Road/Great North Road	Great North Road/Ramsay Road/First Avenue
Parramatta Road/Frederick Street/Wattle Street	Queens Road/Harris Street
Parramatta Road/Bland Street	Great North Road/Lyons Road
Wattle Street/Ramsay Street	
Dobroyd Parade/Waratah Street	
Dobroyd Parade/Timbrel Drive/Mortley Avenue	

Cluster 2 was not assessed in the M4-M5 Link EIS or SPIR, and therefore a comparison is made to the 'without construction' scenario only.

The Cluster 1 model was previously used in the assessment of the construction impacts for the M4-M5 Link EIS and the Cluster 2 model was previously used in the assessment of the construction impacts for the M4 East EIS. The existing models included background traffic forecasts for construction year 2021 (the 'without construction' scenario).

Construction traffic as a result of the proposed modification was then added to the 2021 background traffic, based on the proposed construction methodology, covering vehicle types, volumes and construction traffic routes to and from the various construction ancillary facilities (the 'with construction' proposed modification scenario).

As the proposed modifications relate to the Stage 1 construction sites at Haberfield and Ashfield, and the removal of the Darley Road site from the project, there is negligible change in construction impact forecast on the road network east of these sites along City West Link, and so the roads and intersections assessed in Leichhardt North, Lilyfield and Rozelle in the M4-M5 Link EIS have not been reassessed.

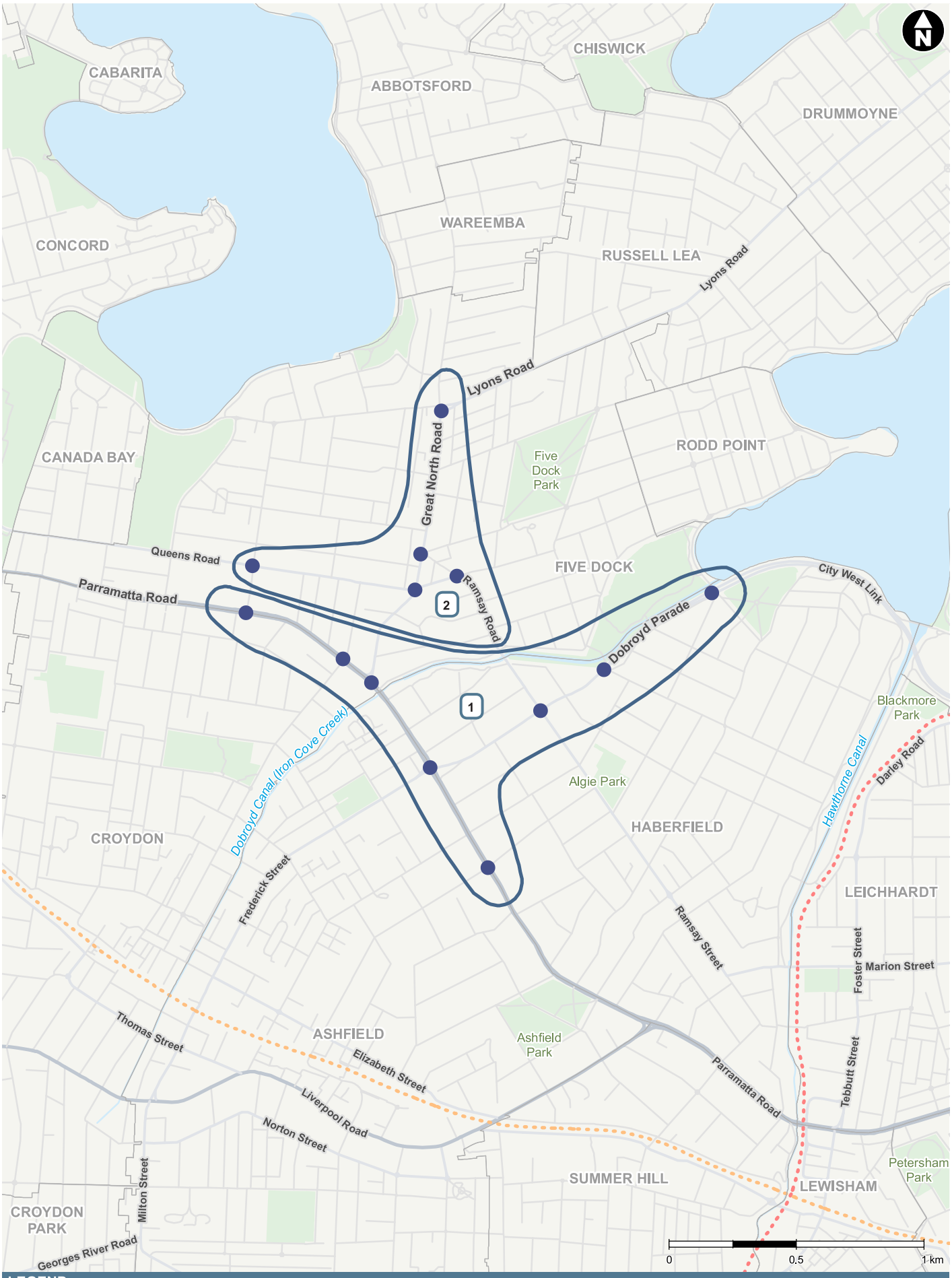


Figure 6-1 Traffic model coverage

The assessment provides a comparison of impacts for the proposed modification and impacts described in the SPIR (the 'with construction' SPIR scenario). The traffic and transport assessment in Appendix A (Traffic and transport impact assessment) of the SPIR amended the assessment in the EIS, taking into consideration changes to preferred infrastructure.

The SPIR considered two construction site options (Option A and Option B). Option A has been included for comparison in this assessment because it is the most comparable to the proposed modification. The assessment also considers the traffic impacts outlined in the SPIR for the M4 East project.

Levels of service

Level of service (LoS) is a measure to describe the operational conditions and efficiency of a road or intersection. The definition of LoS generally outlines the operating conditions in terms of speed and travel time, freedom to manoeuvre, traffic interruptions, comfort and convenience, and road safety. It is a qualitative measure describing operational conditions within a roadway or intersection, as perceived by motorists and/or passengers.

There are six levels of service; LoS A to LoS F. LoS A represents the best operating conditions and LoS F the poorest operating conditions. When the level of service of a road or intersection falls below LoS D, investigations are generally carried out to identify suitable remediation. However, constraints in built up urban areas mean that LoS E and LoS F are regularly experienced by motorists on the Sydney road network during traffic peak periods.

Roadway level of service

Mid-block volume/capacity (v/c) ratios provide an indication of the saturation level of a segment of road, based on the theoretical design capacity of the road. Volume/capacity ratios can be used to provide a corresponding level of service for road operation, as detailed in *Guide to Traffic Management – Part 3 Traffic Studies and Analysis* (Austroads, 2013).

The level of service for freeways or motorways is calculated from the vehicle density, which is the traffic volume divided by the average passenger vehicle speed. Density is measured in passenger car units (PCU[1]) per kilometre per lane (PCU/km/ln).

The roadway LoS criteria are provided in **Appendix B** (Traffic and transport report).

Updated analysis of roadway LoS has been provided at relevant locations impacted by the proposed modification compared to the SPIR.

Intersection level of service

Average delay is often used to assess the operational performance of intersections, with level of service used as an index. An assessment of performance of the intersection is undertaken to determine the average delay times experienced by traffic at the intersection. The intersection is then characterised into its corresponding level of service 'band' based on these delay times.

The intersection LoS criteria are provided in **Appendix B** (Traffic and transport report).

The intersection performance results for the road network under the 2021 'without construction' and 'with construction' forecast volumes are summarised for each relevant location for the AM and PM peak hours. This allows for comparison with the level of impact reported in the SPIR.

Intersection modelling was undertaken using passenger car units (PCU) to quantify traffic volumes. This accounts for the amount of road space used by different vehicle types.

Traffic generation and spoil haulage routes

The assessment considered the changes to construction traffic volumes for the proposed modification compared to the SPIR. Proposed changes to construction traffic volumes are summarised in **Table 6-6**.

Table 6-6 Proposed changes to construction traffic volumes

Site	Light vehicle movements (per hour, AM peak EIS	Light vehicle movements (per hour, AM peak modification	Light vehicle movements (per hour, PM peak EIS	Light vehicle movements (per hour, PM peak modification
Northcote Street civil and tunnel site	50	7	150	7
Parramatta Road East civil site	10	18	10	31
Parramatta Road West civil site	50	12	150	20
Site	**Heavy vehicle movements (per hour, AM and PM peak) EIS**		**Heavy vehicle movements (per hour, AM and PM peak) modification**	
Northcote Street civil and tunnel site	5		8	
Parramatta Road East civil site	3		1	
Parramatta Road West civil site	7		7	

No changes in the indicative construction volumes from the other construction sites are proposed, subject to ongoing detailed construction planning.

The nominated routes for exiting spoil haulage vehicles from Northcote Street civil and tunnel site are described in **Chapter 4** (Proposed modification).There are two nominated routes (Route A and Route B) which are shown in **Figure 6-2**.

For the G-loop route (Route B) two scenarios have been assessed

- Trucks exiting the G-Loop and entering the M4 East westbound entry ramp (Route B – M4 East ramps)
- Trucks exiting the G-Loop and using the westbound Wattle Street surface lanes and the Parramatta Road/Wattle Street intersection (Route B – Wattle Street).

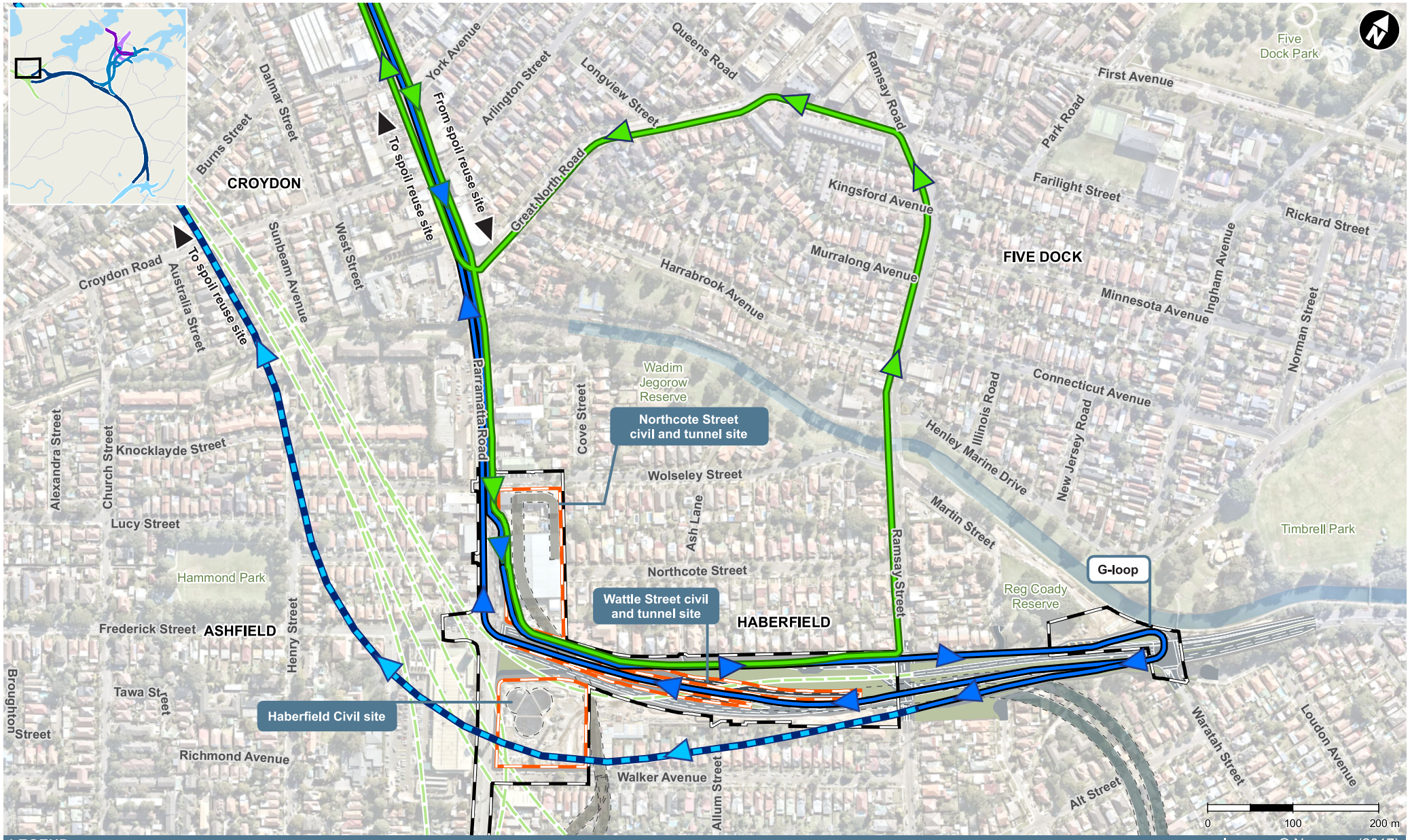


Figure 6-2 Northcote Street civil and tunnel site – proposed spoil haulage routes

Assessment of potential impacts

Roadway level of service – Haberfield and Ashfield

The results for Haberfield and Ashfield identified limited change in terms of volume over capacity (V/C) compared to the assessment in Appendix A (Traffic and transport impact assessment) of the SPIR and indicate that the relevant mid-blocks would remain within their theoretical capacity. The small change in V/C indicates a small change in forecast volume on these links and therefore a limited impact. The results are considered for the Route A haulage route. The Route B haulage route has a minimal impact on the mid-block operational performance.

A comparison of the AM and PM peak hour mid-block operational performance for the SPIR and the modification is provided in **Table 6-7** and **Table 6-8**.

Table 6-7 2021 AM peak hour mid-block operational performance summary[1]

Location and direction		Mid block capacity	With construction (M4 M5 Link SPIR Option A)			With construction (Modification)		
			Flow	V/C[2]	LoS	Flow	V/C[2]	LoS
Parramatta Road, north of Wattle Street – Haberfield	SB	3,300	1,890	0.57	C	1,910	0.58	C
	NB	3,300	1,340	0.41	C	1,350	0.41	C
Wattle Street, east of Parramatta Road – Haberfield	EB	2,000	780	0.39	B	770	0.38	B
	WB	2,000	890	0.45	C	880	0.44	C
M4 East ramps at Wattle Street[3]	EB	2,200	1,310	0.60	D	1,250	0.57	C
	WB	4,500	1,340	0.30	B	1,310	0.29	B

Notes:

1. Traffic volume rounded to nearest 10
2. Volume over capacity ratio
3. Freeway LoS is evaluated in PCU, eastbound (EB) capacity treated as urban road with interrupted flow due to downstream traffic signals.

Table 6-8 2021 PM peak hour mid-block operational performance summary[1]

Location and direction		Mid block capacity	With construction (M4 M5 Link SPIR Option A)			With construction (Modification)		
			Flow	V/C[2]	LoS	Flow	V/C[2]	LoS
Parramatta Road, north of Wattle Street – Haberfield	SB	3,300	2,260	0.68	D	2,120	0.64	D
	NB	3,300	1,380	0.42	C	1,380	0.42	C
Wattle Street, east of Parramatta Road – Haberfield	EB	2,000	1,270	0.64	D	1,130	0.57	C
	WB	2,000	800	0.40	C	760	0.38	B
M4 East ramps at Wattle Street[3]	EB	2,200	1,010	0.46	C	970	0.44	C
	WB	4,500	1,290	0.29	B	1,240	0.28	B

Notes:

1. Traffic volume rounded to nearest 10
2. Volume over capacity ratio.
3. Freeway LoS is evaluated in PCU, eastbound (EB) capacity treated as urban road with interrupted flow due to downstream traffic signals.

Intersection level of service – Haberfield and Ashfield (Route A)

A comparison of the AM and PM peak hour intersection operational performance for the SPIR and the modification Route A is provided in **Table 6-9** and **Table 6-10**.

Table 6-9 2021 AM peak hour intersection operational performance summary[1] (Route A)

Cluster	Intersection	With construction (M4 M5 Link SPIR Option A)		With construction (Modification Northcote Street site egress via Five Dock)	
		Volume (PCU)	LoS	Volume (PCU)	LoS
1	Parramatta Rd | Harris Rd	2,650	C	2,690	C
	Parramatta Rd | Croydon Rd | Arlington St	3,370	C	3,420	C
	Parramatta Rd | Great North Rd	3,940	C	3,960	C
	Parramatta Rd | Frederick St | Wattle St	4,960	D	4,990	D
	Parramatta Rd | Bland St	2,870	F	2,930	F
	Wattle St | Ramsay St	3,280	C	3,310	C
	Dobroyd Parade | Waratah St	3,710	B	3,720	B
	Dobroyd Parade | Timbrell Dr | Mortley Ave	5,780	F	5,780	F

Notes:

1. Traffic volume rounded to nearest 10.

Table 6-10 2021 PM peak hour intersection operational performance summary[1] (Route A)

Cluster	Intersection	With construction (M4 M5 Link SPIR Option A)		With construction (Modification Northcote Street site egress via Five Dock)	
		Volume (PCU)	LoS	Volume (PCU)	LoS
1	Parramatta Rd | Harris Rd	3,240	C	3,220	C
	Parramatta Rd | Croydon Rd | Arlington St	3,710	E	3,760	F
	Parramatta Rd | Great North Rd	3,920	F	3,980	F
	Parramatta Rd | Frederick St | Wattle St	5,200	E	5,070	E
	Parramatta Rd | Bland St	2,530	B	2,570	B
	Wattle St | Ramsay St	3,330	E	3,170	D
	Dobroyd Parade | Waratah St	3,280	B	3,270	B
	Dobroyd Parade | Timbrell Dr | Mortley Ave	5,800	F	5,760	F

Notes:

1. Traffic volume rounded to nearest 10.

Compared to the scenario considered in the SPIR, there is a relatively small change in the volume of construction traffic on parts of the network due to the proposed modification, rising by a maximum of about 60 PCU in the PM peak at the Parramatta Road/Great North Road intersection. This increase in PCUs does not change the level of service (LoS) at this intersection and there is limited change elsewhere on the network.

The change in intersection performance relative to the M4-M5 Link SPIR assessment is limited, with a change in the LoS at two intersections during the PM peak hour:

- Wattle Street/Ramsay Street intersection – improvement from LoS E to LoS D
- Parramatta Road/Croydon Road/Arlington Street intersection – deterioration from LoS E to LoS F. This intersection is at capacity even in the ‘’without construction’ scenario – it is close to LoS E – so even a small change in demand has a large impact on intersection delay. The capacity constraint is caused by exit blocking from downstream intersections, so upgrades at this intersection would not alleviate the forecast delay.

This analysis shows that there is a relatively minor difference in volumes on the modelled road network between the ‘with construction’ SPIR scenario and ‘with construction’ proposed modification scenario.

Intersection level of service – Haberfield and Ashfield (Route B – M4 East tunnels)

A comparison of the AM and PM peak hour intersection operational performance for the SPIR and the modification for Route B (M4 East tunnels) is provided in **Table 6-11** and **Table 6-12**. This scenario involves spoil vehicles exiting the G-Loop and entering the M4 East westbound entry ramp.

Table 6-11 2021 AM peak hour intersection operational performance summary[1] (Route B)

Cluster	Intersection	With construction (M4 M5 Link SPIR Option A)		With construction (Modification Northcote Street site egress via G Loop)	
		Volume (PCU)	LoS	Volume (PCU)	LoS
1	Parramatta Rd | Harris Rd	2,650	C	2,680	C
	Parramatta Rd | Croydon Rd | Arlington St	3,370	C	3,400	C
	Parramatta Rd | Great North Rd	3,940	C	3,940	C
	Parramatta Rd | Frederick St | Wattle St	4,960	D	4,990	D
	Parramatta Rd | Bland St	2,870	F	2,930	F
	Wattle St | Ramsay St	3,280	C	3,310	C
	Dobroyd Parade | Waratah St	3,710	B	3,730	C
	Dobroyd Parade | Timbrell Dr | Mortley Ave	5,780	F	5,780	F

Notes:

1. Traffic volume rounded to nearest 10.

Table 6-12 2021 PM peak hour intersection operational performance summary[1] (Route B)

Cluster	Intersection	With construction (M4 M5 Link SPIR Option A)		With construction (Modification Northcote Street site egress via G Loop)	
		Volume (PCU)	LoS	Volume (PCU)	LoS
1	Parramatta Rd | Harris Rd	3,240	C	3,200	C
	Parramatta Rd | Croydon Rd | Arlington St	3,710	E	3,740	F
	Parramatta Rd | Great North Rd	3,920	F	3,960	F
	Parramatta Rd | Frederick St | Wattle St	5,200	E	5,070	E
	Parramatta Rd | Bland St	2,530	B	2,570	B
	Wattle St | Ramsay St	3,330	E	3,170	D
	Dobroyd Parade | Waratah St	3,280	B	3,290	B
	Dobroyd Parade | Timbrell Dr | Mortley Ave	5,800	F	5,760	F

Notes:

1. Traffic volume rounded to nearest 10.

Similar to the potential impact forecast in the section above for Route A, the change in intersection performance relative to the SPIR assessment for Route B is limited with a change in the LoS forecast at the following intersections:

- Dobroyd Parade/Waratah Street intersection – deterioration from LoS B to LoS C during the AM peak hour. This is mainly due to the additional signal phase for the northern leg (G-Loop exit), which reduces the capacity on the other approaches
- Wattle Street/Ramsay Street intersection – improvement from LoS E to LoS D during the PM peak hour with the forecast reduction in construction vehicles compared to the SPIR
- Parramatta Road/Croydon Road/Arlington Street intersection – deterioration from LoS E to LoS F during the PM peak hour.

The analysis shows there is a relatively minor difference in volumes on the modelled road network between the 'with construction' SPIR scenario and 'with construction' proposed modification scenario.

Compared to the Route A haulage route, the maximum queue length on the eastbound lanes from the M4 East exit ramp is forecast to increase from about 115 metres to 180 metres during the AM peak hour. This is some distance from the M4 East tunnel portal, located at Ramsay Street, which is about 280 metres from the intersection. The use of the G-Loop route (Route B) is therefore not expected to result in queuing back on to the M4 East exit ramps during the AM peak.

Intersection level of service – Haberfield and Ashfield (Route B – Wattle Street)

A comparison of the AM and PM peak hour intersection operational performance for the SPIR and the modification for Route B (Wattle Street) is provided in **Table 6-13** and **Table 6-14**. This scenario involves spoil vehicles exiting the G-Loop and using the surface westbound Wattle Street lanes and the Parramatta Road/Wattle Street intersection.

Table 6-13 2021 AM peak hour intersection operational performance summary[1]

Cluster	Intersection	Without construction		With construction (M4 M5 Link SPIR Option A)		With construction (Modification Northcote Street site egress via G Loop and Parramatta Road)	
		Volume (PCU)	LoS	Volume (PCU)	LoS	Volume (PCU)	LoS
1	Parramatta Rd | Harris Rd	2,550	B	2,650	C	2,700	C
	Parramatta Rd | Croydon Rd | Arlington St	3,280	B	3,370	C	3,420	C
	Parramatta Rd | Great North Rd	3,810	C	3,940	C	3,960	C
	Parramatta Rd | Frederick St | Wattle St	4,880	D	4,960	D	5,010	D
	Parramatta Rd | Bland St	2,870	F	2,870	F	2,930	F
	Wattle St | Ramsay St	3,260	C	3,280	C	3,330	C
	Dobroyd Parade | Waratah St	3,470	B	3,710	B	3,730	C
	Dobroyd Parade | Timbrell Dr | Mortley Ave	5,530	F	5,780	F	5,780	F

Notes:

1. Traffic volume rounded to nearest 10.

Table 6-14 2021 PM peak hour intersection operational performance summary[1]

Cluster	Intersection	Without construction		With construction (M4 M5 Link SPIR Option A)		With construction (Modification Northcote Street site egress via G Loop and Parramatta Road)	
		Volume (PCU)	LoS	Volume (PCU)	LoS	Volume (PCU)	LoS
1	Parramatta Rd | Harris Rd	3,040	B	3,240	C	3,220	C
	Parramatta Rd | Croydon Rd | Arlington St	3,610	D	3,710	E	3,760	F
	Parramatta Rd | Great North Rd	3,820	F	3,920	F	3,980	F
	Parramatta Rd | Frederick St | Wattle St	4,950	E	5,200	E	5,090	E
	Parramatta Rd | Bland St	2,500	B	2,530	B	2,570	B
	Wattle St | Ramsay St	3,080	D	3,330	E	3,190	D
	Dobroyd Parade | Waratah St	2,960	B	3,280	B	3,290	B
	Dobroyd Parade | Timbrell Dr | Mortley Ave	5,450	F	5,800	F	5,760	F

Notes:

1. Traffic volume rounded to nearest 10.

The use of this route adds an additional 20 PCU to the intersections west of the Dobroyd Parade/ Waratah Street intersection compared to Route B (M4 East tunnels). However, this does not impact the forecast level of service of the modelled intersections compared to the route using Route B (M4 East tunnels). Therefore, the impacts relative to the M4-M5 Link SPIR assessment are consistent with those described above for M4 East route option.

Roadway level of service – Five Dock

The AM and PM peak hour mid-block operational performance for the modification at Five Dock is provided in **Table 6-15** and **Table 6-16**. These roadways were not assessed by the M4-M5 Link EIS or SPIR therefore the comparison is made to a 'without construction' scenario.

Table 6-15 2021 AM peak hour mid-block operational performance summary[1]

Location and direction		Mid block capacity	Without construction			With construction (Modification)		
			Flow	V/C[2]	LoS	Flow	V/C	LoS
Ramsay Rd, south of Fairlight St	NB	1800	690	0.38	B	710	0.39	B
	SB	1800	770	0.43	C	770	0.43	C
Fairlight St, west of Ramsay Rd	EB	1800	790	0.44	C	790	0.44	C
	WB	1800	700	0.39	B	720	0.40	C
Great North Rd, south of Fairlight St	NB	900	540	0.60	D	540	0.60	D
	SB	900	550	0.61	D	570	0.63	D

Notes:

1. Traffic volume rounded to nearest 10.
2. Volume over capacity ratio.

Table 6-16 2021 PM peak hour mid-block operational performance summary[1]

Location and direction		Mid block capacity	Without construction			With construction (Modification)		
			Flow	V/C[2]	LoS	Flow	V/C	LoS
Ramsay Rd, south of Fairlight St	NB	1800	800	0.44	C	820	0.46	C
	SB	1800	690	0.38	B	690	0.38	B
Fairlight St, west of Ramsay Rd	EB	1800	630	0.35	B	630	0.35	B
	WB	1800	690	0.38	B	710	0.39	B
Great North Rd, south of Fairlight St	NB	900	350	0.39	B	350	0.39	B
	SB	900	510	0.57	C	530	0.59	D

Notes:

1. Traffic volume rounded to nearest 10.
2. Volume over capacity ratio.

The results in the Five Dock model identified limited impact in terms of volume over capacity and indicate that the relevant mid-blocks will remain within their theoretical capacity. The small change in V/C indicates a small change in forecast volume on these links and therefore a limited impact. A change in the LoS forecast at the following locations:

- Westbound on Fairlight Street, west of Ramsay Road – deterioration from LoS B to LoS C during the AM peak hour
- Northbound on Great North Road, south of Fairlight Street – deterioration from LoS C to LoS D during the PM peak hour.

Intersection level of service – Five Dock

The AM and PM peak hour intersection operational performance for the proposed modification at Five Dock is provided in **Table 6-17** and **Table 6-18**. These intersections were not assessed by the M4-M5 Link EIS or SPIR therefore the comparison is made to a 'without construction' scenario.

Table 6-17 2021 AM peak hour intersection operational performance summary[1]

Cluster	Intersection	Without construction		With construction (Modification)	
		Volume (PCU)	LoS	Volume (PCU)	LoS
2	Ramsay Rd | Fairlight St	2,070	D	2,090	D
	Great North Rd | Queens Rd | Fairlight St	2,840	E	2,860	E
	Great North Rd | Ramsay Rd | First Ave	1,880	F	1,880	F
	Queens Rd | Harris St	2,460	C	2,460	C
	Great North Rd | Lyons Rd	3,530	F	3,530	F

Notes:

1. Traffic volume rounded to nearest 10.

Table 6-18 2021 PM peak hour intersection operational performance summary[1]

Cluster	Intersection	Without construction		With construction (Modification)	
		Volume (PCU)	LoS	Volume (PCU)	LoS
2	Ramsay Rd | Fairlight St	1,950	C	1,970	C
	Great North Rd | Queens Rd | Fairlight St	2,410	B	2,440	B
	Great North Rd | Ramsay Rd | First Ave	1,780	F	1,780	F
	Queens Rd | Harris St	2,300	C	2,300	C
	Great North Rd | Lyons Rd	3,650	F	3,650	F

Notes:

1. Traffic volume rounded to nearest 10.

There is a relatively small change in traffic volume on parts of the network under the 'with construction' (modification) scenario when compared to the 'without construction' scenario, rising by a maximum of about 30 PCU in each peak hour. This increase in PCUs is not forecast to change the level of service at the modelled intersections compared to the 'without construction' scenario. The proposed modification is not forecast to have any material impact on the performance of the modelled road network in the Five Dock area.

Swept path analysis

An assessment of the intersections along the two proposed spoil haulage routes for the Northcote Street civil and tunnel site was carried out to identify intersections that needed further analysis of proposed turning movements. The assessment focused in particular on the Wattle Street/Ramsay Street intersection and the G-loop/Dobroyd Parade/Waratah Street intersection. The swept path analysis indicated that proposed turning movements could be made safely by a truck and dog vehicle at both intersections.

Temporary road network changes, closures and diversions

No changes are proposed to the temporary road network changes, closures or diversions described in the M4-M5 Link SPIR.

Minor changes would be required to the proposed intersection design at the G-loop, Dobroyd Parade and Waratah Street intersection (after completion of the M4 East project) to allow Route B to be used, including:

- Adjustments to the kerb and channel, including protection of new drainage infrastructure, along the north side of Dobroyd Parade at the entry and exit to the G-loop
- A short section of the median designed to separate the eastbound traffic on Dobroyd Parade from the eastbound traffic using the M4 East tunnel exit ramp would be removed to allow heavy vehicles to exit the G-loop and turn right onto Dobroyd Parade westbound
- A section of the pedestrian path along the north side of Dobroyd Parade would be realigned around the perimeter of the G-loop to avoid potential conflict between heavy vehicles and pedestrians
- Upgrade the traffic light phasing at this intersection to accommodate the G-loop traffic
- Signage and line marking associated with the above.

These works would be carried out under a Road Occupancy Licence and in consultation with Transport for NSW's Transport Management Centre (TMC). Works would likely be carried out outside of the peak traffic periods, with establishment and decommissioning works carried out in accordance with the conditions of approval for the project, including the Traffic and Transport CEMP.

Impacts to car parking

A preliminary assessment of parking provision, based on approximate peak workforce estimates, anticipate that the total parking provision within the Haberfield and Ashfield construction sites would be able to meet the forecast parking demand, as shown in **Table 6-19**.

To assist in minimising impacts from the construction workforce using on-street parking, the use of public transport would be encouraged (where feasible). The sites, situated along Parramatta Road, would be serviced by numerous bus routes. However, workers starting or ending shifts very early or very late would be more likely to use private vehicles.

Table 6-19 Parking demand and provision at Haberfield and Ashfield construction ancillary facilities

Location	Approximate day shift peak construction workforce	Estimate of parking demand (0.7 spaces per staff)	Approximate proposed parking numbers	Surplus or deficit
Haberfield and Ashfield construction ancillary facilities	260	182	200	+18

A Construction Parking and Access Strategy would be developed in accordance with condition E54 of the project approval to identify actions that would be implemented by the contractor to avoid or minimise the use of on-street parking in the vicinity of construction sites by the construction workforce. The car parking strategy would consider forecast parking demand, review of existing parking supply, alternative parking arrangements and communication and engagement. Processes for monitoring, reporting and corrective actions would also be part of the strategy.

No changes are proposed to the on-street parking impacts identified in the M4-M5 Link EIS and SPIR as part of this modification. Potential impacts on on-street parking would be confirmed during detailed construction planning and detailed design and managed in accordance with the Construction Traffic, Transport and Access Management Sub-Plan.

Impacts to pedestrians and cyclists

Key elements of the Northcote Street civil and tunnel site would be consistent with the layout used for the M4 East project, including the vehicle entry and exit locations and the arrangements around the G-Loop. The traffic control measures in place to manage impacts on pedestrian and cyclists during construction of the M4 East project would generally be retained or reinstated for the M4-M5 Link Stage 1 construction at the Northcote Street civil and tunnel site. These would be further detailed in the Construction Traffic, Transport and Access Management Sub-Plan.

Safe pedestrian and cyclist access would be maintained through the provision of a shared path around the northern perimeter of the G-loop during construction in accordance with condition E57 of the project approval.

Impacts to public transport

With the small changes in peak hour construction volumes compared to the SPIR, there is likely to be a small impact on buses commensurate with the impact on general traffic.

No changes to bus stops are proposed at the Northcote Street civil and tunnel site.

Impacts to traffic crashes

The change in construction traffic volumes is low when compared to existing traffic volumes on key arterial roads connecting to the construction ancillary facility locations and is not expected to substantially impact road safety.

There is still a risk with construction traffic interacting with general traffic, with elevated risk when construction-related vehicles are entering and leaving construction sites. Any foreseen impacts on road safety for all users during construction would be mitigated as much as possible through the provision of tailored construction traffic management plans and other measures detailed in the M4-M5 Link SPIR and in the Construction Traffic, Transport and Access Management Sub-Plan.

Cumulative impacts

With regard to the cumulative scenario assessment, cumulative traffic volumes included in the M4-M5 Link SPIR (in addition to the construction traffic volumes being generated by the project) were the proposed Western Harbour Tunnel construction site at Rozelle and the Multi-User Facility and Concrete Batching Plant planned at Glebe Island.

Based on forecast traffic distribution, traffic from these facilities is likely to have minimal impact on the Haberfield, Ashfield and Five Dock road network. Some traffic would access the M4 East Wattle Street ramps, which is forecast to have a minor impact on the Dobroyd Parade/Waratah Street and Dobroyd Parade/Timbrell Drive intersections, but with no change in level of service.

Management measures and conditions of approval

The impacts assessed indicate the proposed modification would result in minimal change to the traffic and transport impacts previously assessed in the M4-M5 Link EIS and SPIR. Impacts would therefore continue to be managed through the construction management measures contained in the conditions of approval for the project, specifically those in the Construction Traffic, Transport and Access Management Sub-Plan and the Construction Parking and Access Strategy.

Safe pedestrian and cyclist access would be maintained during construction in accordance with condition E57 of the conditions of approval and road safety audits would be carried during detailed design to assess the safety performance of new or modified road and pedestrian and cyclist infrastructure (including around construction ancillary facilities).

6.3.2 Air quality

Assessment methodology

Potential changes to air quality impacts for the proposed modification relate primarily to changes to dust-generating activities during construction. A construction air quality assessment was carried out to assess these impacts and is provided in **Appendix D** (Air quality report).

The assessment methodology considers three separate potential dust impacts:

- Annoyance due to dust soiling
- The risk of health effects due to an increase in exposure to particulate emissions (PM_{10})
- Harm to ecological receptors.

Particulate emissions from construction activities which mechanically disturb the surface are predominantly made up of the coarse fraction (PM_{10}), rather than the finer $PM_{2.5}$ particles. $PM_{2.5}$ is not a significant component of construction activities and is therefore not assessed.

The construction air quality assessment involved the application of a semi-quantitative risk-based approach following the guidance developed by the UK Institute of Air Quality Management (IAQM, 2014), and adapted to conditions representative of the proposed modification. The assessment of potential air quality impacts during construction involved the following main steps:

- A screening assessment to identify the need for further assessment of air quality impacts at a particular location
- The identification of the construction activities that would be likely to occur in relation to the project and that may result in air quality impacts (ie activities occurring within the construction ancillary facilities)
- A risk assessment for the different activities with the potential to result in air quality impacts: demolition, earthworks, construction and vehicle track-out. Risks were assessed in relation to the size of the project, the volume of traffic on unsealed roads, and the locations of sensitive receivers
- The identification of project-specific management/mitigation measures to minimise the risk of any potential impacts
- The determination of the overall significance of risk of dust impacts considering the application of appropriate dust mitigation measures.

The methodology is consistent with the methodology applied for the assessment of potential air quality impacts during construction in Appendix I (Technical Working Paper: Air quality) of the EIS

Given the proximity of the Northcote Street civil and tunnel site and the Parramatta Road West and Parramatta Road East civil sites, the construction sites have shared receptors that may experience potential dust impacts from a combination of the three sites. The assessment therefore considers the overall change to potential air quality impacts in the Haberfield and Ashfield area, as it is difficult to attribute specific impacts to a specific construction site.

The study area for the assessment is a 350 metre area around the construction footprint of the Northcote Street civil and tunnel site and the Parramatta Road West and Parramatta Road East civil sites.

The screening assessment identified the need for further assessment of potential construction air quality impacts to human receptors in Haberfield and Ashfield. The screening assessment identified that there are no ecological receptors to consider within the study area.

Existing environment

The assessment of construction air quality impacts associated with the proposed modification has assumed that the existing environment conditions are consistent with those set out in Appendix I (Technical Working Paper: Air quality) of the EIS.

The most significant sources of particulate matter (PM) emissions in the Sydney area are the domestic-commercial sector and industry. The contribution to PM from the domestic sector in Sydney is due largely to wood burning for heating in winter. Emissions from natural sources, such as bushfires, dust storms and salt spray, also contribute to PM concentrations. PM levels are affected by:

- The annual variability in the weather
- Natural events such as bushfires and dust storms, as well as hazard reduction burns

- The location and intensity of local emission sources, such as wood heaters, transport and industry.

Assessment of potential impacts

Construction activities with the potential to impact air quality

The following construction activities were identified that may result in air quality impacts:

- Demolition: Demolition is any activity that involves the removal of existing structures. This may also be referred to as de-construction, specifically when a building is to be removed a small part at a time
- Earthworks: This covers the processes of soil stripping, ground levelling, excavation and landscaping. Earthworks would primarily involve excavating material, haulage, tipping and stockpiling
- Construction: Construction is any activity that involves the provision of new structures, modification or refurbishment
- Track-out: This involves the transport of dust and dirt by heavy vehicles from the construction/demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network.

The anticipated potential for dust emissions based on the activities outlined above is identified in accordance with the site categories provided in the IAQM, 2014 guidance in **Table 6-20**, along with a comparison to the assessment in the EIS.

Table 6-20 Anticipated scale of dust emissions for construction activities

Activity	Site category[1]	Potential for dust emissions[1](modification)	Potential for dust emissions[1](EIS)
Demolition	Building volume greater than 50,000 cubic metres, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities greater 20 metres above ground level.	Large	Large
Earthworks	Site area 2,500-10,000 square metres, moderately dusty soil type (e.g. silt), five to 10 heavy earth moving vehicles active at any one time, formation of bunds four to eight metres in height, total material moved 20,000-100,000 tonnes.	Medium	Medium
Construction	Building volume 25,000-100,000 cubic metres, potentially dusty construction material (e.g. concrete), piling, on site concrete batching.	Medium	Medium
Track-out	Greater than a combined 50 heavy vehicle movements (outward) in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length greater than 100 metres.	Large	Large

Notes:

1. As described in IAQM, 2014 guidance

Risk assessment

The assessment identified the risk of dust soiling and human health impacts for each construction activity. The assessments takes into account the sensitivity of an area based on the sensitivity of receptors, the proximity of receptors to construction activities and background PM concentrations. The results of the risk assessment are summarised in **Table 6-21** and a comparison of the risk assessment in the EIS is provided in **Table 6-22**.

Table 6-21 Risk of dust impacts for construction activities

Activity	Potential for dust emissions	Sensitivity of area		Risk of dust impacts	
		Dust soiling	Human health	Dust soiling	Human health
Demolition	Large	High	Medium	High	High
Earthworks	Medium	High	Medium	Medium	Medium
Construction	Medium	High	Medium	Medium	Medium
Track-out	Large	High	Medium	High	Medium

Table 6-22 Comparison of the risk of dust impacts with the EIS

Activity	Risk of dust soiling impacts		Risk of human health impacts	
	Modification	EIS	Modification	EIS
Demolition	High	High	High	Medium
Earthworks	Medium	High	Medium	Medium
Construction	Medium	High	Medium	Medium
Track-out	High	High	Medium	Medium

Given the proximity of the sites, it is anticipated that there would be a minor overall change for the proposed modification to the potential risk of dust impacts to nearby receptors compared to the EIS.

The proposed modification would involve carrying out some construction activities at the Northcote Street civil and tunnel site that were proposed in the EIS to be carried out at the Parramatta Road West civil and tunnel site, including earthworks associated with tunnelling activities. Much of the site preparation work at the Northcote Street civil and tunnel site would have already been carried out as part of the M4 East construction including the acoustic shed and initial stage of the construction access tunnel. This would reduce the potential impacts from earthworks and construction activities for the proposed modification. Demolition works would still occur at the Parramatta Road West and East civil sites as well as the construction of a temporary overhead pedestrian walkway between the two sites.

Overall significance of risk

As described in the section below, the environmental managements summarised in Part E of the SPIR are considered to be sufficient to manage the potential air quality impacts associated with the construction of the project.

Given the application of these measures, construction dust is unlikely to represent a serious ongoing problem. Any impacts would be relatively short in duration, and may only arise during dry weather with the wind blowing towards a receptor, at a time when dust is being generated and mitigation measures are not being fully effective. The potential air quality impacts associated with proposed modification would therefore be ‘not significant’, which is consistent with the assessment in the EIS.

Management measures and conditions of approval

Based on the assessment of potential air quality impacts associated with the proposed modification, no further environmental management measures are deemed necessary beyond those summarised in Part E of the SPIR.

The proposed modification would not require the modification of the conditions of approval for the project related to air quality impacts for construction activities at Haberfield and Ashfield.

6.3.3 Noise and vibration

Assessment methodology

An assessment of the potential noise and vibration impacts associated with the proposed modification was carried out and is included in **Appendix C** (Noise and vibration report). This section summarises the assessment for potential noise and vibration impacts associated with the use of Northcote Street civil and tunnel site, including the construction of the access tunnel and proposed spoil haulage routes.

The approach taken in assessing potential noise and vibration impacts from the proposed modification matches the approach taken in the EIS for the approved project. This approach involves:

- Identifying and classifying the sensitive receivers
- Characterising the existing noise environment based on attended and unattended noise measurements at nearby receiver locations
- Determining noise and vibration management levels in accordance with relevant guidelines
- Modelling to quantify the potential construction noise and vibration impacts from the construction activities for the proposed modification
- Identifying the potential changes to the impacts from the approved project and assessing the significant of potential impacts identified
- Preparing and documenting any changes to the mitigation measures identified for the approved project that would be implemented during construction.

Roads and Maritime *Construction Noise and Vibration Guideline*, August 2016 (CNVG) outlines Roads and Maritime's approach to assessing and mitigating construction noise. This guideline and other relevant guidelines have been used to assess potential noise and vibration impacts.

The Noise Catchment Areas (NCAs) described in the EIS at Haberfield and Ashfield have been used for this assessment. The NCAs are described in **Table 6-23** and shown in **Figure 6-3**.

Table 6-23 Noise catchment areas and surrounding land uses

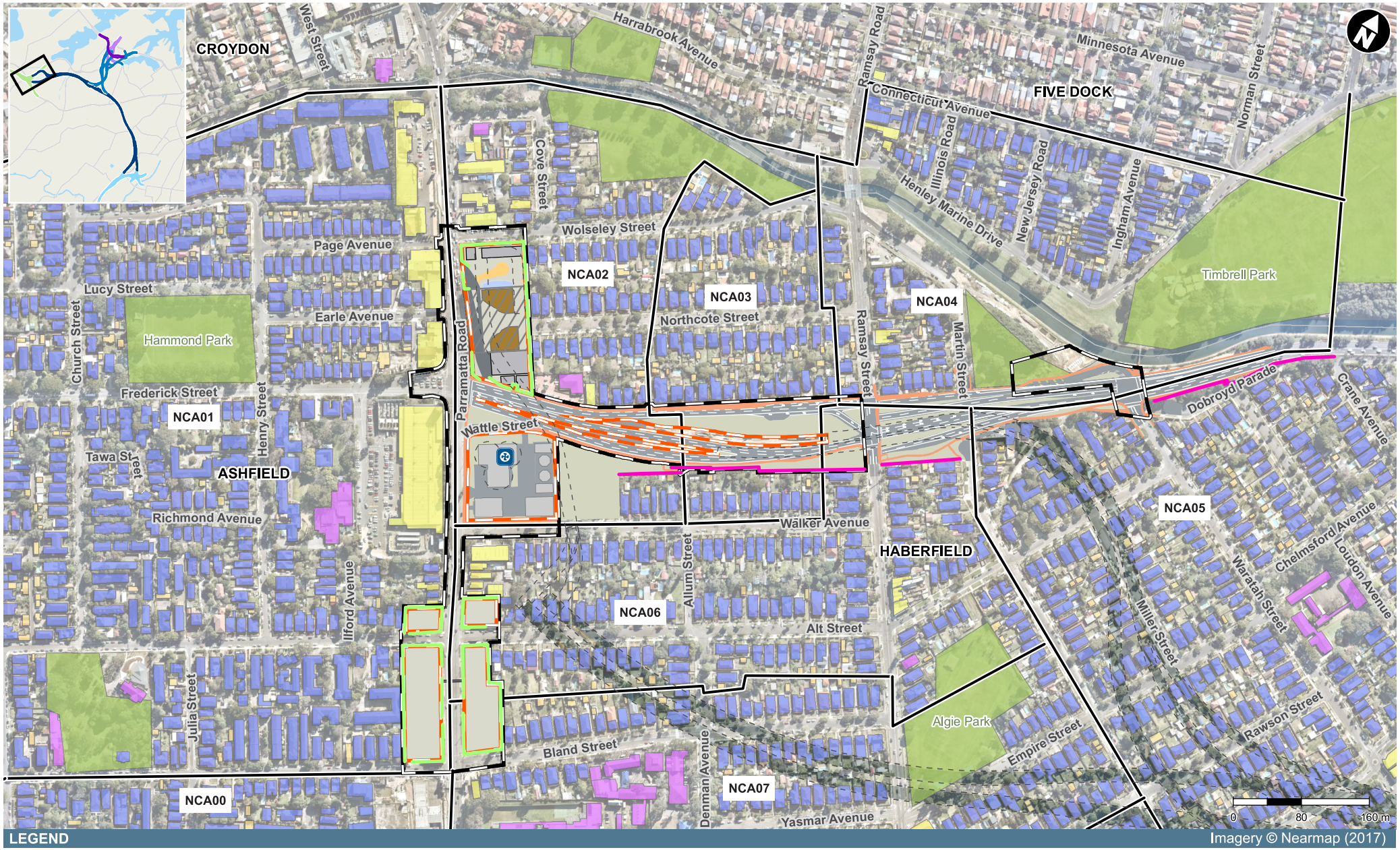
NCA description		
Name	**Minimum distance (metres)[1]**	**Description**
Haberfield and Ashfield		
NCA00	40	West of Parramatta Road between Bland Street and Orpington Street. Land use consists of residential receivers.
NCA01	<5	West of Parramatta Road between Iron Cove Creek and Bland Street. Land use comprises of a mix of residential receivers, special use facilities, active and passive recreation areas and commercial receivers fronting Parramatta Road.
NCA02	<5	East of Parramatta Road between Henley Marine Drive and Walker Avenue. Land use comprises of a mix of residential and commercial receivers, a place of worship and a childcare centre.
NCA03	20	Catchment adjoins either side of Wattle Street between Ash Lane and Ramsay Street. Land use consists of residential receivers.
NCA04	30	Catchment area adjoins Ramsay Street and the northern side of Wattle Street. Land use consists of residential receivers, isolated commercial receivers and a passive recreational area.
NCA05	n/a[2]	South of Dobroyd Parade between Hawthorne Parade and Martin Street. Land use consists of residential receivers with isolated commercial receivers and educational facilities.

NCA description		
Name	**Minimum distance (metres)[1]**	**Description**
NCA06	<5	East of Parramatta Road between Walker Avenue and Alt Street residences. Land use consists of residential and commercial receivers and an educational facility on Ramsay Street
NCA07	<5	East of Parramatta Road between Dalhousie Street and Bland Street residences. Land use comprises of a mix of residential and commercial facilities, other sensitives and active and passive recreation areas.

Notes:

1. Approximate minimum horizontal offset distance from the nearest receiver building facade (receiver of any type) to the nearest point that construction works are occurring
2. No surface works are proposed in this NCA. Receivers in this catchment would therefore only be potentially affected by impacts from tunnelling works during construction

The assessment of potential sleep disturbance impacts is consistent with the approach described in the EIS which included a night-time disturbance 'screening criterion' noise goal of RBL +15 dBA. The term 'sleep criterion' indicates a noise level that is intended as a guide to identify the likelihood of sleep disturbances.



M4-M5 Link

Boundaries
- Project footprint
- Ancillary facility
- NCA boundary

Surface construction
- Access road
- Acoustic shed
- Laydown and storage area
- Building
- Stockpile
- Site hoarding
- Noise wall

Underground construction
- Mainline tunnel
- Temporary access tunnel

Project facilities
- Ventilation facility

Receivers
- Residential
- Commercial
- Outdoor area
- Other receivers

Figure 6-3 NCA boundary map around Haberfield and Ashfield

Existing environment

The existing noise environment was described in Appendix J (Technical working paper: Noise and Vibration) of the M4-M5 Link EIS. **Table 6-24** provides the Residential Noise Management Levels (NMLs) applicable to the Haberfield and Ashfield area.

Table 6-24 Residential NMLs for the project

Representative monitoring location	Rating Background Level (RBL) dBA ICNG defined time periods1		
	Daytime period RBL	Evening period RBL	Night period RBL
1A Wattle St, Haberfield	58	58	52
141 Alt St, Haberfield	46	46	43
119 Alt St, Ashfield	46	46	38
35 Wattle St, Haberfield	58	55	44
259 Ramsay St, Haberfield	56	53	43
99 Charles St, Lilyfield	51	49	42

Assessment of potential impacts

Activities proposed at the Northcote Street civil and tunnel site have been considered in five noise scenarios (NS) to assess potential impacts. For each scenario the use of equipment has been identified, including numbers being used on site and the potential sound power level (dBA). **Table 6-25** details the sound power levels for construction equipment.

Table 6-25 Sound power levels for construction equipment

Noise scenario name	Scenario ID	Equipment (realistic worst case)	Worst case items in same location	Sound power level (dBA)		
				L_{WA}		L_{WAmax}
				Item	Activity[2]	Activity[2]
Site establishment – Northcote Street civil and tunnel site	NS-01	Flatbed truck	1	100	106	112
		Franna crane	1	99		
		Mobile crane	1	101		
		Semi-trailer	2	106		
		Hand tools	1	96		
Tunnelling works – Northcote Street civil and tunnel site	NS-02	Front end loader	2	112	117	119
		Underground trucks	2	113		
		Surface Haulage Trucks	4	110		
		Water treatment plant[1]	1	87		
		Ventilation fans[1]	1	89		
Tunnelling support activities – Northcote Street civil and tunnel site	NS-03	Concrete truck / agitator	2	106	106	112
		Hand tools	1	96		
		Franna crane	1	99		
		Bus	1	98		
		Forklift	1	101		
		Concrete pump	1	106		
Site decommissioning – Northcote Street civil and tunnel site	NS-04	Excavator	1	104	112	123
		Mobile crane	1	101		
		Semi trailer	1	106		
		Elevated working platform	1	97		
		Truck	1	97		
		Concrete saw	1	115		

Noise scenario name	Scenario ID	Equipment (realistic worst case)	Worst case items in same location	Sound power level (dBA)		
				L_{WA}		L_{WAmax}
				Item	Activity[2]	Activity[2]
Site establishment and decommissioning G-loop	NS-05	Concrete truck / agitator	1	103	112	123
		Mobile crane	1	101		
		Semi-trailer	1	106		
		Elevated working platform	1	97		
		Truck	1	97		
		Concrete saw	1	115		

Notes:

1. Equipment sound power levels are referenced from the M4-East Northcote Street tunnel site Construction Noise and Vibration Impact Statement (CNVIS) and are indicative only. Sound power levels of the finalised equipment may differ and are subject to detailed design
2. Activity sound power levels account for the amount of time an item of plant is anticipated to operate within each 15 minute period

For the purpose of the assessment, the existing M4 East tunnelling site arrangement at Northcote Street civil and tunnel site (with minor modifications) is used. The assessment prior to the consideration of additional mitigation takes account of the existing site hoardings and acoustic shed.

Predicted noise levels have been modelled for each NS in relation to the relevant NCAs. As a result of this modelling the predicted NML exceedances are summarised in **Table 6-26**.

Table 6-26 Overview of NML exceedances

Scenario ID	Activity	Weeks[1]	Activity duration compared to overall project program[2]	Number of receivers															
				Total	Highly noise affected[4]	NML exceedance receiver count[3]													
						Daytime			Daytime (out of hours)			Evening			Night-time			Sleep disturbance		
						1-10 dBA	11-20 dBA	>20 dBA	1-10 dBA	11-20 dBA	>20 dBA	1-10 dBA	11-20 dBA	>20 dBA	1-10 dBA	11-20 dBA	>20 dBA	1-10 dBA	11-20 dBA	>20 dBA
NS-01	Site establishment	24	25%	1747	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NS-02	Tunnelling	116	100%	1747	-	-	-	-	1	-	-	1	-	-	41	-	-	162	8	-
NS-03	Tunnelling support activities	116	100%	1747	-	-	-	-	2	-	-	2	-	-	71	1	-	35	-	
NS-04	Site decommissioning	52	25%	1747	-	5	-	-	-	-	-	-	-	-	-	-	-			
NS-05	G-loop establishment and decommissioning	10	6%	1747	-	6	-	-	31	-	-	43	2	-	196	22	-	225	31	-

Notes

1. Approximate overall duration of the activity in all areas of the site. The duration of these impacts is less than the overall duration, and depends on the rate of progress in the works areas
2. Approximate percentage (to nearest 13 per cent) of activity duration within overall proposal program. Where percentage is less than 13 per cent, 13 per cent is shown for illustrative purposes
3. Based on worst case noise works area (closest to receivers)
4. Based on ICNG definition (ie predicted LAeq(15minute) noise at residential receiver is 75 dBA or greater)

The NML exceedances summarised in **Table 6-26** above are described in more detail below.

Site establishment (NS-01) and decommissioning (NS-04)

During site establishment activities no exceedance of daytime NMLs are predicted. Construction activities would primarily be undertaken within the existing acoustic shed and upper parts of the existing construction access tunnel. No major surface earthworks required during site establishment.

Minor exceedances, of up to 10 dBA at five sensitive receivers are predicted during decommissioning (NS-04) during standard construction hours within NCA01 and NCA02. The exceedances are predicted to be related to the use of excavators and concrete saws.

Tunnelling activities (NS-02)

During tunnelling activities, exceedances of the night time airborne NMLs are predicted at residential receivers located to the west of the site (NCA01), with a maximum exceedance of 10 dBA predicted for up to three receivers). These exceedances are anticipated to be associated with opening in both the site hoarding and the acoustic shed to allow truck access and egress from the site.

Tunnelling support activities (NS-03)

For tunnelling support activities, NML exceedances of up to 15 dBA during night periods are predicted in NCA01 and NCA02. The worst case impacts may result in up to 15 dBA exceedance of NMLs during the night time period, at one receiver within NCA01. The majority of the receivers in this area would experience minor noise impacts. The exceedances are anticipated to be associated with the use of concrete pumps associated with concrete deliveries.

Construction of the G-loop (NS-05)

Some of the reconfiguration works to reinstate the G-loop may be carried out outside of standard construction hours to avoid impacts on the road network during busier periods. Moderate NML exceedances of up to 20 dBA are predicted for a scenario where a concrete saw is operating. Noise impacts are generally limited to receivers that are situated near to the G-loop within NCA04, NCA05 and NCA06. Out of hours works (OOHWs) are expected to be limited in duration as the extent of the reconfiguration works is minor. When the concrete saw is not operating it is estimated that the NML exceedances would generally reduce by up to 4 dBA.

Sleep disturbance

The sleep disturbance screening criterion is likely to be exceeded when night works associated with tunnelling (NS-02), tunnelling support activities (NS-03) and the construction of the G-loop (NS-05) are occurring adjacent to residential receivers.

The *Road Noise Policy* (RNP) provides the following guidance in relation to potential sleep disturbance awakening events:

- Maximum internal noise levels below 50-55 dBA are unlikely to awaken people from sleep
- One or two noise events per night, with maximum internal noise levels of 65-70 dBA, are not likely to affect health and wellbeing significantly.

The assessment has provided the potential maximum noise impacts for sleep disturbance, however it is noted that the ICNG only requires the project to consider maximum noise levels where construction works are planned to extend over more than two consecutive nights.

The project Construction Noise and Vibration Management Sub-Plan (CNVMP) will set parameters around how works outside standard daytime construction hours will be carried out, including timing and frequency, and the mitigation measures that will be implemented based on predicted impacts identified through location and activity specific assessments.

Consecutive construction impacts

It is recognised that mitigation measures aimed at short term works may be less effective where longer term impacts are apparent. Longer term impacts require additional consideration of reasonable and feasible management measures to minimise impacts on the community.

When evaluating the extent of noise impacts within the Haberfield area, it is noted that it would likely be subject to potential construction impacts from works associated with other infrastructure projects, including the approved M4 East project, currently under construction.

The impacts previously discussed considered the activity that would be carried out at Northcote Street civil and tunnel site in isolation, whereas the potential impacts from the identified consecutive projects are likely to be perceived to be longer for receivers near this site. The majority of highly noise intrusive works are anticipated to be associated with the M4 East project use of this site. The M4-M5 Link project use of this site is predicted to result in impacts (of a lesser degree) for similar receivers in the area.

The CNVMP to be prepared for the project will consider the longer term impacts and provide consideration of reasonable and feasible management measures to minimise impacts on the community. The measures will be consistent with the measures set out in the M4-M5 Link EIS, SPIR and the conditions of approval for the project, including condition E88.

Construction road traffic noise assessment

Traffic noise impacts have been assessed for the proposed spoil haulage routes identified for Northcote Street civil and tunnel site. The routes are described in **Chapter 4** (Proposed modification).

Table 6-27 presents the assessment of predicted increase in noise impacts along the modelled roads. The results of the construction road traffic noise assessment show that construction traffic is below the assessment criterion (2dB) which reflects only marginal forecast change in noise levels at receivers along the proposed routes. The predicted change in noise levels is less than 2dB along road during the daytime and night-time period.

Table 6-27 Construction road traffic noise assessment

Site	Vehicle type	Road	Predicted traffic noise increase (dBA)[1]	
			Daytime	Night-time
Northcote Street civil and tunnel site	Light & heavy	Parramatta Rd	<0.5	<0.5
		Wattle St	<0.5	<0.5
		Ramsay St / Rd	<0.5	1.6
		Fairlight St	<0.5	1.7
		Great North Rd	<0.5	1.5

When Route A (Ramsay Street) is in use, Ramsay Street and Great North Road are predicted to experience the greatest change in noise levels, with increase of 1.6 dB and 1.5 dB respectively forecast during the night-time period. Whilst the predicted increase is below 2 dB criterion, both of these road have relatively low volumes of heavy vehicles during night time periods. Individual pass-by maximum noise levels of project related spoil haulage trucks are therefore likely to be higher than traffic noise levels without construction during the night-time period.

When Route B (G-loop) is in use, construction traffic is unlikely to result in a noticeable increase in LAeq noise levels at receivers along Wattle Street/ Dobroyd Parade. Noise levels are predicted to increase by less than 0.5 dB during the daytime and night time periods.

Individual pass-by maximum noise levels of project related spoil haulage trucks are therefore likely to be higher than traffic noise levels without construction during the night-time period. The project should consider the potential impact from maximum noise levels that heavy vehicles may have on surrounding receivers along Ramsay Street, Fairlight Street and Great North Road when considering the routes for construction traffic during the night time period.

The G-loop is considered a construction site road for use by construction traffic only and as such noise emissions associated with its use would be assessed against construction noise management levels (NMLs). An assessment of the use of the G-loop was conducted a part of the WestConnex M4 East CNVIS for the Northcote Tunnel Support site (as it was named in the M4 East EIS).

The M4 East project assessed a maximum of 20 heavy vehicles egressing from the Northcote Street site per hour. It is forecast that eight vehicles per hour would egress from the site as a result of this modification. As such, impacts associated with the proposed use of the G-loop would be consistent with or less than the impacts for the M4 East project. As such no further assessment of noise impacts for the G-loop is required.

Ground-borne noise assessment

The construction of the access tunnel from Northcote Street civil and tunnel site to the mainline tunnel alignment has the potential to result in ground-borne noise impacts to nearby sensitive receivers. The ground-borne noise assessment is based on the worst case predicted internal ground-borne noise level when the tunnelling works are at their closest point below each sensitive receiver.

Table 6-28 summaries the maximum ground-borne noise levels associated with the construction of the access tunnel using road-headers and rock-breakers. It is assumed that tunnelling works will occur 24 hours a day, seven days a week.

Table 6-28 Worst case predicted ground-borne noise levels during tunnelling - Northcote Street construction access tunnel

NCA	Worst case ground borne noise level at a residential receiver (dBA $L_{Aeq(15minute)}$)	Number of residential receivers where criteria are exceeded	Number of other sensitive receivers where criteria are exceeded	Number of commercial receivers where criteria are exceeded
Road-header tunnelling works				
NCA01	27	-	-	-
NCA02	33	-	-	-
NCA03	21	-	-	-
NCA06	32	-	-	-
NCA07	22	-	-	-
Rock-breaker tunnelling works				
NCA01	37	1	-	-
NCA02	49	8	1	-
NCA03	23	-	-	-
NCA06	47	28	-	-
NCA07	26	-	-	-

During road header tunnelling works, the worst case ground-borne noise levels are predicted to be compliant with the more stringent 35 dBA LAeq (15minute) night-time criterion at all sensitive receivers which are potentially affected by ground-borne noise from road-header tunnelling works.

During rock-breaker tunnelling works, the worst case ground-borne noise levels are predicted to exceed the 35 dBA LAeq (15 minute) night-time criterion at up to 38 sensitive receivers in NCA01, NCA02, and NCA06. Ground-borne noise levels are predicted to exceed the night-time ground-borne noise levels by up to 14 dB during rock-breaking tunnelling works.

Ground-borne noise predictions are based on the nearest sensitive receivers above or adjacent to the proposed tunnel alignment. The ground-borne noise impacts would reduce for sensitive receivers offset horizontally from the access tunnel due to the increase slant distance. In addition, it is expected that a combination of road-headers and rock-breakers would be used during construction. The exceedances under the rock-breaker tunnelling works scenario are therefore conservative and impacts would be expected to be less than those predicted.

Cumulative noise impacts

Concurrent noise impacts can occur where more than one works activity occurs at the same time and in the same location such that an individual receiver is potentially impacted by noise from more than one element of works. A scenario where construction equipment operates concurrently has been modelled for the Northcote Street civil and tunnel site and for the Parramatta Road pedestrian walkway.

Cumulative noise impacts associated with the operation of multiple construction ancillary facilities in proximity to each other such as the Northcote Street and Wattle Street civil and tunnel sites or the Parramatta Road West and East civil sites are considered unlikely to occur given the following:

- The noise impacts at each site would be localised to receivers in close proximity to each construction site
- The separation distances and noise attenuation between the sites
- The location of the sites adjacent to heavily trafficked major roads such as Wattle Street and Parramatta Road which dominate the ambient noise environment
- The conditions of approval for the project which require each construction ancillary facility to operate within applicable noise management levels particularly during the more sensitive out of hours periods.

As per all construction works associated with the M4-M5 Link project, the construction ancillary facilities around Haberfield and Ashfield will operate in accordance with the project conditions of approval.

Management measures and conditions of approval

Based on the assessment of potential noise and vibration impacts associated with the proposed modification, no further environmental management measures are deemed necessary beyond those summarised in Part E of the SPIR.

The proposed modification would not require the modification of the conditions of approval for noise and vibration at the Northcote Street civil and tunnel site.

6.3.4 Surface water, flooding and drainage

Assessment methodology

An assessment of flooding and drainage impacts during construction for the Northcote Street civil and tunnel site is provided in **Appendix E** (Surface water and flooding report) and included:

- An assessment of flooding conditions and potential impacts based on a review of the relevant sections of the M4-M5 Link EIS, M4 East EIS and the M4 East detailed design
- An assessment of whether surface water can be adequately managed by the environmental management measures stipulated within the M4-M5 Link EIS and SPIR.

Existing environment

The assessment of potential surface water and flooding impacts associated with the proposed modification has assumed that the existing environment conditions at each of the assessed locations are consistent with those set out in Appendix Q (Technical Working Paper: Surface water and flooding) of the EIS.

The Northcote Street civil and tunnel site is located within the Dobroyd Canal catchment. Construction discharges would ultimately drain to Dobroyd Canal.

Assessment of potential impacts

Flooding

Given the Northcote Street civil and tunnel site is located outside the Probable Maximum Flood (PMF) extent for mainstream flooding and overland flow, no flood impacts on adjacent properties are anticipated and the entrance to the tunnel dive would be suitably located outside the PMF flood extent.

The G-loop at Reg Coady Reserve is affected by flooding during a 100 year ARI event. The G-loop was assessed during the M4 East EIS to potentially cause localised increases of up to 200 millimetres in the depth of inundation in Dobroyd Parade at Martin Street. Increases in the range of 10 to 20 millimetres were also assessed to extend into the Sydney Water pump station on the corner of Dobroyd Parade and Martin Street. The M4 East EIS identified that impacts could be mitigated by the provision of local bunding to direct overland flow along the G-loop road and around the Sydney Water pump station.

The temporary flood mitigation measures and temporary drainage associated with the existing G-loop for the M4 East would be reinstated in generally the same form after reconfiguration works for the modification. At the end of construction the G-loop would be decommissioned and adjoining roads would be reinstated in accordance with the M4 East detailed design. As such, no permanent impact to existing flooding conditions is likely to occur.

Temporary impacts during construction would be considered during detailed design and construction planning phases in accordance with the mitigation measures set out in the EIS, SPIR and conditions of approval including the preparation of a Flood Mitigation Strategy (as described in the EIS) which would include details and procedures to manage the risk of adverse flood impacts on surrounding properties.

Localised drainage

All construction works would have the potential to impact local overland flow paths and existing minor drainage paths. Disruption of existing flow mechanisms, both of constructed drainage systems or those of overland flow paths, could occur as a consequence of the various construction activities and facilities. Existing drainage systems at the site have been established by the M4 East project.

These are typical impacts faced on most construction projects and can be addressed by adopting industry standard mitigation measures. Consideration of these impacts would be included during future detailed design and construction planning phases.

Water quality and geomorphology

Construction wastewater (including groundwater ingress, rainfall runoff in tunnel portals and ventilation shafts, heat and dust suppression water and wash down runoff) discharges from the Northcote civil and tunnel site would be approximately 1,100 kilolitres per day (refer to **section 6.3.10** for further information). Intermittent surface water (surface water runoff from roof/paved surfaces) discharges would also occur. Given the minor discharge volumes occurring in the context of the overall catchment and concrete channel receiving environment of Dobroyd Canal, the potential for scour and erosion to occur is considered to be negligible.

With the proposed environmental management measures as described in Part E of the SPIR in place, impacts on water quality are considered to be negligible.

Management measures and conditions of approval

Based on the assessment of potential surface water, flooding and drainage impacts associated with the proposed modification, no further environmental management measures are deemed necessary beyond those summarised in Part E of the SPIR.

The proposed modification would not require the modification of the conditions of approval for the project related to surface water, flooding and drainage impacts at the Northcote Street civil and tunnel site.

6.3.5 Land use and property

Assessment methodology

The assessment of impacts from the proposed modification on land use and property has been carried out by undertaking the following key tasks:

- Providing an overview of the existing land use and zoning in the vicinity of the proposed modification
- Identifying properties and land uses that would be impacted by the proposed modification
- Identifying mitigation measures (general and specific) that would assist in reducing land use and property impacts.

The strategic land use and planning context is described in detail in Chapter 12 (Land use and property) of the EIS for the approved project (the EIS) and is considered to be consistent for the proposed modification.

Existing environment

Northcote Street civil and tunnel site

The Northcote Street civil and tunnel site is currently being used as a tunnelling site for the M4 East project and currently provides acoustic shed, offices, hoardings, noise walls and access for the construction access tunnel.

Construction of dive structures, tunnel portals and surface road upgrades and modifications along Wattle Street near the Northcote Street civil and tunnel site are being carried out as part of the M4 East project. Substantial changes to land use within this area at Haberfield as a result of property acquisition and construction activities including at Northcote Street have already been assessed and approved as part of the M4 East project.

The Northcote Street civil and tunnel site is located on land zoned B6 Enterprise Corridor and R2 Low Density Residential under the Ashfield Local Environmental Plan 2013 (Ashfield LEP 2013). The objective of these zones is to promote businesses along main roads and provide for the housing needs of the community within a low density residential environment respectively.

The area around the Northcote Street civil and tunnel site consists of predominantly residential land uses, comprising attached and detached dwellings and some residential apartments. Land use zoning surrounding the Northcote Street site is shown in **Figure 6-4**. The land is also subject to the *Parramatta Road Corridor Urban Transformation Strategy* (UrbanGrowth NSW 2016).

Refer to section 12.2.2 of the EIS for further information regarding existing land use and planning controls at the Northcote Street site.

Reg Coady Reserve

Reg Coady Reserve is located to the north of Wattle Street, east of the intersection with Martin Street. It forms part of a larger open space corridor which runs along Iron Cove Creek (Dobroyd Canal). A dedicated temporary construction vehicle turning lane (the G-loop) and a laydown area established by the M4 East project currently occupies part of the reserve. The G-loop allows eastbound trucks on Wattle Street from the M4 East project to turn right and head westbound on Wattle Street. The land is presently occupied pursuant to a lease with Inner West Council.

The M4 East EIS described the following land use impacts at Reg Coady Reserve:

- About 18 per cent of the total area of Reg Coady Reserve would be impacted during construction from construction activities, including the establishment of the G-loop. 12 per cent of the total area of the reserve would be required for operation and the widening of Wattle Street for the M4 East project
- The land use of part of Reg Coady Reserve would permanently change from open space to road infrastructure as a result of the widening of Wattle Street as part of the M4 East project.

- The area of Reg Coady Reserve to be leased for the G-loop would be rehabilitated and returned to Inner West Council for use as open space following the construction of the M4 East project.

Subsequent modifications to the M4 East project approval have increased the construction footprint in this area to allow for drainage, utility and other construction works.

The G-loop is located on land zoned RE1 Public Recreation and SP2 Infrastructure. The objective of these zones is to enable land to be used for public open space or recreational purposes and to provide for infrastructure and related uses respectively.

Land use zoning surrounding Reg Coady Reserve is shown in **Figure 6-4**.

Figure 6-4 Land use zoning surrounding Northcote Street civil and tunnel site and G-loop at Reg Coady Reserve

Assessment of potential impacts

Property acquisition

There would be no change to property acquisition at the Northcote Street civil and tunnel site or at Reg Coady Reserve relating to the G-loop. **Table 6-29** provides a comparison of property acquisition required for the approved project and the proposed modification.

Table 6-29 Comparison of property acquisition required for the approved project and the proposed modification

Location	Existing land use	Property acquisition assessed in the EIS	Additional property acquisition required for proposed modification
Northcote Street civil and tunnel site	Construction ancillary facility for the M4 East project	None[1]	No additional property acquisition required for modification
Reg Coady Reserve	G-loop for the M4 East project	None[2]	No additional property acquisition required for modification

Notes:

[1] Refer to the M4 East EIS (September 2015) for acquisitions that occurred at this location

[2] Leased from the former Inner West Council to Roads and Maritime

The part of the Reg Coady Reserve that is being used by the M4 East project for the G-loop is subject to a lease agreement between Roads and Maritime and Inner West Council. This lease agreement would need to be extended as a result of the proposed modification for the M4-M5 Link project.

Ground movement

Ground movement may occur in some areas along the tunnel alignment induced by tunnel excavation. The ground movement anticipated is predominantly settlement, which is downward (also termed subsidence). Upward movement may also occur and is known as heave.

Potential for ground movement would be associated with the provision the construction access tunnel (around 430 metres in length).

The construction access tunnel is located under Wattle Street beneath land acquired for the M4 East project, and under a limited number of residential properties in Walker Avenue and Alt Street. The access tunnel connects to the M4-M5 Link mainline tunnels at a depth of around 40 metres below ground. The horizontal and vertical alignment of the access tunnel has been selected to avoid impact to the M4 East motorway and ventilation tunnels. The construction access tunnel is located at least 30 metres below ground in the vicinity of residential properties in Walker Avenue and Alt Street.

The construction access tunnel excavation is anticipated to result in less than three millimetres of additional surface settlement in the zone of influence (refer to **Figure 6-5**). When combined with the predicted settlement levels described in section 12.3.4 of the EIS for this location associated with excavation of the mainline tunnels, the combined settlement impacts would be in the range of 10 to 12 millimetres (refer to **Figure 6-6**). The predicted settlement impacts at these residential properties would meet the maximum settlement criteria contained within condition E103.

Where the construction access tunnel passes under the M4 East tunnels in the vicinity of Wattle Street and Walker Avenue a maximum settlement at the level of the M4 East tunnels of around five to eight millimetres is anticipated.

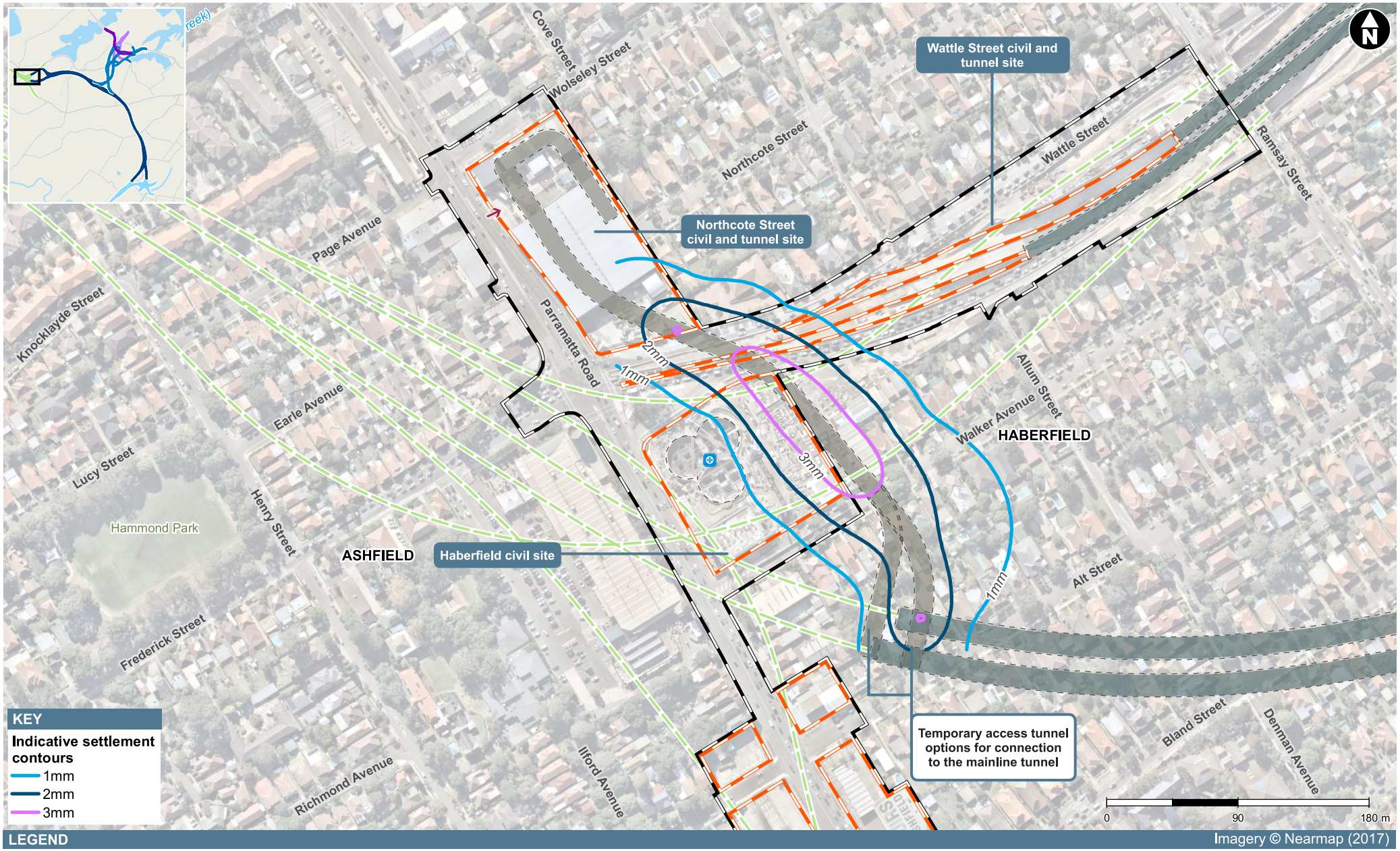
A review of potential angular distortion for the construction access tunnel was carried out. The review did not identify any areas where angular distortion is steeper than one in 500.

Potential settlement impacts would be managed through the implementation of the approved project environmental management measures and in accordance with relevant conditions of approval for the project, including condition E103 which details the maximum settlement criteria as shown in **Table 6-30**.

Table 6-30 Project settlement criteria

Surface and sub surface structures	Maximum Settlement	Maximum Angular Distortion	Limiting Tensile Strain (percent)[1]
Buildings – low or non-sensitive properties (i.e. ≤ 2 levels and carparks)	30 mm	1 in 350	0.1
Buildings and pools – High or sensitive properties (i.e. ≥ 3 levels and heritage items)	20 mm	1 in 500	0.1
Roads and parking areas	40 mm	1 in 250	n/a
Parks	50 mm	1 in 250	n/a

1 As defined in Burland et al. 'Building response to tunnelling – Case studies from construction of the Jubilee Link Extension', London, Thomas Telford (2001)



LEGEND

M4 East
Tunnel

M4-M5 Link

Boundaries
Project footprint
Ancillary facility

Underground construction
Mainline tunnel
Temporary access tunnel

Project features
Ventilation facility

Figure 6-5 Predicted settlement levels for the construction access tunnel

Figure 6-6 Predicated settlement levels for the construction access tunnel and M4 East and M4-M5 Link motorway tunnels

Land use

The Northcote Street site is described in section 6.5.4 of the EIS as a civil site for construction workforce parking and to support construction activities at the nearby civil and tunnel sites, including laydown and storage of materials.

For the proposed modification, the Northcote Street site would be used as a civil and tunnel site. Construction activities would be carried out on land being used as a construction ancillary facility for the M4 East project and within the same surface construction footprint as assessed in the M4-M5 Link EIS.

The proposed modification would not change the temporary land use at this site as assessed in the EIS, as it would still be used for construction purposes. Once construction works are complete, the construction facilities would be removed and the site would be made suitable for a future use in accordance with the M4 East Residual Land Management Plan.

The proposed modification would retain the G-loop at Reg Coady Reserve that was established as part of the M4 East project as a heavy vehicle haulage route for the Northcote Street civil and tunnel site. The EIS for the M4 East project described that the area of Reg Coady Reserve used for construction would be restored and returned to Inner West Council for use as open space following the completion of construction of the M4 East project. The proposed modification would effectively delay the restoration of the area of Reg Coady Reserve required for the G-loop until after the completion of construction activities for the M4-M5 Link project in Q1 2023. The existing lease agreement between Roads and Maritime and Inner West Council would need to be extended (beyond 2021) to allow for the continued use of the G-loop.

Minor changes would be required to the proposed intersection design at Dobroyd Parade and Waratah Street (after completion of the M4 East project) to allow Route B to be used and these are detailed in **Chapter 4** (Proposed modification). On completion of construction of the M4-M5 Link project, the G-loop infrastructure would be removed and that part of Reg Coady Reserve would be rehabilitated in accordance with the M4 East Residual Land Management Plan.

The proposed design for the G-loop for the construction of the M4-M5 Link is shown in **Figure 6-7** and a comparison of land use impacts for the approved project and proposed modification is provided in **Table 6-31**.

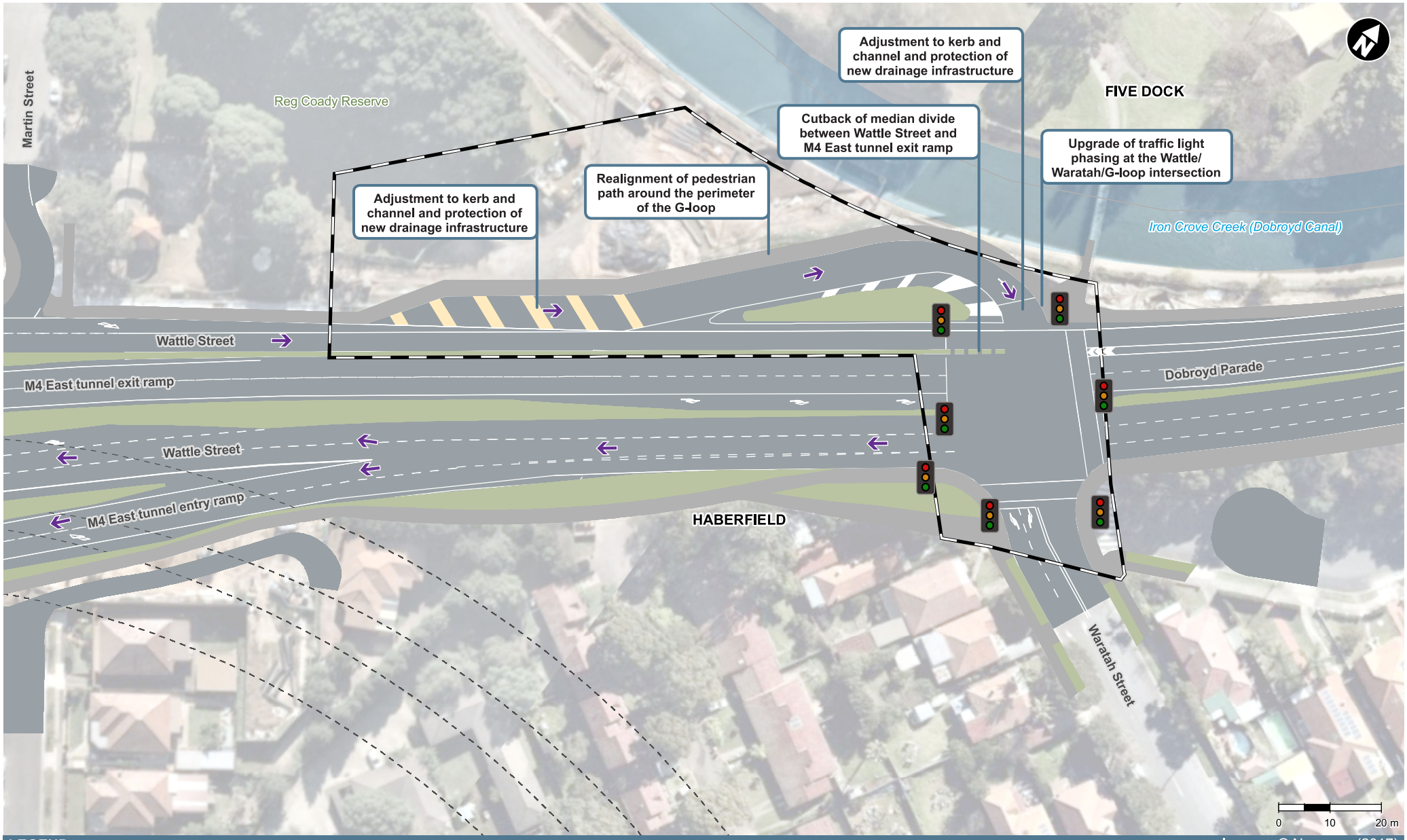


Figure 6-7 Proposed 'G-loop' at Reg Coady Reserve during construction

Table 6-31 Comparison of land use impacts for the proposed modification at Northcote Street civil and tunnel site and Reg Coady Reserve

	Construction		Operation	
Location	**Approved project**	**Proposed modification**	**Approved project**	**Proposed modification**
Northcote Street civil and tunnel site	Construction activities would be carried out on land being used as a construction ancillary facility for the M4 East project. The Northcote Street site would be used as a civil site.	The Northcote Street site would be used as a civil and tunnel site.	Remaining land on the site not used for transport infrastructure would be rehabilitated and landscaped consistently with the M4 East Residual Land Management Plan.	Remaining land on the site not used for transport infrastructure would be rehabilitated and landscaped consistently with the M4 East Residual Land Management Plan.
Reg Coady Reserve	No land use impacts at Reg Coady Reserve. Reg Coady Reserve to be reinstated at completion of construction for M4 East the project.	Reconfiguration works to facilitate continued use of the G-loop within Reg Coady Reserve by heavy vehicles for the M4-M5 Link project.	No operational land use impacts at Reg Coady Reserve. The M4 East project assessed permanent impacts associated with widening works for the Wattle Street interchange.	No operational land use impacts at Reg Coady Reserve. The G-loop would be demobilised and be rehabilitated and returned to Inner West Council for use as open space consistent with the proposal for the M4 East project.

Utility works

The proposed Northcote Street civil and tunnel site would require a new power supply connection. The power supply connection would be provided to the site from the Croydon Zone substation. The maximum demand of 10 Mega Volt Amp (MVA) would require two High Voltage Connections (HVCs) connected by underground cables to the Ausgrid (High Voltage) network.

The route of the power supply connection from the substation to Parramatta Road would generally be consistent with the approved route outlined in Appendix F Utility Management Strategy of the EIS. The main change would be the provision of a connection into the site from the western side of Parramatta Road and crossing to the eastern side of Parramatta Road into the site, near the intersection with Wattle Street (refer to **Figure 6-8**).

The connection would be included in the updated Utility Management Strategy as required by condition of approval E140.

A substation kiosk is proposed at the Northcote Street civil and tunnel site, subject to detailed design. The substation would be located in around the same position of the existing substation for the M4 East project near Wattle Street.

Management measures and conditions of approval

Potential land use and property impacts associated with the proposed modification would be effectively managed through the implementation of the approved environmental management measures for the project as summarised in Part E of the SPIR.

The proposed modification would not require the modification of the conditions of approval for the project related to land use impacts at the Northcote Street civil and tunnel site and Reg Coady Reserve.

Figure 6-8 Construction power - Haberfield and Ashfield

6.3.6 Urban design and visual amenity

Assessment methodology

An assessment of impacts from the proposed modification on visual amenity has been carried out by undertaking the following key tasks:

- Review of the landscape and visual context as described in Chapter 13 (Urban design and visual amenity) of the EIS for the approved project
- Assessment of visual impacts during construction
- Assessment of landscape character and visual impacts during operation
- Assessment of night lighting impacts during construction and operation
- Identification of reasonable and feasible mitigation measures.

The methodology for the assessment of visual impacts for construction and the assessment of landscape character and visual impacts during operation is consistent with the methodology for the landscape character and visual impact assessment summarised in Chapter 13 (Urban design and visual amenity) of the EIS.

Existing environment

Northcote Street civil and tunnel site

The Northcote Street civil and tunnel site is located between Wattle Street and Wolseley Street at Haberfield on land that is currently being used as a construction ancillary facility for the M4 East project. The site includes a large-scale acoustic shed as well as storage, workshop and multi-level site offices.

Adjoining properties consist primarily of residential dwellings at Northcote Street and Wolseley Street and a religious congregation located at Wattle Street. The adjacent Parramatta Road corridor includes adjacent commercial development and roadside infrastructure such as signage, street lighting and traffic signals and caters for high traffic volumes. The ventilation facilities for the M4 East and M4-M5 Link projects are currently under construction on the opposite corner of Parramatta Road and Wattle Street.

Existing sources of night lighting at and around the site includes street lighting associated with Parramatta Road, Wattle Street and local streets such as Northcote Street and Wolseley Street, lighting associated with construction activities being undertaken at the site as part of the M4 East project, vehicular traffic and illuminated windows of the surrounding residential and commercial buildings along Parramatta Road and Wattle Street.

The existing acoustic shed is shown in **Plate 1** and additional photos of the existing environment in this area are provided in **Appendix F** (Site photos).

Plate 1 Existing M4 East acoustic shed at the Northcote Street civil and tunnel site

G-loop at Reg Coady Reserve

Reg Coady Reserve is located to the north of Wattle Street, east of the intersection with Martin Street. It forms part of a larger open space corridor which runs along Iron Cove Creek (Dobroyd Canal). The G-loop was established by the M4 East project. The turning lane allows eastbound trucks on Wattle Street associated with construction of the M4 East project to turn right and head westbound on Wattle Street. As part of the M4 East project, widening of the road corridor in this area is being carried out to accommodate the entry and exit ramps for the M4 East tunnels.

The existing G-loop is shown in **Plate 2** and additional photos of the existing environment in this area are provided in **Appendix F** (Site photos).

Plate 2 Existing M4 East G-loop at Reg Coady Reserve

Assessment of potential impacts

Northcote Street civil and tunnel site

The primary visual element that would change for the proposed modification at the Northcote Street civil and tunnel site would be the retention of the large acoustic shed that has been established by the M4 East project. The acoustic shed is an existing visual element on the site, and the existing visual impact of this structure would be extended over a further period of around four years. The acoustic shed is a large visual element in the order of 10 metres high. It is visible from Parramatta Road, Wattle Street and from adjacent residential properties located at Northcote Street and Wolseley Street.

Sensitive receivers are shown in **Figure 6-9**. A summary of visual and night lighting impacts on sensitive receivers during construction at the Northcote Street civil and tunnel site is provided in **Table 6-32**, including a comparison of the overall impact ratings described in Chapter 13 (Urban design and visual amenity) of the EIS.

Table 6-32 Summary of construction visual impacts on sensitive receivers at the Northcote Street civil and tunnel site

Receiver		Sensitivity to impact	Magnitude of impact	Overall impact rating (modification)	Overall impact rating (EIS)
Visual impacts					
NC1	Religious congregation – Wattle Street	Low	Low	Low	Low
NC2	Motorists – Wattle Street, Parramatta Road	Moderate	Moderate	Moderate	Moderate-Low

Receiver		Sensitivity to impact	Magnitude of impact	Overall impact rating (modification)	Overall impact rating (EIS)
NC3	Residents – Wattle Street, Northcote Street, Wolseley Street	Moderate	Moderate	Moderate	Moderate
NC4	Pedestrians – Wattle Street, Northcote Street, Wolseley Street, Parramatta Road	Low	Moderate	Moderate-Low	Low
Night lighting impacts					
NC1	Religious congregation – Wattle Street	Low	Negligible	Negligible	Low
NC2	Motorists – Wattle Street, Parramatta Road	Low	Negligible	Negligible	Low
NC3	Residents – Wattle Street, Northcote Street, Wolseley Street	Moderate	Negligible	Low	Moderate-Low
NC4	Pedestrians – Wattle Street, Northcote Street, Wolseley Street, Parramatta Road	Low	Negligible	Low	Low

The overall impact is considered to be 'moderate' for nearby receivers including residences and motorists with the exception of the religious congregation on Wattle Street which would have a limited view of the shed over the hoarding around the perimeter of the site.

Lighting would largely be contained within the acoustic shed and would be designed to minimise light spill, which would reduce the amount of light trespass onto adjoining residential properties. This would represent a reduction of potential night lighting impacts for the proposed modification compared to the EIS, which did not consider an acoustic shed at this location. Potential night lighting impacts would generally be consistent with existing conditions associated with the presence of the M4 East acoustic shed. The magnitude of the impact is considered to be 'low' for all nearby receivers. Night lighting would be designed to minimise light spillage to adjoining properties and would be generally consistent with the requirements of *AS 4282-1997 Control of the obtrusive effects of outdoor lighting*.

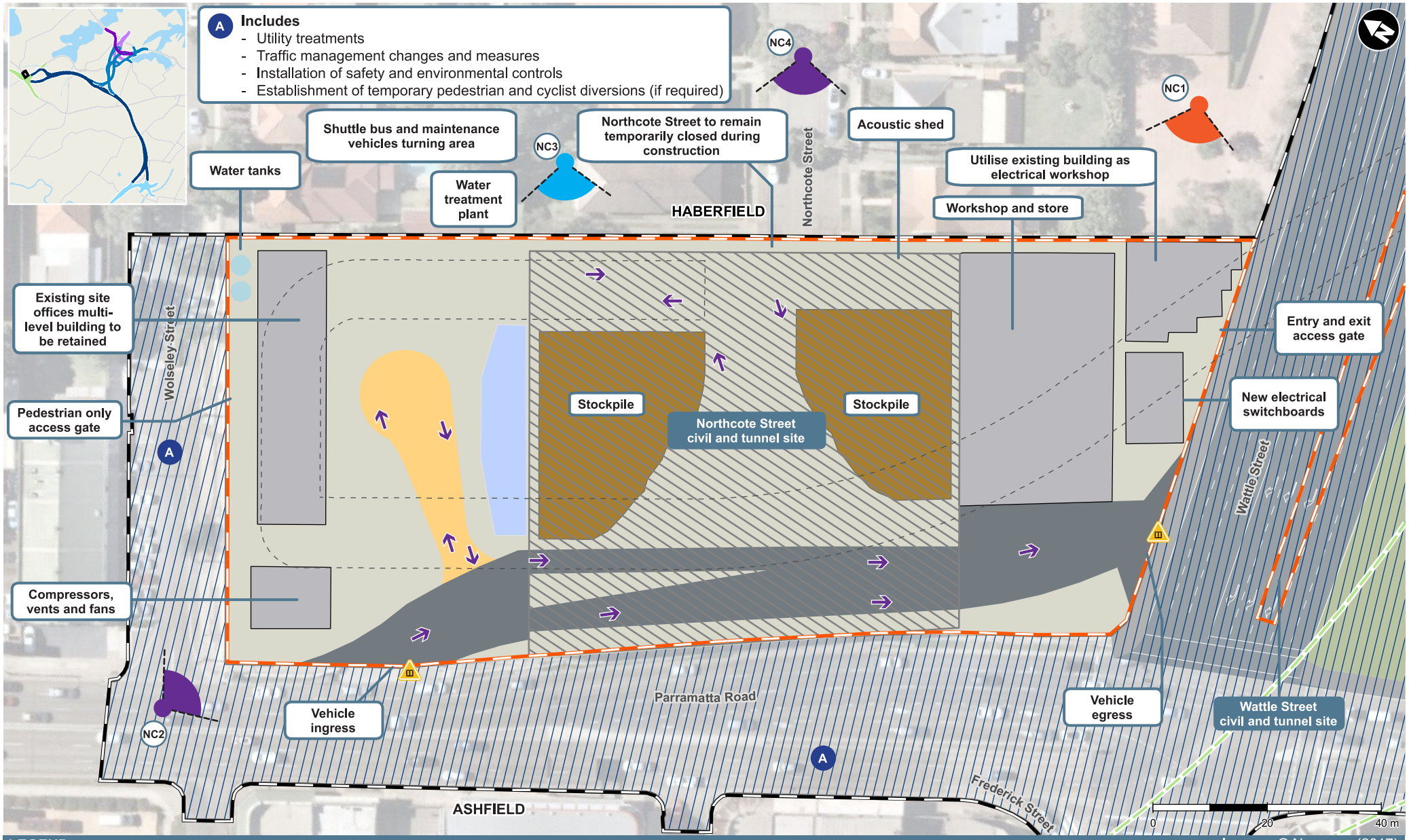


Figure 6-9 Northcote Street civil and tunnel site representative receiver locations

G-loop at Reg Coady Reserve

The reconfiguration works and use of the G-loop by heavy vehicles at Reg Coady Reserve would result in temporary visual impacts to motorists and pedestrians travelling on Dobroyd Parade, recreational users of Reg Coady Reserve and residential receivers on the southern side of Dobroyd Parade and along Martin Street to the west. The road corridor is currently being widened to accommodate the entry and exit ramps for the M4 East tunnels at the Wattle St interchange. Visual impacts would be temporary viewed in the context of an adjacent arterial road corridor which has been subject to construction works for the Wattle Street interchange and are therefore considered to be low.

The visual impacts from reconfiguration and use of the G-loop would be an extension of the existing visual impacts at this location as described in the M4 East project EIS. The impact will also include the use of the G-loop by construction heavy vehicles at a rate of around seven to eight trucks per hour. This impact would be negligible when considered in the context of the heavy traffic volumes using the adjacent traffic lanes on Wattle Street.

The G-loop would be demobilised and be rehabilitated and returned to Inner West Council for use as open space consistent with the proposal for the M4 East project. Residual impacts at this location would be limited to the impacts from operational infrastructure for the Wattle Street interchange which was described in the M4 East EIS.

Management measures and conditions of approval

Potential visual impacts associated with the proposed modification would be effectively managed through the implementation of the approved environmental management measures for the project as summarised in Part E of the SPIR.

The proposed modification would not require the modification of the conditions of approval for the project related to visual impacts at the Northcote Street civil and tunnel site and Reg Coady Reserve.

6.3.7 Social and economic

Assessment methodology

An assessment of the potential social and economic impacts has been carried for the proposed modification. The assessment is informed by the outcomes of the assessments that have been prepared for the proposed modification. This includes assessments of air quality, urban design and visual amenity, traffic and transport and noise and vibration impacts.

The social and economic impact assessment in the EIS considered impacts related to:

- Demographic profile
- Community values
- Amenity
- Social infrastructure
- Business and industry
- Access and connectivity
- Economy
- Utilities
- Property acquisition
- Construction fatigue.

Potential impacts relating to demographic profile, community values, economy, utilities and property acquisition as described in the EIS are considered to be consistent for the proposed modification. Potential impacts of the proposed modification relating to amenity, social infrastructure, business and industry, access and connectivity and construction fatigue are assessed in the sections below.

Figure 6-10 outlines the assessment framework that was employed to determine the overall significance of socio-economic impacts. Project data and knowledge and professional judgement has been applied on a case-by-case basis to identify the duration, spatial extent, severity, consequence, likelihood and ultimately the significance of impact on the socio-economic environment for each identified impact.

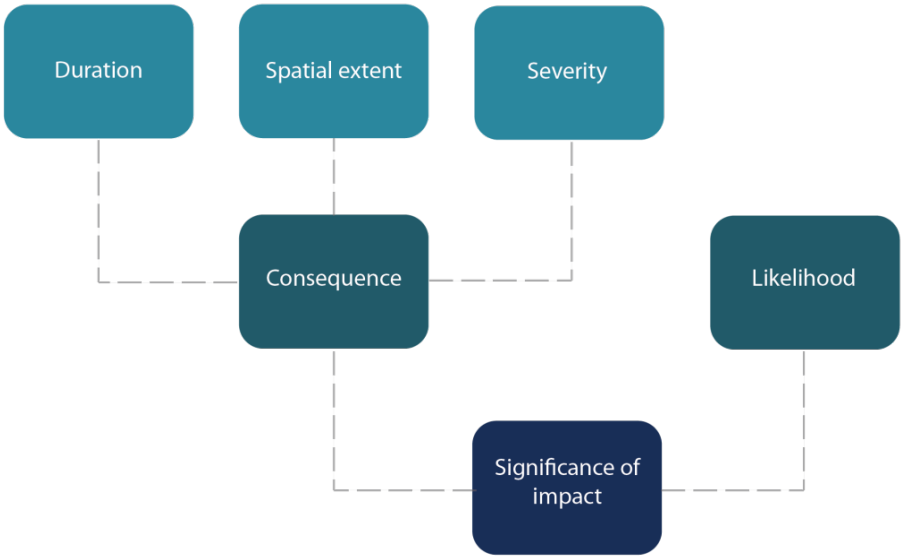


Figure 6-10 Socio-economic assessment framework

Existing environment

The surface construction footprint for the proposed modification at the Northcote Street civil and tunnel site would not change compared to the approved project and therefore the existing environment for the social and economic assessment is considered to be consistent with the existing environment for the approved project as described in section 14.2 of the EIS.

Reg Coady Reserve is located to the north of Wattle Street, east of the intersection with Martin Street. It forms part of a larger open space corridor which runs along Iron Cove Creek (Dobroyd Canal). The G-loop and other construction areas established by the M4 East project currently occupies part of the reserve (refer to **section 6.3.5** for further information). The remainder of the reserve is available to be used for open space and recreation.

Assessment of potential impacts

Potential social and economic impacts of the proposed modification during construction at the Northcote Street civil and tunnel site and Reg Coady Reserve are assessed in the sections below.

Road and intersection performance

Section 6.3.1 identifies the changes in level of service of roads and intersection performance during construction due to the proposed modification for the Route A and Route B haulage options for the Northcote Street civil and tunnel site. The impacts assessed indicate the proposed modification would result in minimal change to the traffic and transport impacts previously assessed in the M4-M5 Link EIS and SPIR. Impacts would therefore continue to be managed through the construction management measures contained in the conditions of approval for the project, specifically those in the Construction Traffic Transport and Access Management Sub-Plan and the Construction Parking and Access Strategy.

The Route B option, including use of the G-loop presents a number of benefits to reduce the potential social and economic impacts associated with spoil haulage for the Northcote Street civil and tunnel site including:

- Keeping heavy vehicles on major arterial roads
- Provision of access to the M4 East tunnels once completed
- Utilisation of existing infrastructure from the M4 East project.

Safety

Construction traffic and heavy vehicles associated with the proposed modification may affect community safety around roads and active transport connections, including along Ramsay Street for the Route A option, noting that these are state roads under the control of Roads and Maritime. A reduction in safety may be experienced on these roads with marginally higher traffic volumes and more heavy vehicles than would normally be experienced, as a result of the presence of construction traffic.

The proposed spoil haulage routes for the Northcote Street civil and tunnel site would be more direct and less constrained by comparison to the proposed spoil haulage route for the Parramatta Road West civil and tunnel site described in the EIS and SPIR. The proposed spoil haulage routes would be restricted to state roads that are controlled by Roads and Maritime. Use of the G-loop would allow spoil haulage vehicles the option of using the M4 East motorway tunnels and as a result reduce impacts on the surface road network.

Without mitigation, the traffic impact of construction activities would result in a moderate negative impact upon the safety of these roads. Impacts would therefore continue to be managed through the construction management measures contained in the conditions of approval for the project, specifically those in the Construction Traffic Transport and Access Management Sub-Plan and the Construction Parking and Access Strategy.

Access and connectivity

The provision of construction workforce car parking at Haberfield/Ashfield is described in **Chapter 4** (Proposed modification). The proposed modification would increase the amount of construction workforce car parking at Haberfield/Ashfield compared to Option A and Option B in the EIS. The White Bay civil site may also be used to supplement car parking for the construction workforce at Haberfield/Ashfield if necessary.

A preliminary assessment of parking provision, based on approximate peak workforce estimates, anticipate that the total parking provision within the Haberfield and Ashfield construction sites would be able to meet the forecast parking demand (refer to **section 6.3.1**)

Condition E54 of the project approval requires that a shuttle bus is provided as part of the Construction Parking and Access Strategy. It is proposed that a shuttle bus would be provided to transport the majority of construction workforce to and from designated parking areas, which are anticipated to be predominantly at the Parramatta Road West and Parramatta Road East civil sites to the Northcote Street civil and tunnel site. Where possible, the workforce will also be encouraged to walk the relatively short distance (around 400 metres) between these sites. This would help to mitigate potential impacts to on-street car parking around the Northcote Street civil and tunnel site.

A Construction Parking and Access Strategy would be developed in accordance with condition of approval E54. This plan would reduce the extent of the impact associated car parking on the socio-economic environment.

The proposed use of the Northcote Street site as a civil and tunnel site would not require the removal of on-street parking.

Local amenity – noise

The use of the Northcote Street civil and tunnel site will extend tunnelling operations and associated noise, air quality, traffic and parking impacts at this site for a further four years. This site is being used for tunnelling by the M4 East project. This enables existing infrastructure at the site such as the acoustic shed, driveways, water treatment plant, site offices and other structures to be re-used thereby reducing impacts associated with site establishment activities.

Potential noise impacts for the proposed modification are described in **section 6.3.3**. Potential impacts for the proposed modification would be generally consistent with the EIS and no additional environmental management measures would be required beyond those summarised in Part E of the SPIR. The potential social and economic impacts associated with noise amenity impacts described in the EIS would therefore be consistent for the proposed modification.

Local amenity – air quality

The proposed modification has the potential to affect local amenity due to the increase in dust in an environment. Potential air quality impacts for the proposed modification are described in **section 6.3.2**. Potential impacts for the proposed modification would be consistent with the EIS and are considered to be 'not significant' given the application of the environmental management measures summarised in Part E of the SPIR.

Local amenity – visual amenity

The primary visual element that would change for the proposed modification at the Northcote Street civil and tunnel site would be the retention of the large scale acoustic shed that has been established by the M4 East project. During construction, extended impacts to visual amenity may affect the enjoyment of an environment, business revenue and the well-being of individuals. Although the visual impacts would not substantially change from the existing use as a construction site, the ongoing use of these sites introduces construction fatigue risks with the adjacent residential properties likely to be more sensitive to ongoing impacts

With consideration of these factors, the overall impact on the socio-economic environment would be a moderate negative.

Social infrastructure

Changes in amenity may affect how users interact with, or enjoy an environment, or their ability to participate and concentrate. The sensitivity of social infrastructure to a construction impact would vary dependent on proximity to the construction activity, the individual's sensitivity to the construction impact (ie noise, dust, vibration) and the duration of the activity.

Table 6-33 details the social infrastructure that has a higher likelihood of experiencing multiple effects of construction activity at the Northcote Street civil and tunnel site. Social infrastructure users exposed to multiple construction activities may also be more susceptible to construction fatigue, which may have direct social and economic consequences.

Table 6-33 Social infrastructure likely to experience multiple construction effects

Use type	Social infrastructure facility	Change to environment	Potential socio economic effects
Place of worship	Kingdom Hall of Jehovah's Witnesses at 12 Wattle St, Haberfield	• Day and night-time noise exceedances anticipated • Increased construction vehicles (Wattle Street) • Visual amenity reduction (acoustic shed) • Construction dust from tunnelling	• Reduced amenity and access, particularly when services and events are occurring.
Outdoor recreation	Reg Coady Reserve, Five Dock	• Ongoing occupation of part of the reserve for the G-loop for a longer duration • Noise and visual amenity reduction associated with reconfiguration works and use of the G-loop	• Reduced amenity and access, particularly when services and events are occurring • Reduced area available for outdoor recreation • Amenity impacts.

The EIS for the M4 East project described that the area of Reg Coady Reserve used for construction would be rehabilitated and returned to Inner West Council for use as open space following the construction of the M4 East project. The proposed modification would effectively delay the rehabilitation of this area of Reg Coady Reserve until after the completion of construction activities for the M4-M5 Link project in Q1 2023. Potential temporary amenity impacts such as visual and noise impacts to recreational users of the reserve associated with the operation of the G-loop would be extended as a result of the proposed modification.

M4 East construction traffic and public motorists are able to use the G-loop during construction of the M4 East project. The access to the G-loop for public motorists was provided because the construction of the M4 East project removed the ability to turn right into Waratah Street when travelling eastbound on Dobroyd Parade.

Use of the G-loop for the proposed modification would be restricted to M4-M5 Link construction vehicles. This restriction would be communicated through appropriate signage and line marking. Public motorists would not be able to use the G-loop. However, the completed M4 East project will provide a right turn lane from the M4 East eastbound lanes into Waratah Street at this location and a right turn lane from the Wattle Street eastbound lanes into Ramsay Street.

Construction fatigue

Construction fatigue relates to receivers that experience construction impacts from a variety of projects over an extended period of time with few or no breaks between construction periods. Construction fatigue typically relates to traffic and access disruptions, noise and vibration, air quality and visual amenity and social impacts from projects that have overlapping construction phases or are back to back.

Construction fatigue from cumulative construction projects or multiple construction effects of a single project may be felt by residents, businesses and social infrastructure users around Haberfield near the Northcote Street civil and tunnel site and G-loop at Reg Coady Reserve where extensive construction work associated with the M4 East project has already been undertaken on or in the immediate vicinity of these sites.

Where construction timeframes overlap or are proximal to other project activities for longer durations of time, individuals and communities may experience effects on mental health through stress and anxiety.

The proposed modification would increase the duration of potential environmental impacts for sensitive users near the Northcote Street civil and tunnel site and therefore would also increase construction fatigue impacts associated with the project. Key potential environmental impacts that would contribute to construction fatigue would include:

- Noise, including noise from 24 hour a day tunnelling
- Traffic impacts from the movement of construction heavy vehicles
- Impacts to on-street car parking from construction light vehicles
- Air quality impacts, including potential dust impacts from tunnelling activities
- Visual impacts from the ongoing use of construction ancillary facilities.

Management measures and conditions of approval

Potential social and economic impacts associated with the proposed modification would be effectively managed through the implementation of the approved environmental management measures for the project as summarised in Part E of the SPIR and the conditions of approval for the project, including:

- Preparation of a CNVMP to manage potential construction noise and vibration impacts
- At receiver noise mitigation as required by condition of approval E88 to address construction fatigue and amenity
- Preparation of Construction Traffic, Transport and Access Management Sub-Plan, and Construction Parking and Access Strategy to manage potential traffic, transport, access and car parking impacts during construction
- Preparation of a Construction Air Quality Sub-Plan to manage air quality impacts, including minimising dust generation during construction.

The proposed modification would not require the modification of the conditions of approval for the project related to social and economic impacts at the Northcote Street civil and tunnel site and Reg Coady Reserve.

6.3.8 Groundwater

The construction access tunnel at the Northcote Street civil and tunnel site would extend around 430 metres to the mainline tunnel. The access tunnel would be constructed through good quality Hawkesbury Sandstone and would not intersect alluvium. It therefore is expected that the rate of groundwater inflow (in litres per second per kilometre) compared to the approved project would be similar.

The EIS provided for a construction access tunnel from Parramatta Road West civil and tunnel site to the mainline tunnels over a distance of around 250 metres. This access tunnel was also to be constructed through good quality Hawkesbury Sandstone. The proposed modification would no longer require the provision of this construction access tunnel. The construction access tunnel for the Darley Road civil and tunnel site is also no longer required.

It is considered that the groundwater impacts associated with the proposed construction access tunnel from the Northcote Street civil and tunnel site are likely to be comparable to the impacts assessed in the EIS. It is considered that the environmental management measures related to groundwater as outlined in Part E of the SPIR and the conditions of approval relating to limiting groundwater inflows into the tunnels, further groundwater modelling and on-going groundwater monitoring would be sufficient to manage potential groundwater impacts.

The proposed modification would potentially result in cumulative groundwater impacts with the nearby M4 East tunnels during construction of the M4-M5 Link project. However, the impacts are likely to be consistent with those described in section 26.1.11 of the EIS and no additional management measures or conditions of approval are required.

6.3.9 Non-Aboriginal heritage

The construction footprint of the Northcote Street civil and tunnel site would not increase for the proposed modification and therefore there would be no additional direct impacts associated with the proposed modification compared to the impacts described in the EIS.

Section 6.3.5 describes potential settlement impacts associated with the construction access tunnel excavation at the Northcote Street civil and tunnel site. The predicted settlement impacts would comfortably meet the project settlement criteria for sensitive structures as summarised in in **Table 6-30** and specified in the condition of approval E103 of the project approval. As a result there is not likely to be any heritage impact to properties within the Haberfield HCA as a result of settlement associated with the construction access tunnel.

The ongoing use of the acoustic shed at the Northcote Street civil and tunnel site would result in minor temporary impacts to the visual setting of the Haberfield HCA as described in the M4 East EIS.

Reg Coady Reserve is located within the Haberfield HCA. The use of the G-loop and ongoing occupation of part of Reg Coady Reserve during construction would have minor temporary impacts to the visual setting of the Haberfield HCA, which would be generally consistent with the impacts described in the M4 East EIS at this location. The impacts would be temporary and Reg Coady Reserve would be rehabilitated on the completion of construction.

The environmental management measures related to Non-Aboriginal heritage as outlined in Part E of the SPIR would be sufficient to manage potential impacts to the Haberfield HCA. The proposed modification would not require the modification of the conditions of the project approval related to non-Aboriginal heritage at the Northcote Street civil and tunnel site and Reg Coady Reserve.

6.3.10 Resource use and waste

A construction water treatment plant was not proposed at Northcote Street civil and tunnel site in the EIS. The removal of the construction water treatment plants at the Darley Road site would result in changes to construction wastewater discharges at the Northcote Street civil and tunnel site and Pyrmont Bridge Road civil and tunnel site (refer to **section 6.5.6**). The existing M4 East water treatment plant outside the acoustic shed at the Northcote Street site would be modified to meet the requirements of the M4-M5 Link project during construction.

Construction wastewater (including groundwater ingress, rainfall runoff in tunnel portals and ventilation shafts, heat and dust suppression water and wash down runoff) discharges from the Northcote civil and tunnel site would be approximately 1,100 kilolitres per day. This discharge would be predominantly associated with tunnel groundwater ingress which would be treated at the construction WTP and then discharged to Dobroyd Canal. Intermittent surface water (surface water runoff from roof/paved surfaces) discharges from the site would also occur.

The discharge of 1,100 kilolitres of wastewater per day from the construction water treatment plant at the Northcote Street civil and tunnel site is comparable to the discharge of 1,200 kilolitres of wastewater for the Parramatta Road West civil and tunnel site as described in the EIS. A construction water treatment plant would not be provided at the Parramatta Road West civil site for the proposed modification.

With the proposed environmental management measures as described in Part E of the SPIR in place, impacts on water quality are considered to be negligible. The proposed modification would not require the modification of the conditions of approval for the project related to resource use and waste and discharge water quality criteria for the Northcote Street civil and tunnel site.

6.4 Parramatta Road West and Parramatta Road East civil sites

The following is an assessment of the issues relevant to Parramatta Road West and East civil and sites as identified in **Table 6-2**.

6.4.1 Traffic and transport

Assessment methodology

Changes to construction traffic associated with the use of the Parramatta Road West and Parramatta Road East civil sites and the Northcote Street civil and tunnel site have been considered as part of the assessment of construction traffic at Haberfield, Ashfield and Five Dock for the proposed modification provided in **section 6.3.1**.

Changes to construction traffic associated with the use of the Parramatta Road West and Parramatta Road East civil sites by comparison to the EIS would include:

- Decrease at the Parramatta Road East civil site from three heavy vehicles to one heavy vehicle (one-way) during the AM and PM peak hours
- Increase at the Parramatta Road West civil site from 10 light vehicles to 18 light vehicles (one-way) during the AM and PM peak hours
- Decrease at the Parramatta Road East civil site from 50 light vehicles to 12 light vehicles (one-way) during the AM and PM peak hours.

The impact of shuttle buses from the Parramatta Road West and Parramatta Road East civil sites was included in this assessment.

Light and heavy vehicle access points are provided for Parramatta Road West civil site from Parramatta Road, Bland Street and Alt Street. The entry along Parramatta Road would only be accessible for west-bound traffic via a left turn into the site. Exit onto Parramatta Road would be left turn out to travel west-bound. Entry and exit points are also proposed onto Bland Street and Alt Street to allow traffic to access between the sites or onto Parramatta Road.

Light and heavy vehicle access points for the Parramatta Road East civil site would be from Parramatta Road and Alt Street. Entry from Parramatta Road would be left turn in, only available for east-bound traffic. Exit would be left turn out to travel east bound along Parramatta Road. Vehicle access points would not be provided from Bland Street for the Parramatta Road East civil site.

Other construction traffic impacts associated with the use of the Parramatta Road West and Parramatta Road East civil sites would include impacts associated with the temporary overhead pedestrian walkway above Parramatta Road between the two sites.

Existing environment

Traffic movements at and around the site include movements associated with:

- The former commercial properties located at the site and in the immediate vicinity of the site along Parramatta Road
- Traffic accessing and exiting the residential streets of Alt Street and Bland Street from Parramatta Road including traffic travelling to and from the Haberfield Public School
- Through traffic travelling along Parramatta Road.

Access to the Parramatta Road West and Parramatta Road East sites is currently available from Parramatta Road, Alt Street and Bland Street at multiple locations.

Assessment of potential impacts

Impacts on the road network from the temporary overhead pedestrian walkway above Parramatta Road would occur primarily during establishment and decommissioning and therefore over a short duration. It is likely Parramatta Road would need to be closed overnight for installation of the pedestrian bridge. Approval would be required from TMC for a Road Occupancy Licence and diversion routes would be in place during the overnight installation.

The temporary overhead pedestrian walkway would provide sufficient clearance for vehicles travelling along Parramatta Road with the base of the walkway being around six metres above Parramatta Road. This would be sufficient to accommodate all light vehicles and most heavy vehicles travelling along Parramatta Road. The Roads and Maritime Special Permits Unit are to be notified for the management of over height vehicle permits.

A road safety audit would be carried out during detailed design to ensure that the bridge would not obstruct or reduce motorists' sight distance to any signs / directional signs or important traffic directions / infrastructure (refer to condition E56 of the project approval).

Impacts on pedestrian, cycle or public transport users are likely to be negligible and able to be adequately managed through the Construction Traffic Transport and Access Management Sub-Plan that will be prepared for the project, which would aim to provide safe routes for pedestrians and cyclists during construction.

It is proposed that the existing bus stop on the western side of Parramatta Road north of the intersection with Bland Street would be relocated to avoid conflict between buses and heavy vehicles attempting to access the nearby Parramatta Road West civil site. The bus stop would be moved to a new location around 150 metres to the north on Parramatta Road. The relocation of the bus stop would be subject to on-going consultation with Transport for NSW, Transit Services and other stakeholders and would be detailed in the Construction Traffic Transport and Access Management Sub-Plan.

Environmental management measures and conditions of approval

Based on the assessment of traffic impacts associated with the use of the Parramatta Road West and Parramatta Road East civil sites, no further environmental management measures are deemed necessary beyond those summarised in Part E of the SPIR.

The proposed modification would also not require changes to the conditions of the project approval which relate to traffic and transport. Impacts would continue to be managed through the construction management measures contained in the Construction Traffic Transport and Access Management Sub-Plan (condition C4 of the project approval) and the Construction Parking and Access Strategy (condition E54 of the project approval). Safe pedestrian and cyclist access would be maintained during construction in accordance with condition E57 of the project approval.

6.4.2 Air quality

Potential air quality impacts for the proposed modification at the Parramatta Road West and Parramatta Road East civil sites are assessed as part of impacts to Haberfield and Ashfield as summarised in **section 6.3.2**.

As identified in **section 6.3.2**, the proposed modification would involve carrying out some construction activities at the Northcote Street civil and tunnel site that were approved to be carried out at the Parramatta Road West civil and tunnel site, including earthworks associated with tunnelling activities. It is anticipated that there would be a minor change to the potential risk of dust impacts to nearby receptors compared to the impacts described in the EIS. The potential air quality impacts associated with proposed modification would be 'not significant' given the application of appropriate mitigation measures, which is consistent with the assessment in the EIS.

Demolition works would still occur at the Parramatta Road West and East civil sites as well as the construction of a temporary overhead pedestrian walkway between the two sites. Potential air quality impacts associated with these works would be managed in accordance with the environmental management measures for the project as summarised in Part E of the SPIR and relevant conditions of approval for the project.

6.4.3 Noise and vibration

Assessment methodology

A qualitative assessment of potential noise and vibration impacts for the proposed modification at the Parramatta Road West and Parramatta Road East civil sites, including the use of the temporary overhead pedestrian walkway. The assessment of potential noise and vibration impacts is consistent with the methodology outlined in **section 6.3.3** and includes the NCAs described in **Table 6-23** and shown in **Figure 6-3**.

Existing environment

The existing ambient noise environment was descried in Appendix J (Technical working paper: Noise and Vibration) of the M4-M5 Link EIS. **Table 6-34** provides the Residential Noise Management NMLs applicable to the Haberfield and Ashfield area.

Table 6-34 Residential NMLs for the project

Representative monitoring location	Rating Background Level (RBL) dBA ICNG defined time periods1		
	Daytime period RBL	Evening period RBL	Night period RBL
1A Wattle St, Haberfield	58	58	52
141 Alt St, Haberfield	46	46	43
119 Alt St, Ashfield	46	46	38
35 Wattle St, Haberfield	58	55	44
259 Ramsay St, Haberfield	56	53	43
99 Charles St, Lilyfield	51	49	42

Assessment of potential impacts

Parramatta Road West and East civil sites

Table 6-35 provides a qualitative assessment of the noise impacts associated with the use of the sites as proposed in the modification against the use of the sites assessed in the EIS and SPIR consistent with the environmental assessment requirements. This assessment considered the differences in noise and/or vibration impacts between the equivalent work activities for each of the proposed activities.

Review of the assessment outlined in **Table 6-35** indicates that the proposed use of the Parramatta Road West and Parramatta Road East civil sites is considered to be consistent with the assessment undertaken in the M4-M5 Link EIS and SPIR and would not result in a change to the mitigation proposed for the equivalent activities.

The proposed modification would remove tunnelling activities from Parramatta Road West site and is therefore is expected to result in a reduction in the impact on nearby receivers previously predicted for these activities.

Consistent with recommendations in the M4-M5 Link EIS and SPIR, a CNVIS will be prepared based on the finalised construction methodology and will include consideration of the indicative revised layout and use of the site, including the location of specific items of plant. The CNVIS will include details of how the noise emissions from the sites will be managed to achieve compliance with the applicable noise management levels as required by condition of approval C19. Where non-compliances are predicted within the CNVIS, the contractor will explore at source noise mitigation options that may include, but are not limited to:

- Site perimeter hoarding
- Localised enclosures around noise sources
- Judicious selection of fixed plant and equipment
- Optimisation of site layout to maximise localised shielding by on-site buildings

- Positioning driveways away from sensitive receivers
- If necessary, limiting noise intensive activities during sensitive periods.

Noise and vibration impacts on receivers in the vicinity of the Parramatta Road West and Parramatta Road East civil sites were assessed in the M4-M5 Link EIS. Condition of approval (E88) requires mitigation in the form of “at-property treatment” to be offered to habitable spaces for the properties identified within the Appendix E of the conditions of approval.

Sensitive receivers adjoining the Parramatta Road East and Parramatta Road West civil sites were identified in Appendix E of the conditions of approval due to their proximity to the works associated with the construction of the M4-M5 Link project and the impacts associated with the consecutive and long-term nature of construction of the wider WestConnex program of works.

While the modification proposes the use of these sites as civil sites (with the use to be in accordance with condition C19), with the exception of noise from tunnelling activities, the noise impacts are expected to be consistent with those identified in the EIS, and would not change the boundaries defined in Appendix E of the conditions of the project approval.

Table 6-35 Qualitative consistency assessment

Activity (modification)	Description	Equivalent activity assessed in the EIS	Proposed period of work (modification)	Assessed period of work (EIS)	Comparison of impacts for proposed modification and EIS (reduced / consistent / higher)	Mitigation
Site establishment	Demolition of buildings and structures such as the workshops, awnings and stores	Yes	Standard daytime hours	Standard daytime hours	**Consistent –** The extent of the site footprint was assessed in the EIS. Several buildings located within the site may be retained for use during construction. These would be demolished at the end of construction.	Recommended mitigation methods outlined in the EIS, SPIR and conditions of approval are considered appropriate.
	Vegetation clearing and removal	Yes	Standard daytime hours	Standard daytime hours	**Consistent –** No material change to the amount of vegetation clearing described and assessed in the EIS.	
	Establishment of temporary noise attenuation measures	Yes	Standard daytime hours	Standard daytime hours	**Consistent –** The extent of the site footprint was assessed in the EIS.	
	Utility works including protection and/or adjustment of existing utilities	Yes	All periods	Standard daytime hours All time periods	**Consistent –** EIS assessed utility works required within the compound. As there is no requirement for the site to provide power to support tunnelling, the extent of utility works would be less than that assessed in the EIS. The EIS scenario addressed pavement and infrastructure works required where the site adjoins Parramatta Road and was assessed against all time periods (day, evening and night).	
	Contamination remedial work	Yes	Standard daytime hours	Standard daytime hours	**Consistent –** The extent of the site footprint was assessed in the EIS.	

Activity (modification)	Description	Equivalent activity assessed in the EIS	Proposed period of work (modification)	Assessed period of work (EIS)	Comparison of impacts for proposed modification and EIS (reduced / consistent / higher)	Mitigation
	Construction of a workforce pedestrian access temporary bridge over Parramatta Road	No	All periods	All periods	An assessment of potential noise and vibration impacts associated with the construction of the pedestrian bridge is included in the sections below.	
	Establishment of site offices, amenities and temporary infrastructure	Yes	Standard daytime hours	Standard daytime hours	**Consistent –** The extent of the site footprint was assessed in the EIS. The proposed layout of the site would also provide a greater level of shielding than that assessed in the EIS as some existing buildings may be retained through the operation of the site.	
Site operations	Laydown and storage of materials Plant and equipment assembly Heavy vehicle, equipment and plant storage Delivery of materials, plant and equipment	Yes	All periods	All periods	**Consistent -** The EIS assessed general laydown operations within select areas of the site footprint. Although the proposed use of the site is to include laydown operations over a larger area of the footprint, it is expected that the predicted absolute level of noise would be comparable to that presented in the EIS at the closet receiver due to similar items of plant being used. The proposed layout of the site would also provide a greater level of shielding than that assessed in the EIS as some existing buildings may be retained through the operation of the site. The proposed site footprint is consistent with that assessed in the EIS.	Recommended mitigation methods outlined in the EIS, SPIR and conditions of approval are considered appropriate. A Construction Noise and Vibration Impact Statement (CNVIS) will be prepared based on the revised layout of the site and will detail noise mitigation and management measures in line with the contractor's finalised construction methodology.

Activity (modification)	Description	Equivalent activity assessed in the EIS	Proposed period of work (modification)	Assessed period of work (EIS)	Comparison of impacts for proposed modification and EIS (reduced / consistent / higher)	Mitigation
	Construction traffic access	Yes	All periods	All periods	**Consistent -** The site is to be used for civil activities, with no spoil storage or haulage proposed from the site. The EIS assessed spoil haulage from the Parramatta Road West site as it was a tunnelling compound. This will result in reduced number of heavy vehicles (spoil haulage truck and dogs) accessing the site.	
Site rehabilitation and landscaping	Demobilisation including works to prepare the site for a future use in accordance with the M4-M5 Link Residual Land Management Plan.	Yes	Standard daytime hours	Standard daytime hours	**Consistent –** The extent of the site footprint was assessed in the EIS.	Recommended mitigation methods outlined in the EIS, SPIR and conditions of approval are considered appropriate.

The assessment of the proposed use of Parramatta Road West and East civil sites indicates that, with the exception of tunnelling activities, the noise and vibration impacts are generally consistent with those assessed for the EIS. As such it is expected that existing environmental management measures contained in the SPIR and relevant conditions of approval would be suitable for the proposed modification.

Temporary overhead pedestrian walkway

The proposed activities associated with the construction of the temporary overhead pedestrian walkway have been broken down into three scenarios. For each scenario the use of equipment has been identified, including numbers of equipment being used and the potential sound power level (dBA). **Table 6-36** details the sound power levels for construction equipment.

Table 6-36 Sound power levels for construction equipment – Haberfield

Scenario name	Scenario ID	Equipment (realistic worst case)	Worst case items in same location	Sound power level (dBA)[1,2]		
				L_{WA}		L_{WAmax}
				Item	Activity[4]	Activity
Footing constructions include concrete saws	MPO-01	Concrete saw	1	115	110	123
		Excavator (small)	1	98		
		Truck	1	98		
Boarded piling	MPO-02	Piling rig (bored)	1	108	108	118
		Mobile crane	1	100		
		Concrete truck	1	106		
Bridge span lift	MPO-03	Mobile crane(large)	1	104	107	112
		Semi-trailer	2	106		
		Lighting tower	2	99		

Notes:

1. In accordance with the EPA ICNG for activities identified as particularly annoying (such as jackhammering, rock-breaking and power saw operation), a 5 dBA 'penalty' is added to predicted noise levels when using the quantitative method
2. Activity sound power levels account for the amount of time an item of plant is anticipated to operate within each 15 minute period

Predicted noise levels have been modelled for each MPO in relation to the relevant NCAs. The predicted NML exceedances are summarised in **Table 6-37**.

Following the completion of construction of the walkway, the use of the walkway by construction workers is anticipated to result in only a negligible noise impact to nearby receivers.

Table 6-37 Overview of NML exceedances

Activity ID	Activity	Weeks[1]	Activity duration within overall project program[2]	Number of receivers															
				Total	Highly noise affected[4]	NML exceedance receiver count[3]													
						Daytime			Daytime (out of hours)			Evening			Night-time			Sleep disturbance		
						1-10 dBA	11-20 dBA	>20 dBA	1-10 dBA	11-20 dBA	>20 dBA	1-10 dBA	11-20 dBA	>20 dBA	1-10 dBA	11-20 dBA	>20 dBA	1-10 dBA	11-20 dBA	>20 dBA
MPO-01	Footing constructions include concrete saws	1	25%	1747	-	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MPO-02	Boarded piling	3	25%	1747	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MPO-03	Bridge assembly and span lift	8	25%	1747	-	3	-	-	21	1	-	21	1	-	88	8	-	22	1	-

The NML exceedances summarised in **Table 6-37** above are described in more detail below.

Work activity MPO-01 and MPO-02

MPO-01 and MPO-02 include construction activities required for the preparation of the footings and other structures and are limited to standard daytime hours only. Exceedances of the daytime NMLs are predicted at 14 receivers within NCA01 and NCA06, with a maximum exceedance of nine dBA. These exceedances are anticipated to be associated with the use of a concrete saw during the demolition of the existing hardstand (MPO-01). Noise levels would significantly decrease when the concrete saw is not in use, and it would be expected that these works would be short in duration.

Work activity MPO-03

MPO-03 is representative of the bridge assembly and span lift which is expected to occur over a duration of 8 weeks. The work associated with assembly of the bridge would be undertaken during daytime hours and the span lift may be conducted outside of standard construction hours to avoid impacts on the road network during peak periods. Moderate NML exceedances of up to 19 dBA are predicted when the crane is operating. Noise impacts are generally limited to receivers that are situated near to the Parramatta Road facilities within NCA00, NCA01, NCA06 and NCA07. These works are expected to be completed over a few nights and would be managed via the implementation of the mitigation and management measures outlined in the EIS and SPIR.

Sleep disturbance

Sleep disturbance screening criterion is likely to be exceeded at adjacent residential receivers when night works are occurring. The assessment has included predicted maximum noise impacts for assessment of potential sleep disturbance, however, it is noted that the ICNG only requires the project to consider maximum noise levels when construction works are planned to extend over more than two consecutive nights.

An OOHW protocol would be developed as part of the project CNVMP to set parameters around how works outside standard daytime construction hours will be carried out, including timing and frequency, and the mitigation measures that will be implemented based on predicted impacts identified through location and activity specific assessments. The OOHW protocol will be developed in consultation with the NSW Environment Protection Authority (NSW EPA).

Vibration impacts

Piling works associated with the construction of the temporary overhead pedestrian bridge have the potential to result in vibration impacts at the nearest sensitive receivers. Relevant vibration criteria are provided in **Table 6-38**.

Table 6-38 Recommended minimum working distances for vibration intensive plant

Plant item	Rating/description	Minimum working distance			
		Cosmetic damage			Human response[1]
		Residential and light commercial[1]	Group 2 (typical)[2]	Group 3 (structurally unsound)[2]	
Pile boring	≤ 800 mm	2 m (nominal)	3 m	5 m	4 m

The locations of the proposed works are approximately 30 metres from the nearest sensitive receivers. No sensitive receivers are located within the minimum working distances for piling works. As such, cosmetic damage and human response vibration impacts from piling works associated with construction of the temporary overhead pedestrian bridge are considered unlikely to occur.

Management measures and conditions of approval

The existing management measures and conditions of approval provided are sufficient to manage impacts generated by the proposed modification at the Parramatta Road West and East civil sites including the construction of the temporary overhead pedestrian bridge.

The proposed modification would not require any change to the conditions of approval for noise and vibration.

6.4.4 Surface water, flooding and drainage

Assessment methodology

An assessment of flooding and drainage impacts during construction for the Parramatta Road West and Parramatta Road East civil sites is provided in **Appendix E** (Surface water and flooding report) and included:

- An assessment of flooding conditions and potential impacts based on a review of the relevant sections of the M4-M5 Link EIS, M4 East EIS and the M4 East detailed design
- An assessment of whether surface water can be adequately managed by the environmental management measures stipulated within the M4-M5 Link EIS and M4-M5 Link SPIR.

Existing environment

The assessment of potential surface water and flooding impacts associated with the proposed modification has assumed that the existing environment conditions at each of the assessed locations are consistent with those set out in Appendix Q (Technical Working Paper: Surface water and flooding) of the EIS.

The Parramatta Road West and Parramatta Road East civil sites are located within the Dobroyd Canal catchment. Construction discharges would ultimately drain to Dobroyd Canal. The sites are occupied by buildings and extensive hardstand areas with limited pervious areas.

Assessment of potential impacts

Flooding

The Parramatta Road East civil site is located outside the PMF flood extent and the Parramatta Road West civil site is located on the fringe of the PMF flood extent with no overland flow paths occurring through the site. No topographic changes are proposed for the Parramatta Road West and Parramatta Road East civil sites or for Parramatta Road, Bland Street or Alt Street which abut the two sites. Therefore no flood impacts on adjacent properties are anticipated.

The Parramatta Road West civil site is no longer proposed for tunnelling and therefore there will be no construction access tunnel at this site.

Localised drainage

All construction works would have the potential to impact local overland flow paths and existing minor drainage paths. Disruption of existing flow mechanisms, both of constructed drainage systems or those of overland flow paths, could occur as a consequence of the various construction activities and facilities.

These are typical impacts faced on most construction projects and can be addressed by adopting industry standard mitigation measures. Consideration of these impacts would be included during future detailed design and construction planning phases.

Water quality and geomorphology

No tunnel dive is proposed for the Parramatta Road West civil site, therefore a construction water treatment plant is not proposed at this site. Tunnel water that would have been pumped to Parramatta Road West tunnel site (under option B for construction ancillary facilities at Haberfield/Ashfield) would be pumped to the Northcote Street civil and tunnel site and the Pyrmont Bridge Road civil and tunnel site.

Discharges from the Parramatta Road West and East civil sites would only relate to surface water (surface runoff from roofs and paved surfaces). The total discharge volume would vary depending on rainfall conditions. Surface water would be managed in accordance with the environmental management measures presented in the EIS, SPIR, conditions of approval and Environment Protection Licence including implementation of erosion and sediment controls and construction discharge criteria.

Management measures and conditions of approval

Based on the assessment of potential surface water, flooding and drainage impacts associated with the proposed modification, no further environmental management measures are deemed necessary beyond those summarised in Part E of the SPIR.

The proposed modification would not require any change to the conditions of approval for the project related to surface water, flooding and drainage impacts at the Parramatta Road West and East civil sites.

6.4.5 Land use and property

Assessment methodology

The assessment of impacts from the proposed modification on land use and property has been carried out according to the methodology summarised in **section 6.3.5**.

Existing environment

The Parramatta Road West and East civil sites are located on the western and eastern sides of Parramatta Road between Alt Street and Bland Street and to the north of Alt Street at Ashfield and Haberfield. The sites are mostly vacant and have previously comprised of a former car dealership and servicing workshop on land on both sides of Parramatta Road, with several smaller commercial premises on the western side of Parramatta Road near Bland Street.

The area around the Parramatta Road West and East civil sites consist of predominantly residential land uses, comprising attached and detached dwellings and some multi storey residential apartments which are located adjacent to the Parramatta Road West site. A mixture of commercial and light industrial land uses front onto Parramatta Road to the north of the sites. South of Bland Street, a large construction site is present on the western side of Parramatta Road to construct the Parramatta Road portals and realign Parramatta Road as part of the M4 East project. Haberfield Public School is located on Bland Street about 100 metres east of the intersection of Parramatta Road and Bland Street.

The Parramatta Road West and Parramatta Road East civil sites would be on land zoned B6 Enterprise Corridor under the Ashfield LEP. The objectives of this zone include to promote businesses along main roads and to provide a range of employment uses. The Ashfield LEP 2013 defines the land use zoning surrounding the Parramatta Road West and Parramatta Road East civil sites as a mix of the following zones: B6 Enterprise Corridor, SP2 Infrastructure and R3 Medium Density Residential. The land is also subject to the *Parramatta Road Corridor Urban Transformation Strategy* (UrbanGrowth NSW 2016).

Land use zoning surrounding the Parramatta Road West and Parramatta Road East civil sites is shown in **Figure 6-11**.

Refer to section 12.2.2 of the EIS for further information regarding existing land use and planning controls at the Parramatta Road West and Parramatta Road East civil sites.

Figure 6-11 Parramatta Road West and Parramatta Road East civil sites – existing land use zoning

Assessment of potential impacts

Property acquisition

There would be no change to property acquisition at the Parramatta Road West and Parramatta Road East civil sites. **Table 6-39** provides a comparison of property acquisition required for the approved project and the proposed modification.

Table 6-39 Comparison of property acquisition required for the approved project and the proposed modification

Location	Land use	Property acquisition assessed in the EIS	Additional property acquisition required for proposed modification
Parramatta Road West and Parramatta Road East civil sites	Former car dealership, car servicing workshop and commercial properties already owned by Roads and Maritime. One commercial property to be acquired.	1	No additional property acquisition required for modification

Ground movement

Section 6.5.5 of the EIS described the construction of a temporary access tunnel at the Parramatta Road West site. The temporary access tunnel was proposed to be around 250 metres in length. This temporary access tunnel would no longer be required for the proposed modification and a new access tunnel would be constructed from the Northcote Street civil and tunnel site.

Land use

The Parramatta Road West site is described as a civil and tunnel site in section 6.5.5 of the EIS and the Parramatta Road East site is described as a civil site in section 6.5.7 of the EIS.

For the proposed modification the Parramatta Road West and Parramatta Road East civil sites would be used generally in accordance with condition C19 and other conditions of the project approval. The sites would be used for parking and other works that do not exceed the 'noise affected' Noise Management Levels as identified in the ICNG.

The sites would be used for site offices, light and heavy vehicle car parking, shuttle bus services, workshop and storage of equipment, materials and construction machinery. Both sites would operate 24 hours a day, 7 days a week in accordance with the conditions of the project approval.

The sites would be used to support civil and tunnelling construction activities at other project construction sites, primarily within the Haberfield and Ashfield area. No tunnelling, tunnel spoil handling or tunnel spoil haulage would occur at these sites.

A temporary overhead pedestrian walkway above Parramatta Road would link the Parramatta Road West and Parramatta Road East civil sites (refer to **Figure 6-12**). This walkway would only be used by the construction workforce and access would be via stairs located within the work sites.

With the exception of the temporary overhead pedestrian walkway above Parramatta Road, construction activities would be carried within the same surface construction footprint as assessed for the Parramatta Road West and Parramatta Road East civil sites in the EIS. Land use at the sites would temporarily change from commercial sites for the project which is consistent with the land use impacts described in section 12.4.2 of the EIS.

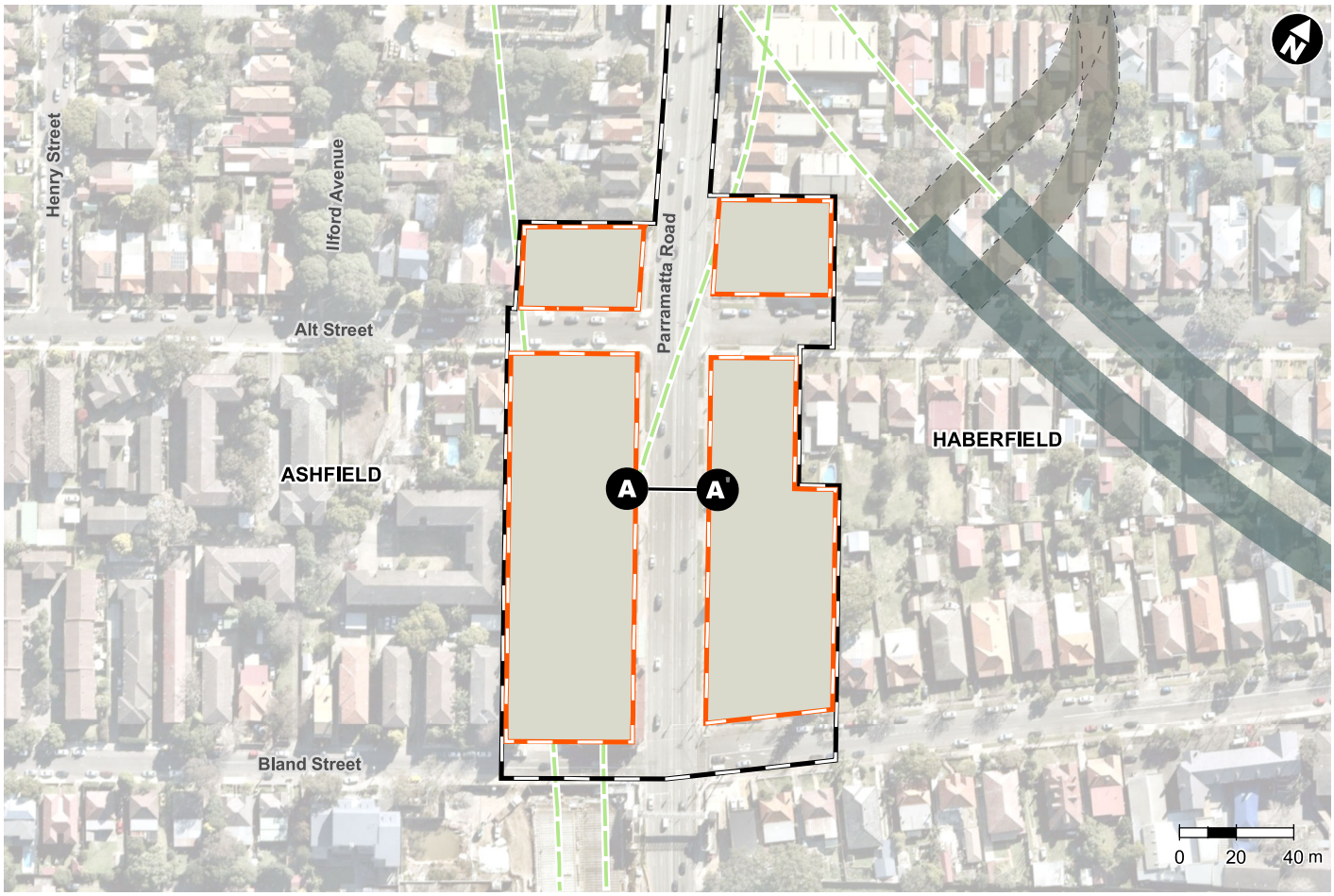
The temporary overhead pedestrian walkway would not impact the use of the Parramatta Road corridor in this location. The structure has been designed to provide sufficient clearance for vehicles travelling along Parramatta Road with the base of the walkway being around six metres above Parramatta Road. The bridge structure would not interfere with the existing footpath and pedestrian movements along either side of Parramatta Road. The structure would be generally comparable to an

existing pedestrian walkway located over Parramatta Road at Haberfield, east of Bland Street (refer to **Plate 3**).

Plate 3 View looking south along Parramatta Road towards Bland Street and the Haberfield pedestrian bridge

Following the completion of construction, the site would be restored to generally the existing ground level or as otherwise agreed with Roads and Maritime. Future development would be determined by Roads and Maritime in accordance with the relevant zoning and policy controls applicable at that time. The modification would not involve a change to the future land use of the Parramatta Road West and East sites described in section 12.4.2 of the EIS.

A comparison of land use impacts for the approved project and proposed modification is provided in **Table 6-40**.



Imagery © Nearmap (2017)

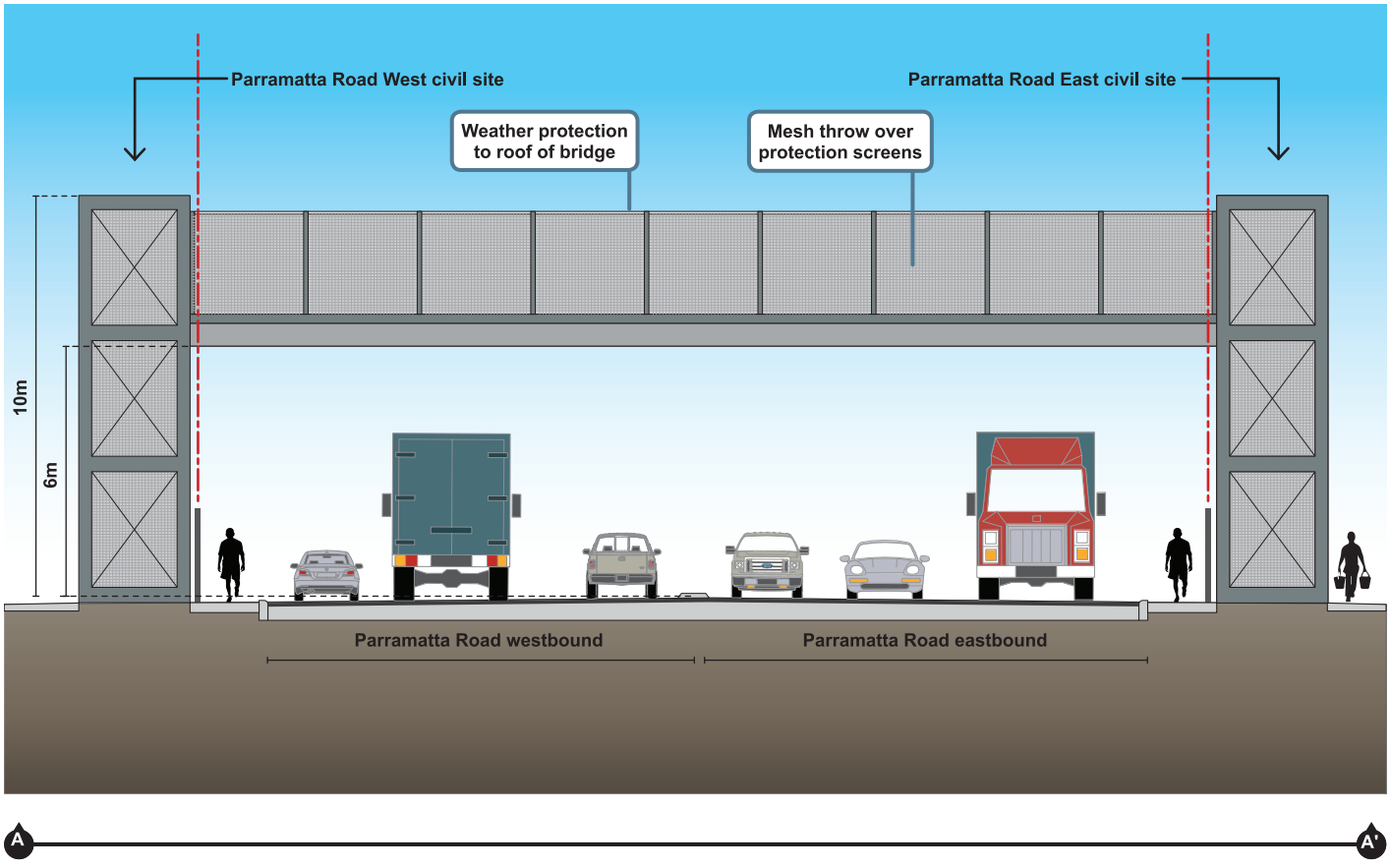


Figure 6-12 Indicative overhead pedestrian walkway over Parramatta Road

Table 6-40 Comparison of land use impacts for the approved project and proposed modification at Parramatta Road West and Parramatta Road East civil sites

	Construction		Operation	
Location	**Approved project**	**Proposed modification**	**Approved project**	**Proposed modification**
Parramatta Road West civil site	Land use would change from commercial to a construction site for the project. The site was to be used as a civil and tunnel site including tunnelling activities and laydown areas (under option B for construction ancillary facilities at Haberfield/Ashfield).	Land use would change from commercial to a construction site for the project. The site would be used in accordance with condition C19 and other conditions of the project approval. The sites would be used for parking and other works that do not exceed the 'noise affected' Noise Management Levels as identified in the ICNG. The sites would be used for site offices, light and heavy vehicle car parking, shuttle bus services, workshop and storage of equipment, materials and construction machinery. Tunnelling would not be carried out at this location. A temporary overhead pedestrian walkway above Parramatta Road would link the site with Parramatta Road East civil and tunnel site (see **Figure 6-12**).	The site would be restored to generally the existing ground level or as otherwise agreed with Roads and Maritime. Future development would be determined by Roads and Maritime.	No change in operational impact described in the EIS.

	Construction		Operation	
Location	**Approved project**	**Proposed modification**	**Approved project**	**Proposed modification**
Parramatta Road East civil site	Land use would change from commercial to a construction site for the project. The site was to be used as a civil site including site offices, car parking and laydown areas.	Land use would change from commercial to a construction site. The site would be used in accordance with condition C19 and other conditions of the project approval. The sites would be used for parking and other works that do not exceed the 'noise affected' Noise Management Levels as identified in the ICNG. The sites would be used for site offices, light and heavy vehicle car parking, shuttle bus services, workshop and storage of equipment, materials and construction machinery. Tunnelling would not be carried out at this location. A temporary overhead pedestrian walkway above Parramatta Road would link the site with Parramatta Road West civil and tunnel site (see **Figure 6-12**).	The site would be restored to generally the existing ground level or as otherwise agreed with Roads and Maritime. Future development would be determined by Roads and Maritime.	No change in operational impact described in the EIS.

Management measures and conditions of approval

Potential land use and property impacts associated with the proposed modification would be effectively managed through the implementation of the approved environmental management measures for the project as summarised in Part E of the SPIR.

The proposed modification would not require changes to the conditions of approval for the project related to land use impacts at the Parramatta Road West and Parramatta Road East civil sites.

6.4.6 Urban design and visual amenity

Assessment methodology

The assessment of impacts from the proposed modification on visual amenity has been carried out according to the methodology summarised in **section 6.3.6**.

Existing environment

The Parramatta Road West and Parramatta Road East civil sites are located on the western and eastern sides of Parramatta Road between Alt Street and Bland Street and to the north of Alt Street at Ashfield and Haberfield. The sites are mostly vacant and have previously comprised of a former car dealership and servicing workshop on land on both sides of Parramatta Road, with several smaller commercial premises on the western side of Parramatta Road near Bland Street. The sites are shown in **Plate 4** and **Plate 5** and additional photos of the existing environment in this area are provided in **Appendix F** (Site photos).

The area surrounding the sites consists of predominantly residential land uses, comprising attached and detached dwellings and some residential apartments. A mixture of commercial and light industrial land uses front onto Parramatta Road to the north. South of Bland Street, a construction site is present on the western side of Parramatta Road to construct the Parramatta Road portals and realign Parramatta Road as part of the M4 East project. The adjacent Parramatta Road corridor includes adjacent commercial development and roadside infrastructure such as signage, street lighting and traffic signals and caters for high traffic volumes.

The Haberfield pedestrian bridge crosses over Parramatta Road to the south east near Bland Street (refer to **Plate 3**). Located directly to the south east of the Haberfield pedestrian bridge is Yasmar, a property listed on the State Heritage Register.

Existing sources of night lighting includes security lighting associated with the existing use of the site, street lighting associated with Parramatta Road, local streets and associated vehicular traffic, and illuminated windows of the surrounding residential and commercial properties.

Plate 4 Existing environment at the Parramatta Road East civil site

Plate 5 Existing environment at the Parramatta Road West civil site

Assessment of potential impacts

The primary visual elements that would change for the proposed modification at the Parramatta Road West and Parramatta Road East civil sites include:

- The addition of a temporary pedestrian overbridge for construction workforce between the Parramatta Road West and Parramatta Road East civil sites
- The removal of the proposed acoustic shed at the Parramatta Road West site due to change of construction activities at this location.

The proposed indicative site layout for Parramatta Road West and Parramatta Road East civil sites and the location of nearby sensitive visual receivers is provided in **Figure 6-13**.

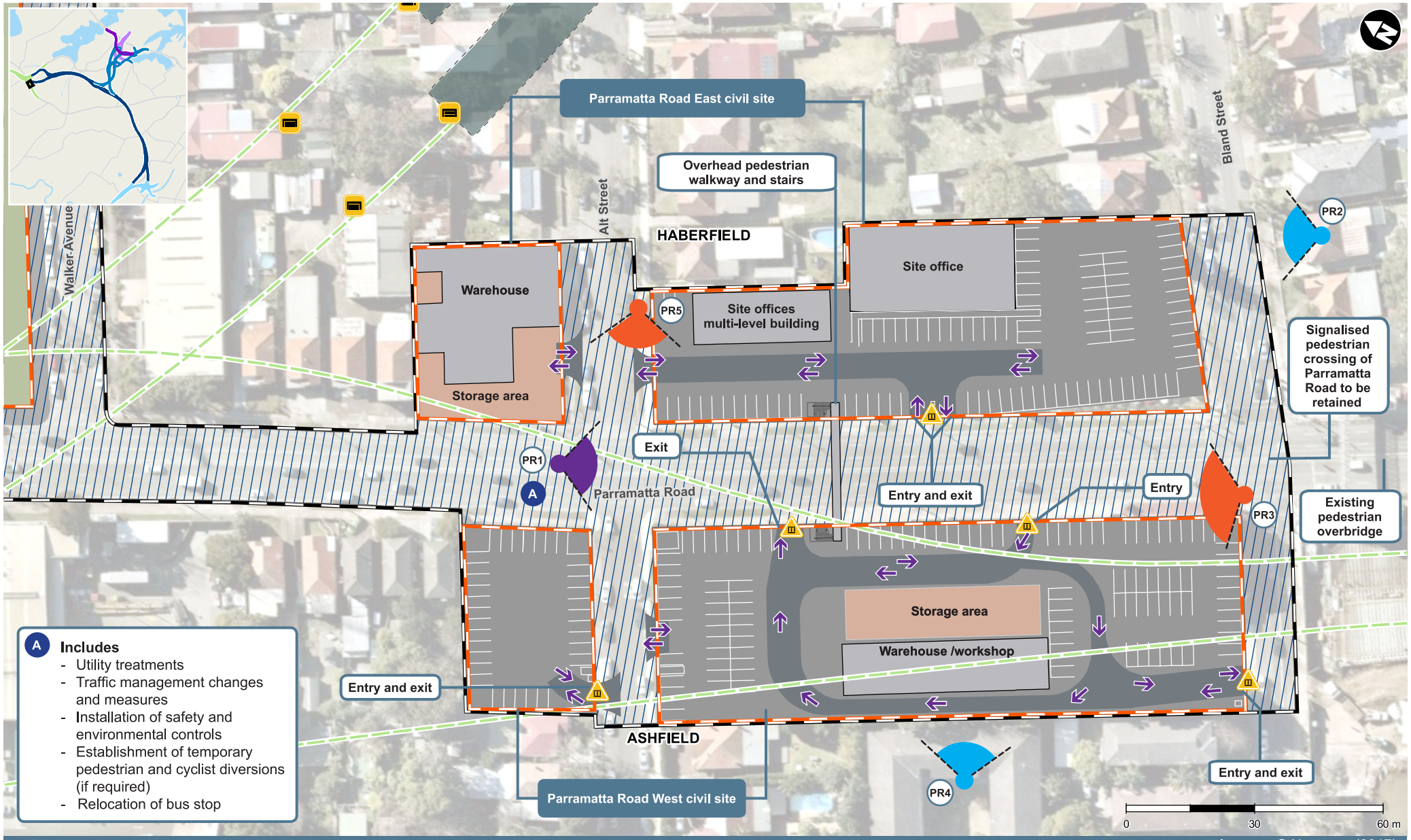


Figure 6-13 Parramatta Road West and Parramatta Road East civil sites representative receiver locations

The structure would provide sufficient clearance for vehicles travelling along Parramatta Road with the base of the walkway being around six metres above Parramatta Road. The overall height of the walkway structure would extend to around 10 metres above Parramatta Road. Both the walkway and access towers would be enclosed to provide weather protection for users and enable use 24 hours a day, seven days a week. Lighting would be provided to allow the walkway to be used after daylight hours.

The temporary overhead pedestrian walkway would introduce a visual change to the Parramatta Road corridor in this location. The walkway would be of a comparable visual scale and character to the Haberfield pedestrian bridge, which crosses over Parramatta Road to the south east near Bland Street. The temporary overhead pedestrian walkway would be viewed in the context of the busy Parramatta Road corridor which includes adjacent commercial development and roadside infrastructure such as signage, street lighting and traffic signals and caters for high volumes of traffic.

The temporary overhead pedestrian walkway would be an additional night lighting source with the lighting designed to illuminate the walkway for construction workers. The walkway is elevated but located over the road corridor and some distance from the closest residential properties.

Night lighting would be designed to minimise light spillage to adjoining properties and would be generally consistent with the requirements of AS 4282-1997 Control of the obtrusive effects of outdoor lighting.

A summary of construction visual impacts on sensitive receivers for the temporary overhead pedestrian walkway is provided in **Table 6-41**.

Table 6-41 Summary of construction visual impacts on sensitive receivers for the temporary overhead pedestrian walkway

Receiver		Sensitivity to impact	Magnitude of impact	Overall impact rating
Visual impacts				
PR1	Motorists on Alt Street, Bland Street and Parramatta Road	Low	Low	Low
PR2	Residents – Alt Street, Bland Street and Parramatta Road (west)	High	Negligible	Moderate
PR3	Pedestrians – Alt Street, Bland Street and Parramatta Road (west)	Low	Low	Low
PR4	Residents – Alt Street, Bland Street and Parramatta Road (east)	Moderate	Negligible	Moderate
PR5	Pedestrians – Alt Street, Bland Street and Parramatta Road (east)	Low	Low	Low
Night lighting impacts				
PR1	Motorists on Alt Street, Bland Street and Parramatta Road	Low	Low	Low
PR2	Residents – Alt Street, Bland Street and Parramatta Road (west)	Moderate	Low	Moderate-Low
PR3	Pedestrians – Alt Street, Bland Street and Parramatta Road (west)	Low	Low	Low
PR4	Residents – Alt Street, Bland Street and Parramatta Road (east)	Moderate	Low	Moderate-Low
PR5	Pedestrians – Alt Street, Bland Street and Parramatta Road (east)	Low	Low	Low

The removal of the proposed acoustic shed at the Parramatta Road West civil site would result in a general reduction of potential visual impacts compared to the impacts described in the EIS (for the option B construction ancillary facilities arrangement Haberfield/Ashfield). However, the removal of the acoustic shed would mean that lighting within the construction ancillary facility would not be shielded from nearby sensitive receivers to the same extent and night lighting impacts would likely increase compared to the impacts described in the EIS.

Night lighting would be designed to minimise light spillage to adjoining properties and would be generally consistent with the requirements of AS 4282-1997 Control of the obtrusive effects of outdoor lighting.

A comparison of visual and night lighting impacts on sensitive receivers during construction at the Parramatta Road West and Parramatta Road East civil sites for the EIS and the proposed modification is provided in **Table 6-42**.

Table 6-42 Summary of construction visual impacts on sensitive receivers at Parramatta Road West and Parramatta Road East civil sites

Receiver		Sensitivity to impact	Magnitude of impact	Overall impact rating (modification)	Overall impact rating (EIS)
Visual impacts – Parramatta Road West					
C1b-1	Motorists on Alt Street, Bland Street and Parramatta Road	Low	Moderate	Moderate–Low	Moderate–Low
C1b-2	Residents – Alt Street, Bland Street and Parramatta Road (west)	High	Moderate	High-Moderate	High
C1b-3	Pedestrians – Alt Street, Bland Street and Parramatta Road (west)	Low	Moderate	Moderate–Low	Moderate–Low
Visual impacts – Parramatta Road East					
C3b-2	Residents – Alt Street, Bland Street and Parramatta Road (east)	Moderate	Moderate	Moderate	Moderate
C3b-3	Pedestrians – Alt Street, Bland Street and Parramatta Road (east)	Low	Low	Low	Low
Night lighting impacts – Parramatta Road West					
C1b-1	Motorists on Alt Street, Bland Street and Parramatta Road	Low	Moderate	Moderate–Low	Low
C1b-2	Residents – Alt Street, Bland Street and Parramatta Road (west)	Moderate	Moderate	Moderate	Moderate–Low
C1b-3	Pedestrians – Alt Street, Bland Street and Parramatta Road (west)	Low	Moderate	Moderate–Low	Low
Night lighting impacts – Parramatta Road East					
C3b-2	Residents – Alt Street, Bland Street and Parramatta Road (east)	Moderate	Moderate	Moderate	Moderate-Low
C3b-3	Pedestrians – Alt Street, Bland Street and Parramatta Road (east)	Low	Low	Low	Low

Management measures and conditions of approval

Potential visual impacts associated with the proposed modification would be effectively managed through the implementation of the approved environmental management measures for the project as summarised in Part E of the SPIR.

The proposed modification would not require changes to the conditions of approval for the project related to visual impacts at the Parramatta Road West and Parramatta Road East civil sites.

6.4.7 Social and economic

The Parramatta Road West and Parramatta Road East civil sites would be used in accordance with condition C19 and other conditions of the project approval. The sites would be used for parking and other works that do not exceed the 'noise affected' Noise Management Levels as identified in the ICNG. The sites would be used to support civil and tunnelling construction activities at other project construction sites, primarily within the Haberfield and Ashfield area. No tunnelling, tunnel spoil stockpiling and handling or tunnel spoil haulage would occur at these sites.

The level of socio-economic impacts directly associated with the Parramatta Road West and Parramatta Road East civil sites identified in the EIS would therefore be reduced or remain generally consistent for the proposed modification.

6.4.8 Non-Aboriginal heritage

The proposed modification would link the Parramatta Road West and Parramatta Road East civil sites with a temporary overhead pedestrian walkway above Parramatta Road. There is the potential for the temporary overhead pedestrian walkway to impact the visual setting of the adjacent Haberfield HCA.

Potential indirect visual setting impacts on the Haberfield HCA were identified in the EIS however these were assessed to have a neutral impact (Refer to Appendix U (Technical working paper: Non-Aboriginal heritage) of the EIS). The EIS noted that indirect impact on the Haberfield HCA would primarily result from the extension of time associated with using the existing M4 East construction ancillary facilities at Northcote Street and along Wattle Street for the M4-M5 Link project.

The Parramatta Road East civil site and temporary overhead pedestrian walkway are located in the context of the busy Parramatta Road corridor and are located outside of, but in proximity to, the Haberfield HCA. The Parramatta Road East civil site is located adjacent to the western extent of the Haberfield HCA.

The structure would provide sufficient clearance for vehicles travelling along Parramatta Road with the base of the walkway being around six metres above Parramatta Road. The overall height of the walkway structure would extend to around 10 metres above Parramatta Road. Both the walkway and access towers would be enclosed to provide weather protection for users and enable use 24 hours a day, seven days a week. Lighting would be provided to allow the walkway to be used after daylight hours.

Oblique views of the bridge would be available from residential properties in Alt Street and Bland Street which are located further away from the site and these views would be obscured by intervening structures within the construction sites.

Given the location of the temporary overhead pedestrian walkway, it is considered that indirect impacts to the visual setting of the Haberfield HCA would represent a neutral impact consistent with the impacts assessed in the EIS.

Given that the impacts associated with the modification would be consistent with those assessed in the EIS, it is considered that the environmental management measures related to Non-Aboriginal heritage as outlined in Part E of the SPIR would be sufficient to manage potential impacts to the Haberfield HCA.

6.5 Removal of Darley Road civil and tunnel site from the project

The following is an assessment of the issues associated with the removal of Darley Road civil and tunnel site from the project as identified in **Table 6-3**.

As described in **Chapter 4** (Proposed modification), the approved project involved the removal and transportation of around 550,300 cubic metres of tunnel spoil from the Darley Road civil and tunnel site as described in Section 23.3.2 of the EIS. Given that the length of the mainline tunnel would not change for the proposed modification, the balance of this spoil volume would be required to be removed from other tunnelling sites. The overall intensity (rate) of spoil removal at approved tunnelling sites is not expected to change, however the additional spoil to be removed would require the extension of the tunnelling component of the overall construction program by around six months. This would increase the duration of environmental impacts associated with tunnelling.

6.5.1 Traffic and transport

The EIS described that the intersection levels of service during the construction of the project are forecast to generally not be significantly impacted, with the exception of Wattle Street/Ramsay Street, and Dobroyd Parade/Timbrell Drive. This is due to Wattle Street being one of the key routes for construction traffic. Impacts due to temporary lane closures and speed reductions, particularly during traffic staging, would also occur.

The EIS also described impacts to intersection levels of service for the City West Link/James Street and City West Link/The Crescent intersections. The removal of the Darley Road site means that construction vehicles would not need to turn into and out of James Street at the City West Link/James Street intersection. This would improve the performance of this intersection compared to the M4-M5 Link SPIR. The removal of turning movements would also reduce delays at this intersection compared to the M4-M5 Link SPIR

The EIS described that the volume of traffic generated by construction is expected to be relatively low compared to existing traffic, and therefore the effects of the short term increase on the existing road network were not expected to significantly impact road safety in the study area, while noting there is still a risk with construction traffic interacting with general traffic.

The proposed modification would extend these construction traffic impacts associated with tunnelling activities for the project by around six months at the other tunnelling sites supporting the construction of Stage 1 of the project.

A Construction Traffic and Access Management Plan (CTAMP) will be prepared and implemented to minimise disruption to road users. Potential construction traffic impacts for the proposed modification would be managed in accordance with the approved environmental management measures for the project as summarised in Part E of the SPIR and relevant conditions of approval for the project.

6.5.2 Air quality

The EIS described that with the implementation of a Dust Management Plan, potential construction air quality impacts associated with dust generation including from tunnelling activities and the transportation of spoil are considered to be ‘not significant’. All loaded spoil haulage trucks and other project-related heavy vehicles carrying materials with the potential to result in dust generation will be covered to prevent dust emissions during transport in accordance with relevant road regulations.

The proposed modification would extend the construction air quality impacts associated with tunnelling for the project by around six months at the other tunnelling sites supporting the construction of Stage 1 of the project. Potential air quality impacts would be managed in accordance with the environmental management measures for the project as summarised in Part E of the SPIR and relevant conditions of approval for the project.

6.5.3 Noise and vibration

The removal of Darley Road site from the approved project would avoid the potential noise and vibration impacts at this location as described in the EIS. Such impacts include airborne noise, ground-borne noise, sleep disturbance and vibration.

Key noise impacts associated with tunnelling that would be extended for the proposed modification are described below:

- Haberfield/Ashfield: Noise from tunnelling support activities and onsite traffic movements is predicted to result in exceedances at up to 19 residential receivers. However, the predicted noise impacts from these activities are minor (less than 10 dBA above NMLs). While the magnitude of the predicted exceedance is relatively low, these impacts are predicted at receivers which would likely have been exposed to noise impacts from the interfacing M4 East project. These receivers are those adjoining the Northcote Street civil and tunnel site and that have line of sight to the Wattle Street civil and tunnel site.
- Pyrmont Bridge Road: Noise from tunnelling support activities, onsite car parking, deliveries and storage is predicted to result in exceedances at up to 14 residential receivers. The predicted noise impacts from these activities are typically minor (less than 10 dBA above NML) however up to four receivers are predicted with moderate (up to 20 dBA) NML exceedances during night-time spoil handling activities. Bridge Road School is located on the opposite side of Parramatta Road in this location and would be subject to noise impacts during construction
- St Peters: Noise from include onsite vehicle movements, tunnelling support and ventilation building construction are predicted to be minor (less than 10 dBA above NML) however one receiver is predicted with moderate (up to 20 dBA) NML exceedances during night-time cumulative activities. No receivers are predicted to be highly noise affected during the proposed works at this site. While the magnitude of the predicted exceedance is relatively low, these impacts are predicted at receivers which would likely have been exposed to noise impacts from the interfacing New M5 project.

The extension of the tunnelling component of the overall construction program by around six months would result in the extension of the duration of the noise impacts described above.

Potential impacts related to vibration were identified in the EIS to primarily relate to activities within construction ancillary facilities such as the use of rock-breakers and concrete saws. The extension of the duration of tunnelling would not impact on these types of vibration intensive activities.

The EIS described that ground-borne noise from tunnelling works would exceed the night-time ground-borne NML for up to around 16 to 20 days for receivers at Haberfield/Ashfield and Pyrmont Bridge Road respectively. Airborne noise emissions were predicted to be higher than the ground-borne noise levels at St Peters and therefore ground-borne noise was not anticipated to be the controlling factor for construction works at this location.

Given the rate of tunnelling progression would not change, an increase in the duration of ground-borne noise impacts at individual receivers is not expected by comparison to how they were described in the EIS. While most road-heading works would be anticipated to progress at a consistent rate, there may be discreet locations which require a longer duration of tunnelling works due to site conditions.

Given the intensity of the impacts would not change, the environmental management measures related to noise and vibration impacts as outlined in Part E of the SPIR would be sufficient to manage potential impacts.

6.5.4 Social and economic

The removal of Darley Road site from the approved project would avoid the potential social and economic impacts at this location described in the EIS, including impacts to parking and community safety, health and wellbeing from light spill, dust, traffic, noise and vibration.

The extension of the tunnelling component of the overall construction program by around six months would result in the extension of the duration of social and economic impacts at other tunnelling sites. Key social and economic impacts associated with tunnelling are summarised in **Table 6-43**.

Table 6-43 Social and economic impacts at tunnelling sites

Impact associated with tunnelling	Discussion
Community safety, health and wellbeing	The proposed modification would extend the duration of potential impacts to community safety, health and wellbeing including: • Health impacts from construction noise and dust generation • Impact to the community's perception of safety around roads and active transport connections from spoil haulage vehicles.
Amenity – noise and vibration, air quality and visual amenity	Construction would generate a minor exceedance of background noise levels at sensitive receivers surrounding the tunnelling sites during tunnelling activities which would impact local amenity. Nuisance dust generated from construction activities associated with tunnelling may affect residential dwellings or sensitive premises that require a cleaner and/or sterilised environment. Visual impacts associated with the presence of the tunnelling sites have the potential to affect the appeal of external and internal living spaces and reduce the overall amenity of an environment.
Social infrastructure	Social infrastructure facilities would be affected during construction by the impacts outlined in this table. This includes the following receivers nearby the relevant tunnelling facilities, including: • Kingdom Hall of Jehovah's Witnesses at 12 Wattle Street, Haberfield • Timbrell Park at Henley Marine Drive, Five Dock • The Infants Home at 17 Henry Street, Haberfield • Yasmar training facility • Chaya's Family Day Care at 12/111 Alt Street, Ashfield • Nurjahan's Family Day Care at 12a/115 Alt Street Ashfield • Haberfield Public School at 24-26 Denman Avenue, Haberfield • Bridge Road School at 127 Parramatta Road, Camperdown • Sydney Park at St Peters.
Access and connectivity	Increased intersection delays and traffic congestion associated with spoil haulage vehicles during tunnelling activities has the potential to increase stress and anxiety for road users; reduce access to residences, social infrastructure and businesses; increase air and noise pollution; and increase the costs and reduce the efficiency of the freight network. Impacts to intersection performance and the road network along proposed haulage routes are unlikely to change in magnitude from what was assessed in the EIS but these impacts will extend over a longer period.
Business and industry	Construction of the project would affect the amenity of an environment, including for people visiting or working at local businesses in the study area. This would be as a result of increased noise, vibration and dust, or reduced visual outlook and business visibility. Changes to amenity can affect business ambience, productivity, functionality and exposure.

Given the intensity of the impacts would not change, the environmental management measures related to social and economic impacts as outlined in Part E of the SPIR would be sufficient to manage potential impacts.

6.5.5 Visual amenity

The removal of Darley Road site from the approved project would avoid the potential visual and amenity impacts at this location described in the EIS. Upgrades to other construction water treatment plants to compensate for the removal for the construction water treatment plant at Darley Road would not result in visual amenity impacts that would be inconsistent with the impacts described in the EIS.

Visual impacts associated with the relocation of the operational water treatment plant from Darley Road site to St Peters are considered in **section 6.6.6**.

6.5.6 Resource use and waste

The proposed modification would result in changes to spoil volumes generated from the tunnelling sites for the project. **Table 6-44** details the change in indicative spoil volumes compared to the volumes described in section 23.3.2 of the EIS.

Table 6-44 Comparison of indicative spoil volumes for the proposed modification

Tunnelling site	Spoil volumes (cubic metres) EIS	Spoil volumes (cubic metres) proposed modification
Northcote Street civil and tunnel site	n/a	566,300
Wattle Street civil and tunnel site	311,500	311,500
Parramatta Road West civil site	520,000	n/a
Darley Road civil and tunnel site	550,300	n/a
Pyrmont Bridge Road tunnel site[1]	854,500	1,190,400
Campbell Road civil and tunnel site	755,000	942,900

Notes:

1. Pyrmont Bridge Road tunnel site was renamed to Pyrmont Bridge Road civil and tunnel site in the SPIR

The spoil volumes outlined in **Table 6-44** are indicative and may change subject to detailed design and construction planning.

The removal of the construction water treatment plants at the Parramatta Road West civil site and the Darley Road site would result in changes to construction wastewater discharges at the Northcote Street civil and tunnel site and Pyrmont Bridge Road civil and tunnel site. Additional infrastructure to pump wastewater would not be required as a result of this change. Changes at the Northcote Street civil and tunnel site are described in **section 6.3.10**. Discharges from the Northcote civil and tunnel site would be approximately 1,100 kilolitres per day.

At the Pyrmont Bridge Road civil and tunnel site, construction wastewater discharges would increase to around 1,400 kilolitres per day. This is approximately a 15% increase from the daily discharge volume described in the EIS.

This discharge would be predominantly associated with tunnel groundwater ingress which would be treated at the construction water treatment to be located at the Pyrmont Bridge Road civil and tunnel site. Given the increase in discharge volume is minor from that described in the EIS and considering the receiving environment is the tidally influenced concrete channel of Johnstons Creek, the potential for scour and erosion to occur is negligible.

The discharge volumes from the construction water treatment plant at the Northcote Street civil and tunnel site are also considered minor in the context of the overall Dobroyd Canal catchment and concrete channel receiving environment of the canal. As a result the potential for scour and erosion to occur at this location is also considered to be negligible (refer to **section 6.3.4**).

Impacts would be of a comparable type and magnitude for the proposed modification, it is considered that the environmental management measures related to resource use and as outlined in Part E of the SPIR would be sufficient to manage potential impacts.

6.6 Relocation of operational water treatment plant to St Peters

The following is an assessment of the issues associated with the relocation of the operational water treatment plant to St Peters.

6.6.1 Traffic and transport

The relocation of the permanent water treatment plant from Darley Road to the Campbell Road motorway operation complex at St Peters interchange is likely to result in a negligible change in impact on traffic and transport users compared to the impact assessment in the EIS, as no change in peak construction traffic volumes are forecast.

6.6.2 Air quality

A screening assessment consistent with the methodology outlined in **section 6.3.2** was carried out to assess whether the proposed changes at the Campbell Road motorway operations complex would change the construction dust risk assessment presented in Appendix I of the M4-M5 Link EIS (Technical working paper: Air quality). The screening assessment identified that there would be a negligible change to the impacts outlined in the M4-M5 Link EIS as a result of the proposed modification and that further assessment of this location is not required.

Potential air quality impacts would be managed in accordance with the environmental management measures related to air quality as outlined in Part E of the SPIR and relevant conditions of approval for the project.

6.6.3 Noise and vibration

Construction of the water treatment plant would be undertaken during standard construction hours only. Potential noise impacts associated with the construction of the water treatment plant would be consistent with the construction scenarios assessed in the EIS which did not identify any noise impacts at nearby receivers.

The water treatment plant at the Campbell Road motorway operations complex has been modelled at a sound power level of 90 dBA. This is the maximum sound power level that results in compliance with the criteria at all residential receivers. Other fixed plant at this location has been modelled consistent with the EIS.

The water treatment plant would include specific equipment designed to achieve compliance with the relevant criteria for noise output. The equipment and sound power levels modelled for the water treatment plant are indicative only and may be subject to change during the detailed design phase of the project. It is envisaged that the mechanical plant noise sources associated with the fixed facilities would be controllable by common engineering methods that may consist of:

- Judicious location selection
- Noise barriers
- Silencers
- Acoustically lined ductwork
- Acoustic louvres.

Any mechanical equipment selected would be subject to review and assessed for compliance with the established design criteria at the detailed design stage of the project. Any specific mitigation measures would be determined at this point, taking account of cumulative noise emissions from all fixed facility noise sources at Campbell Road motorway operations complex.

6.6.4 Surface water, flooding and drainage

Assessment methodology

An assessment of flooding and drainage impacts for the operational water treatment plant at the Campbell Road motorway operations complex is provided in **Appendix E** (Surface water and flooding report) and included:

- A qualitative flooding and drainage assessment to assess potential flooding and drainage impacts associated with the construction of the operational water treatment plant
- An assessment of potential water quality impacts and scour impacts associated with the treated discharges from the operational water treatment plant and a qualitative flooding assessment based on a review of the WestConnex New M5 EIS.

A “box model” was developed to assess how the quality and quantity of pollutants associated with treated releases from the operational water treatment plant would impact Alexandra Canal. A box model simulates the average state of a system through mass balancing and is used to evaluate changes in the system, in this instance changes in water quality.

The key inputs and assumptions applied during the box modelling assessment are provided in section 3.3.2 and Annexure A of **Appendix E** (Surface water and flooding report).

Existing environment

The assessment of potential surface water and flooding impacts associated with the proposed modification has assumed that the existing environment conditions at each of the assessed locations are consistent with those set out in the Appendix Q (Technical Working Paper: Surface water and flooding) of the EIS. The Campbell Road motorway operations complex (MOC5) is located within the Alexandra Canal catchment with discharges ultimately discharging to Alexandra Canal.

Alexandra Canal is a constructed canal, originally a natural watercourse named Sheas Creek. It flows into the Cooks River near the north-western corner of Sydney Airport. As it was originally built for navigation by boat for transportation purposes, it is much larger than technically required to convey stormwater from the catchment area draining to it.

Due to its size, inflows and tidal interactions, the canal accumulates sediment. The sediments within the canal have been assessed to be contaminated and are subject to a Remediation Order issued by the NSW EPA.

A review of known water quality data was undertaken as part of the EIS. The monitoring results were compared with the slightly to moderately disturbed trigger values for marine waters or estuarine waters in the case of nutrients, which correspond with the NSW Water Quality Objectives for aquatic ecosystems in the Cooks River catchment. Elevated levels of metals (chromium (III+VI), copper, lead, nickel (Sheas Creek only) and zinc) and nutrients (nitrogen, phosphorus and reactive phosphorus) were recorded in Alexandra Canal and Sheas Creek. The results are indicative of waterways within an urbanised catchment.

Assessment of potential impacts – construction

Flooding

The operational water treatment plant is sited outside the PMF flood extent for mainstream flooding and is not located within an existing major overland flow path.

The New M5 project is providing the construction site platform within the St Peters interchange. When the operational water treatment plant area is handed over to the M4-M5 Link contractor, the contractor will refine the construction site platform (if appropriate) to manage local overland flows.

Therefore, construction of the operational water treatment plant is considered to pose a negligible risk of flooding impacts on adjacent properties.

Localised drainage

All construction works would have the potential to impact local overland flow paths and existing minor drainage paths. Disruption of existing flow mechanisms, both of constructed drainage systems or

those of overland flow paths, could occur as a consequence of the various construction activities and facilities.

These are typical impacts faced on most construction projects and can be addressed by adopting industry standard mitigation measures. Consideration of these impacts would be included during future detailed design and construction planning phases, along with consideration of the typical mitigation measures described in the EIS, SPIR and conditions of approval.

Water quality and geomorphology

There would be a slight increase in the volume of construction surface water and construction wastewater as a result of the proposed construction activities associated with the operational water treatment plant. With the proposed environmental management measures in place, impacts on water quality are considered to be negligible. Discharge would be managed in accordance with the discharge criteria in condition of approval E186.

Assessment of potential impacts – operation

Flooding

The operational water treatment plant is sited outside the PMF flood extent for mainstream flooding and will be designed with consideration to potential local overland flow impacts and flood mitigation measures stipulated within the EIS, SPIR and conditions of approval for the project. Therefore, the operational water treatment plant is not likely to cause flooding impacts on adjacent properties.

Runoff generated from the operational water treatment site will either be discharged to the St Peters interchange stormwater management system being constructed as part of the New M5 project or directly to the local drainage system.

Any potentially contaminated runoff (e.g. wash bay or a bunded chemical storage area without a roof) would be captured and disposed to sewer via a trade waste agreement or removed by a liquid waste contractor and disposed of offsite at a licensed facility.

Tunnel drainage streams

The EIS provides a description of the two tunnel drainage streams which will be managed separately including tunnel groundwater and tunnel surface water (stormwater ingress at portals, spills, maintenance washdown water, fire suppressant deluge and other potential water ingress events). As discussed in the EIS, given tunnel surface water discharges would be intermittent and the quality would be consistent with the approved discharge criteria, impacts associated with tunnel surface water are considered to be negligible.

The operational water treatment plant would discharge on average around 23 litres per second of treated flow. For the proposed modification three options would be considered for the discharge of treated wastewater from the mainline tunnel drainage system:

- Option 1: Wastewater would be pumped to the water treatment plant at the Campbell Road motorway operations complex. Treated water would discharge to the stormwater basin and/or drainage network within the St Peters interchange site being constructed by the New M5 project. This drainage network would then discharge to Alexandra Canal
- Option 2: Wastewater would be pumped to the water treatment plant at the Campbell Road motorway operations complex .Treated water would be discharged to the existing drainage network and then to Alexandra Canal
- Option 3: Wastewater would be discharged to Sydney Water's sewage system in accordance with a Trade Waste Agreement.

The discharge options are shown in **Figure 6-14**.

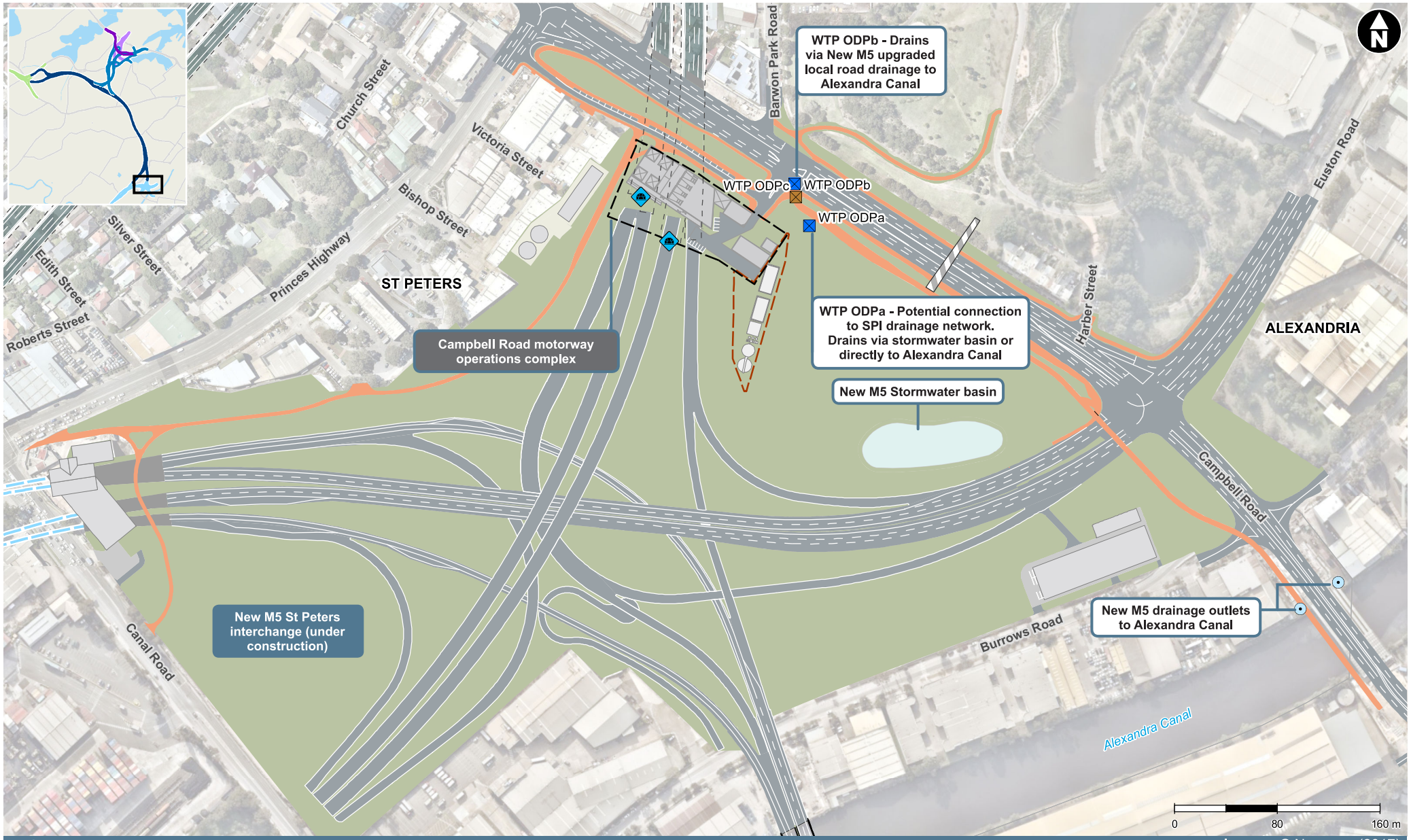


Figure 6-14 Operational water treatment plant potential discharge options

The strategy for treated tunnel discharges would be confirmed during detailed design and supported by drainage modelling to assess the capacity of the drainage network to accept the additional flows. The detailed design for the water treatment plant may include a combination of the above options. In the event a new outlet to Alexandra Canal is required, further environmental assessment would be required by the contractor.

An assessment of treated tunnel groundwater discharges is provided below assuming treated flows are ultimately discharged to Alexandra Canal. No assessment was undertaken for discharges to the sewer system as environmental impacts are considered to be negligible.

Discharge water quality

For the purposes of the assessment, tunnel groundwater quality is assumed to be equivalent to average groundwater quality recorded across monitoring wells in proximity to the mainline tunnel. Tunnel groundwater characterisation undertaken as part of the EIS was updated to incorporate the latest available groundwater monitoring data.

The review of average groundwater quality conditions indicates that chromium (III+VI), copper, iron and zinc were elevated in comparison to the approved discharge criteria.

- Iron: 24 milligrams per litre (mg/L) above the discharge criteria
- Chromium (III+VI): 0.0004mg/L above the discharge criteria
- Copper: 0.0013 mg/L above discharge criteria
- Zinc: 0.009 mg/L above discharge criteria

While iron concentrations were significantly above the discharge criteria, the concentration of chromium, copper and zinc only slightly exceeded the discharge criteria. It is noted that the average chromium (III+VI) concentration only exceeded the chromium (VI) 95 per cent species protection level and was below the chromium (III) 95 per cent species protection level.

The groundwater quality is considered to be indicative of typical groundwater quality in the Hawkesbury Sandstone aquifer.

The proposed discharge criteria for the operational water treatment plant are based on the condition of approval E187 which states:

- *The CSSI operational water treatment plant discharge criteria must comply with the ANZECC (2000) 95 per cent species protection level and a 99 per cent protection level for contaminants that bioaccumulate unless other discharge criteria are agreed in consultation with relevant stakeholders including EPA, DPI Water and Sydney Water. Discharge criteria for iron during operation must comply with the ANZECC (2000) recreational water quality criteria.*

Discharges from the operational water treatment plant would be to the estuarine environment of Alexandra Canal. Therefore, the marine water quality trigger values were adopted as the discharge criteria. The freshwater trigger value was adopted for manganese consistent with the EIS. No nutrient discharge criteria were adopted in the absence of a 95 per cent species protection level for nutrients. The adopted operational water treatment plant discharge criteria are presented in the section below.

Water quality impacts

A box model assessment was undertaken to assess impacts associated with treated tunnel water discharges. This assessment was limited to the assessment of treated tunnel groundwater flows. The results of the box model assessment are provided in **Table 6-45**.

The box model assessment results indicate that:

- Treated discharges would result in a negligible impact on water quality within Alexandra Canal
- The number of constituents that currently exceeds the NSW Water Quality Objectives for aquatic ecosystems in marine / estuarine waters within Alexandra Canal (i.e. copper, lead, zinc, nitrogen and phosphorus) would remain the same as described in the EIS.

On the basis that minor increases in nutrient loading were assessed to pose a negligible impact to Alexandra Canal, nutrient removal processes within the water treatment plant are not considered to be required.

Table 6-45 Box model assessment results

Pollutants	Baseline Alexandra Canal water quality (mg/L)	Tunnel groundwater quality (mg/L)	WTP discharge criteria[1] (mg/L)	Assumed WTP discharge quality (mg/L)[5]	Final Alexandra Canal water quality (mg/L)	Impact (%)
Arsenic	0.003	0.0009	-	0.0009	0.003	-0.3
Cadmium	0.00005	0.00006	0.0007	0.00006	0.00005	0.0
Chromium (III+VI)	0.002	0.0048	0.0044[3]	**0.0044**	0.002	0.5
Copper	0.0050	0.0047	0.0013	**0.0013**	0.0050	-0.3
Iron	0.29	24.34	0.3	**0.3**	0.29	0.0
Lead	0.0050	0.0013	0.0044	0.0013	0.005	-0.3
Manganese	0.031	0.69	1.9 [2]	0.69	0.034	9.5
Mercury	0.00005	0.00005	0.00010	0.00005	0.00005	0.0
Nickel	0.002	0.007	0.007	0.007	0.002	1.1
Zinc	0.046	0.024	0.015	**0.015**	0.046	-0.3
Nitrogen (Total)	0.9	1.64	- [4]	1.64	0.90	0.4
Nitrate	0.2	0.09	- [4]	0.09	0.20	-0.2
Ammonia	0.38	0.56	0.91	0.56	0.381	0.2
Phosphorus (Total)	0.09	0.41	- [4]	0.41	0.091	1.6
Reactive Phosphorus as P	0.010	0.013	- [4]	0.013	0.010	0.1

[1] Adopted discharge criteria based on marine water 95 per cent or 99 per cent (for contaminants that bioaccumulate) species protection level (ANZECC, 2000)

[2] Freshwater 95 per cent species protection level adopted for manganese

[3] Based on chromium (VI) marine water 95 per cent species protection level

[4] No ANZECC (2000) 95 per cent or 99 per cent species protection level

[5] Lower value of tunnel groundwater quality and WTP discharge criteria. **Bold values** indicate where the discharge criteria were adopted as the discharge quality indicating some treatment may be required

Shaded values indicate Alexandra Canal constituent exceeds NSW Water Quality Objective (WQO) for aquatic ecosystems in marine / estuarine waters.

Geomorphic impacts

The operational water treatment plant would increase discharge volumes to Alexandra Canal on average by around 23 litres per second with a negligible increase in runoff rates also occurring associated with the minor increase in impervious surface. Potential discharge options to Alexandra Canal are described in **Chapter 4** (Proposed modification). The final design of the stormwater infrastructure would be confirmed during detailed design.

There is potential to disturb contaminated sediments within Alexandra Canal through increases in concentrated flow and velocities at an existing outlet where insufficient dissipation / scour protection is provided. There is also potential for sediment to be disturbed if flow rates within the wider canal are significantly increased. The disturbance of contaminated sediments could affect local water quality. Contaminated sediments within Alexandra Canal are regulated by a Remediation Order issued by the NSW EPA which aims to prevent the disturbance of these sediments.

The treated tunnel discharge rate (around 23 litres per second) would be minor compared to flow rates and velocities from intermittent stormwater discharges at the outlet (likely to be greater than 1000 L/s) and compared to the overall flow rates in the Alexandra Canal.

Providing appropriate dissipation / scour protection is in place at the existing outlet to cater for stormwater flows, the newly introduced continuous flow is unlikely to increase the risk of scour occurring during dry conditions. The suitability of the existing dissipation / scour protection to cater for the additional flow during design storm conditions would be confirmed during detailed design and supported by drainage modelling.

Management measures and conditions of approval

Based on the assessment of potential surface water, flooding and drainage impacts associated with the proposed modification, no further environmental management measures are deemed necessary beyond those summarised in Part E of the SPIR.

The proposed modification would not require changes to the conditions of approval for the project related to surface water, flooding and drainage impacts at the Campbell Road motorway operations complex.

6.6.5 Land use and property

Assessment methodology

The assessment of impacts from the proposed modification on land use and property has been carried out according to the methodology summarised in **section 6.3.5**.

Existing environment

The Campbell Road motorway operations complex site is to be located on land undergoing change due to the construction of the New M5 project. This includes construction of permanent operational infrastructure including the St Peters interchange and upgrades and modifications to the local road network.

The approved design for the interchange (as delivered by the New M5 project) would result in the provision of open space and recreation areas.

Existing land uses in the immediate vicinity of the St Peters interchange include a commercial enterprise corridor along the Princes Highway, general industrial lands, local and arterial roads, Sydney Park to the north and Alexandra Canal to the east. Surrounding land uses include the residential neighbourhoods of Newtown, Sydenham and St Peters, as well as general residential and industrial areas of Alexandria to the east. Residential areas around Campbell Road consist primarily of double storey ‘Victorian’ terrace houses on the north side of Campbell Road and a multi-storey apartment building on the corner of Campbell Road and Barwon Park Road.

Operational infrastructure for the approved M4-M5 Link project at this location will include a motorway control complex, ventilation facilities, distribution substation, fire pump rooms and deluge tanks.

Land use zoning surrounding the Campbell Road motorway operations complex site is shown in **Figure 6-15**.

Refer to section 12.2.2 of the EIS for further information regarding existing land use and planning controls at the Campbell Road motorway operations complex site.

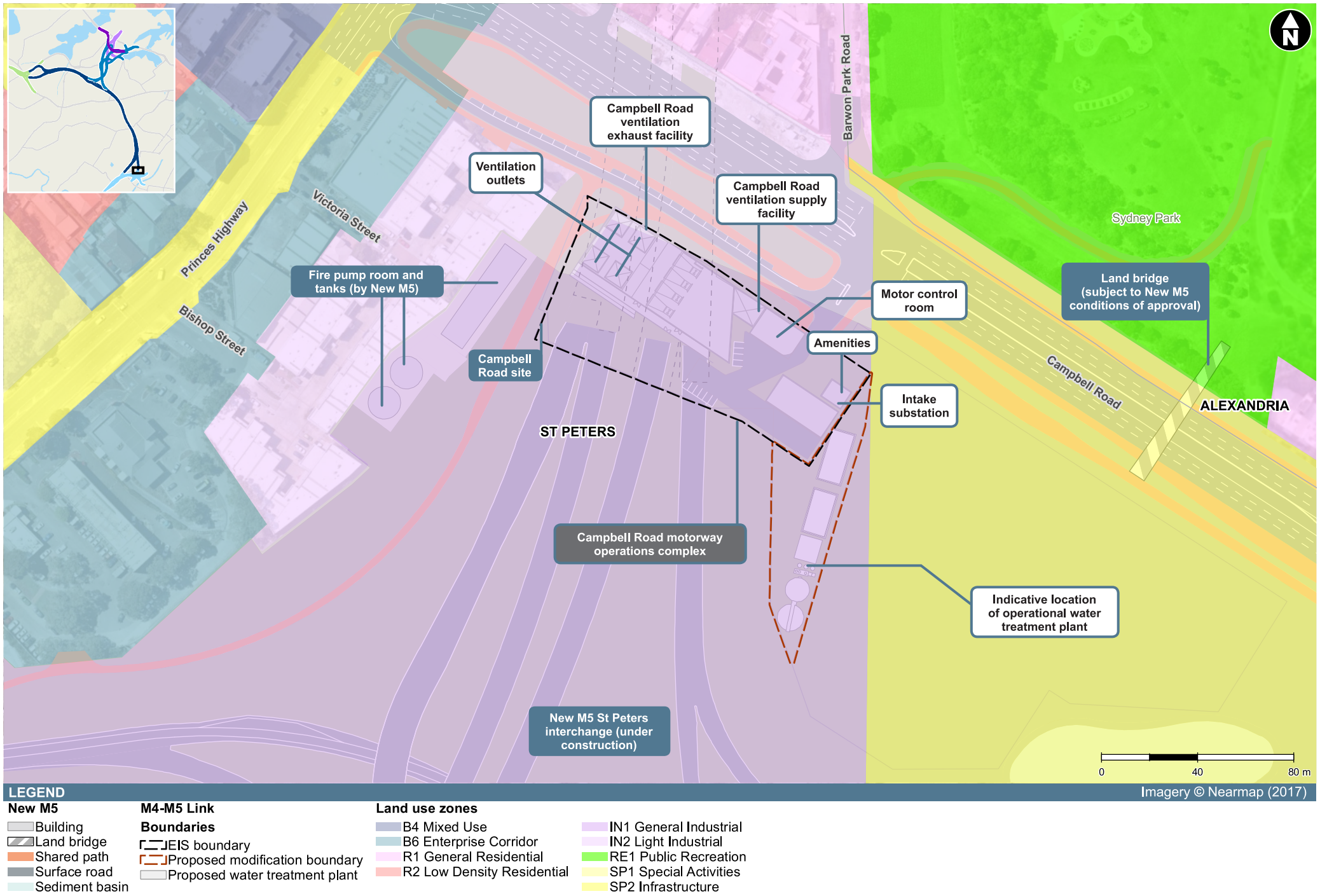


Figure 6-15 Campbell Road motorway operations complex - existing land use zoning surrounding the site

Assessment of potential impacts

Property acquisition

The operational footprint of the Campbell Road motorway operations complex would change for the inclusion of the operational water treatment plant however this land has already been acquired as part of the New M5 project and is now owned by Roads and Maritime as described in section 12.2.2 of the EIS.

Table 6-29 provides a comparison of property acquisition required for the approved project and the proposed modification.

Table 6-46 Comparison of property acquisition required for the approved project and the proposed modification

Location	Existing land use	Property acquisition assessed in the EIS	Additional property acquisition required for proposed modification
Campbell Road civil and tunnel site / motorway operations complex	A section of land is being used as a construction ancillary facility for the New M5 project and a section of land is being used construction ancillary facility for the M4-M5 Link project.	None[1]	No additional property acquisition required for modification

Notes:

[1] Refer to the New M5 EIS (November 2015) for acquisitions that occurred at this location

Land use

The Campbell Road civil and tunnel site is described in section 6.5.14 of the EIS for the approved project. The EIS describes that construction activities would be carried out on land that was at the time being used for the New M5 project. Construction activities at the facility would include tunnelling and tunnel support activities and the construction of operational infrastructure. This would remain unchanged for the proposed modification, with the exception that an operational water treatment plant would be included as part of the infrastructure to be constructed.

The proposed modification would require an increase to the operational footprint of the Campbell Road motorway operations complex towards the south east to allow for the relocation the operational water treatment plant from Darley Road, as described in **Chapter 4** (Proposed modification). The proposed modification would not involve changes to other operational infrastructure at the site. The increase in footprint for the Campbell Road motorway operations complex would be around 0.2 hectares.

The increase in footprint of the motorway operations complex would have only a minimal impact on the total area of proposed open space on the southern side of Campbell Road at the St Peters interchange that is being delivered as part of the New M5 project. The increase in footprint will also have a small impact on the proposed landscaping area for the St Peters interchange to be provided in this location.

A comparison of land use impacts for the approved project and proposed modification is provided in **Table 6-47**.

Table 6-47 Comparison of land use impacts for the approved project and proposed modification at the Campbell Road motorway operations complex

	Construction		Operation	
Location	**Approved project**	**Proposed modification**	**Approved project**	**Proposed modification**
Campbell Road civil and tunnel site	Construction activities would be carried out on land currently being used for the New M5 project. Construction activities would include tunnelling and tunnel support activities and the construction of operational infrastructure including ventilation facilities and sub-station.	Construction activities would be carried out on land currently being used for the New M5 project. Construction activities would include tunnelling and tunnel support activities and the construction of operational infrastructure including the operational water treatment plant, ventilation facilities and sub-station.	A section of the site would be used for operational infrastructure including the Campbell Road Motorway Operations Centre (MOC5).	A section of the site would be used for operational infrastructure including the Campbell Road Motorway Operations Centre. The footprint of the operational area would be increased by around 0.2 hectares to allow for the operational water treatment plant.

Management measures and conditions of approval

Potential land use and property impacts associated with the proposed modification would be effectively managed through the implementation of the approved environmental management measures for the project as summarised in Part E of the SPIR.

The proposed modification would not require changes to the conditions of approval for the project related to land use impacts at the Campbell Road motorway operations complex.

6.6.6 Urban design and visual amenity

Assessment methodology

The assessment of impacts from the proposed modification on urban design and visual amenity has been carried out according to the methodology summarised in **section 6.3.6**.

Existing environment

The Campbell Road motorway operations complex comprises a section of land being used as a construction ancillary facility for the New M5 project and a section of land is being used as a construction ancillary facility for the M4-M5 Link project.

The approved design for the interchange (as delivered by the New M5 project) would result in the provision of open space and recreation areas.

Operational infrastructure for the approved M4-M5 Link project at this location will include a motorway control complex, ventilation facilities and substation.

The existing landscape character and visual setting in this area is characterised by:

- Residential areas around Campbell Road consisting primarily of double storey 'Victorian' terrace houses and a multi-storey apartment building on the corner of Campbell Road and Barwon Park Road
- Sydney Park, which comprises open space areas and pockets of dense 'bush character' vegetation
- Industrial land uses around the Alexandra Canal
- Commercial and medium to high density mixed land uses around the Princes Highway
- A large construction site for the St Peters interchange.

Large areas of new tree planting will be incorporated as part of the New M5 project on both sides of the M4-M5 Link ramps at the St Peters interchange and above the portals to present a continuous canopy and create a sense of green immersion for the motorist upon entry or exit from the tunnel.

Roads and Maritime, as the proponent for the New M5 project, has responsibility for the urban design of the St Peters interchange. This includes a proposed land bridge connecting Sydney Park to the St Peters interchange and areas of open space and recreation areas. Roads and Maritime are currently working with the City of Sydney Council as to the Urban Design outcomes in accordance with the New M5 conditions of approval.

Existing sources of night lighting at and around the site includes street lighting associated with Campbell Road including a new signalised intersection, Albert Street, the share pathway running along the western edge of the St Peters interchange, some lighting to the facades and windows of fringing industrial and residential development, lighting associated with construction activities being undertaken at and around the site as part of the New M5 project. The location of nearby sensitive visual receivers is provided in **Figure 6-16**.

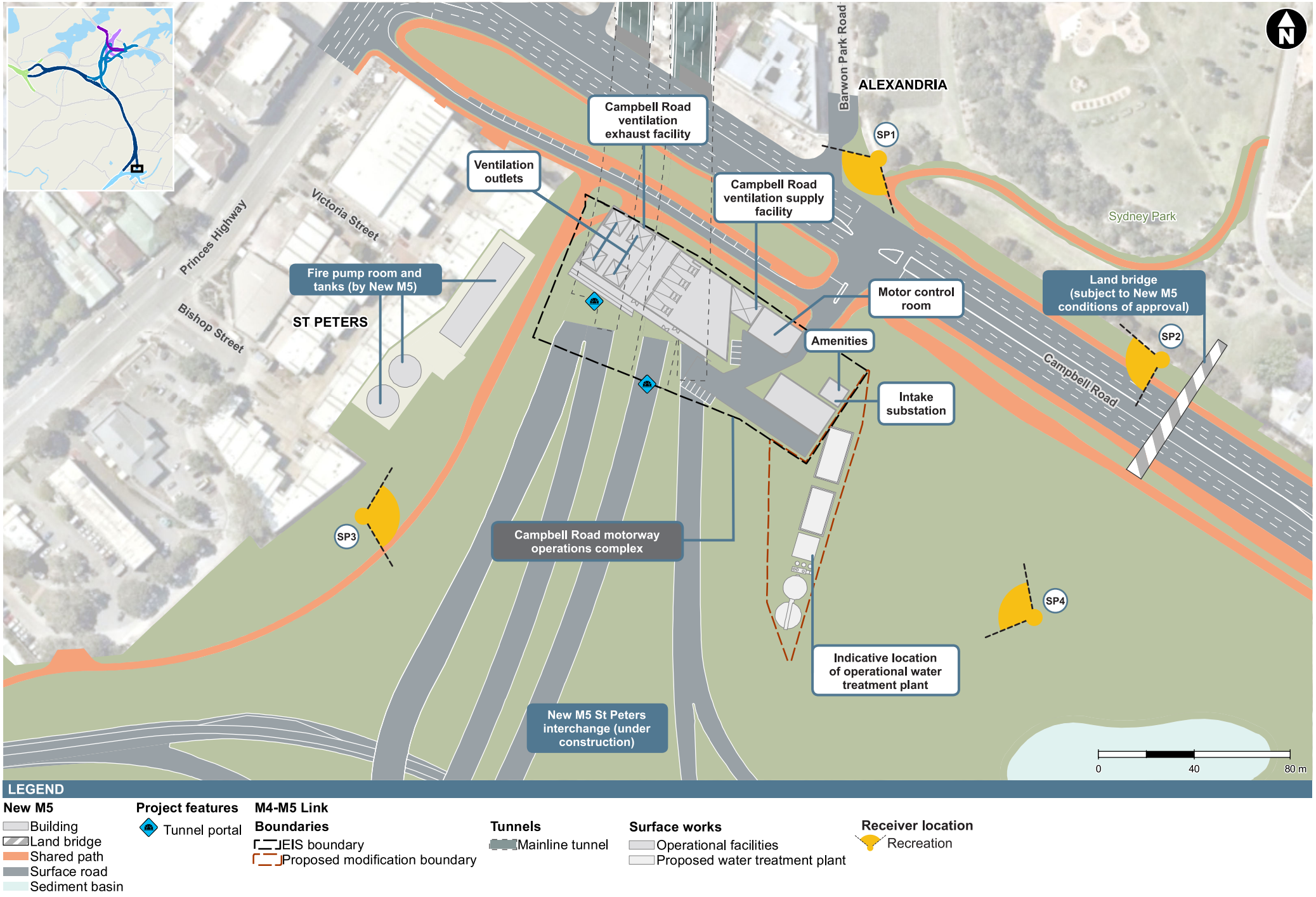


Figure 6-16 Campbell Road motorway operations complex representative receiver locations

Assessment of potential impacts – construction

The operational water treatment plant would be constructed generally within the approved construction footprint at the Campbell Road civil and tunnel site as detailed in section 6.5.14 of the M4-M5 Link EIS.

The construction of the water treatment plant would involve construction activities generally consistent with the approved construction activities described in the EIS. As a result the proposed modification would not change the magnitude of visual impact or night lighting impact of the project during construction at this location.

Assessment of potential impacts – operation

The primary visual element that would change for the proposed modification at the Campbell Road motorway operations complex would be the addition of the operational water treatment plant in the location shown in **Figure 6-16**. The footprint of the motorway operations complex would be extended to accommodate the water treatment plant and it would be located in proximity to an area of landscaping and active open space for the New M5 project.

The architectural design of the operational water treatment plant would be undertaken in accordance with a project Urban Design and Landscape Plan (UDLP) and the urban design principles developed for the project. The operational water treatment plant would be designed to be visually consistent with adjacent operational infrastructure comprising the Campbell Road motorway operations complex.

The operational water treatment plant would be located in proximity to the intake substation, amenities building and motorway control room at the Campbell Road motorway operations complex. The visibility of the treatment plant from the north would be limited given that views would be obscured in part by the ventilation facilities and intake substation.

The operational water treatment plant would be about one to two storey in height and consist of water tanks, buildings and plant equipment. The water treatment plant would generally be of a smaller scale compared to surrounding motorway infrastructure including the tunnel portals, St Peters interchange, and ventilation facilities.

The water treatment plant would include site lighting however the additional lighting would be negligible compared to overall site lighting impacts assessed in the EIS for the motorway operations and given the existing illumination levels from Campbell Street and lighting proposed at the St Peters interchange. Site lighting would be designed to minimise glare issues and light spillage in adjoining properties and would be generally consistent with the requirements of *Australian Standard 4282-1997 Control of the obtrusive effects of outdoor lighting*.

A summary of visual on sensitive receivers during operation at the Campbell Road motorway operations complex for the proposed modification is provided in **Table 6-48**.

Table 6-48 Summary of operational visual impacts on sensitive receivers at the Campbell Road motorway operations complex

Receiver location	Receiver type	Sensitivity	Magnitude	Overall impact rating (modification)	Overall impact rating (EIS)
Visual impacts					
View looking south from corner of Barwon Park Road and Campbell Road (SP1)	Residents	Moderate	Moderate	Moderate	Moderate
	Pedestrians	Moderate	Moderate	Moderate	Moderate
	Motorists/ cyclists	Low	Moderate	Moderate–Low	Moderate–Low
View from Campbell Road verge looking west (SP2)	Pedestrians	Low	Moderate	Moderate–Low	Moderate–Low
	Motorists/ public transport/ cyclists	Low	Moderate	Moderate–Low	Moderate–Low
View looking north from St Peters interchange shared pathway (SP3)	Pedestrians/ recreational cyclists	Low	Moderate	Moderate–Low	Moderate–Low
Night lighting impacts					
View looking south from corner of Barwon Park Road and Campbell Road (SP1)	Residents	Low	Low	Low	Low
	Pedestrians	Low	Low	Low	Low
	Motorists/ cyclists	Negligible	Negligible	Negligible	Negligible
View from Campbell Road verge looking west (SP2)	Pedestrians	Low	Low	Low	Low
	Motorists/ cyclists/ public transport	Negligible	Negligible	Negligible	Negligible
View looking north from St Peters interchange share pathway (SP3)	Pedestrians/ recreational cyclists	Low	Low	Low	Low

The operational water treatment plant would have potential visual impacts on future users of the proposed open space to be provided by the New M5 project directly to the east. The operational water treatment plant would be viewed in the context of other building structures and road infrastructure associated with the St Peters interchange.

The proposed modification would comprise the addition of small scale structures that would be congruent with the portals, ventilation facilities, sub-station and other structures that will form part of the broader St Peters interchange landscape. The architectural design, detailing, fencing and landscaping of the water treatment plant would consider potential views from the proposed adjacent open space areas for the New M5 project. The potential visual impact to future users of the active open space to be provided by the New M5 project is therefore considered to be minor.

Potential landscape character impacts associated with the operational water treatment plant would be limited to the St Peters interchange precinct (landscape character zone (LCZ) 33 as assessed in

Chapter 13 (Urban design and visual amenity) of the EIS). The description of the LCZ 33 in the EIS is consistent with the description of the existing environment described above. The water treatment plant infrastructure would generally not be visible from other LCZs in the context of the large scale of the St Peters interchange.

As described above, the water treatment plant would be located at the St Peters and would comprise the addition of small scale structures that would be highly congruent with the portals and other structures part of the broader St Peters interchange landscape. The overall impact to LCZ 33 is therefore considered to be negligible. A summary of potential landscape character impacts is provided in **Table 6-49**.

Table 6-49 Summary of landscape character impacts at the Campbell Road motorway operations complex associated with the operational water treatment plant

Receiver location	Sensitivity	Magnitude	Overall rating (Modification)	Overall rating (EIS)
LCZ 33 – St Peters interchange precinct	Negligible	Low	Negligible	Negligible

Given the location of the operational water treatment plant and the fact that it would be designed in accordance with a project UDLP and would be of a comparable or smaller scale to surrounding operational infrastructure, it is considered that the modification would not result in an increased magnitude of visual or landscape impacts at this location compared to the impacts assessed in the EIS.

Urban design

An environmental management measure relating to urban design has been included (see section below) to ensure the operational water treatment plant would integrate with nearby areas of open space. The operational water treatment plant would be subject to the M4-M5 Link UDLP for the Campbell Road motorway operations complex and would consider landscaping along the perimeter of the operational water treatment plant to provide a degree of visual screening of the infrastructure when viewed from the south and east.

A detailed review and finalisation of architectural treatment of the operational water treatment plant as part of a review of all project operational infrastructure, including ventilation facilities, would be undertaken during detailed design. The architectural treatment of the operational water treatment plant would be guided by, the outcomes of community consultation and the urban design principles identified in section 13.2.2 of the EIS.

Management measures and conditions of approval

Potential visual impacts associated with the proposed modification would be effectively managed through the implementation of the approved environmental management measures for the project as summarised in Part E of the SPIR.

For the relocation of the operational water treatment plant at the Campbell Road motorway operations complex, the environmental management measure identified in **Table 6-50** would be implemented to ensure the structure would be visually consistent with the adjacent open space areas that would be delivered for the New M5 project.

Table 6-50 Environmental management measures for the proposed modification

Impact	Environmental management measure	Timing
Impacts to visual amenity at St Peters interchange	The architectural design, detailing, fencing and landscaping of the water treatment plant would consider potential views from the proposed adjacent open space areas for the New M5 project.	Construction

The proposed modification would not require changes to the conditions of approval for the project related to urban design and visual amenity at the Campbell Road motorway operations complex.

6.6.7 Social and economic

Construction of the operational water treatment plant at the Campbell Road civil and tunnel site would not result in any additional amenity impacts by comparison to those considered in the EIS. The increase in footprint of the motorway operations complex would have only a minimal impact on the total area of proposed open space on the southern side of Campbell Road at the St Peters interchange that is being delivered as part of the New M5 project. The increase in footprint will also have some impact on the proposed landscaping area for the St Peters interchange to be provided in this location.

Impacts associated with the construction of the operational water treatment plant at the Campbell Road civil and tunnel site for the proposed modification would be consistent with the impacts identified for the approved project.

6.6.8 Non-Aboriginal heritage

Options 1 and 2 for the discharge of wastewater from the mainline tunnels (as described in **section 6.4.4**) would discharge to the stormwater basin and/or drainage network within the St Peters interchange site being constructed by the New M5 project or to the existing local drainage network. These drainage networks would then discharge to Alexandra Canal. The Alexandra Canal is listed on the State Heritage Register and Sydney Water s.170 NSW State agency heritage register.

By using the existing drainage infrastructure or drainage infrastructure being constructed by the New M5 project, no additional works are proposed which would impact on Alexandra Canal. The additional discharge flow is considered to pose a negligible impact on flow velocities and flow energy in the canal. The proposed modification would therefore not result in direct or indirect impacts to the heritage item.

Option 3 would discharge to Sydney Water's sewage system in accordance with a Trade Waste Agreement and would not directly impact the Alexandra Canal.

7 Conditions of approval

This chapter outlines the conditions of approval relevant to the WestConnex M4-M5 Link (the project) (as described in **Chapter 1**(Introduction)) that would need to be amended as a result of the proposed modification.

A review of the conditions of approval for the project was undertaken to identify the conditions that would require either amendment or deletion as part of the proposed modification.

7.1 Conditions to be amended or removed

Table 7-1 presents the proposed changes to the conditions of approval for the project. These changes are required to Schedule 1 (description of critical State Significant Infrastructure (CSSI)) and Schedule 2 (conditions of approval). Proposed amendments are shown in red text and deletions shown as strikethrough text (e.g. ~~strikethrough~~ text).

Table 7-1 Conditions of approval to be amended or removed

No.	Description of CSSI or condition of approval	Action and reason
Sch1	Development for the purposes of the WestConnex M4-M5 Link project being a new multi-lane road link connecting the M4 East project at Haberfield with the New M5 project at St Peters comprising: • (…) • ~~five~~ four motorway operations complexes – ~~one at Darley Road, Leichhardt,~~ two within the former Rozelle Rail Yards, one adjacent to Victoria Road between Callan and Springside Streets, Rozelle and one adjacent to Campbell Road, St Peters interchange; • (…)	**Amend condition** Remove specific reference to the Darley Road motorway operations complex. The Darley Road motorway operations complex no longer forms part of the project. The removal of the Darley Road motorway operations complex is described in **Chapter 4** (proposed modification). By removing this reference Schedule 1 would be consistent with the proposed modification.
A1	The CSSI must be carried out in accordance with the terms of this approval and generally in accordance with the description of the CSSI in the WestConnex M4-M5 Link Environmental Impact Statement – Volumes 1A-C and 2A-J (dated August 2017) (the EIS), ~~and~~ the WestConnex M4-M5 Link Submissions and Preferred Infrastructure Report (dated January 2018) (the SPIR), and WestConnex M4-M5 Link Modification Report (MOD 1) (September 2018).	**Amend condition** The project would be changed by the proposed modification. Reference to the modification application documentation should be included in the condition.
A2	The CSSI must be carried out in accordance with all procedures, commitments, preventative actions, performance criteria and mitigation measures set out in the EIS, ~~and~~ SPIR, and MOD1 unless otherwise specified in, or required under, this approval.	**Amend condition** The project would be changed by the proposed modification. Reference to the modification application documentation should be included in the condition.

No.	Description of CSSI or condition of approval	Action and reason
C19	The Parramatta Road West and Parramatta Road East civil sites are to be ~~Only one of the two ancillary facility options (A or B) presented in Chapter 6 of the EIS can be implemented at Haberfield, except if one site is~~ used for parking and other works that do not exceed the 'Noise affected' Noise Management Levels as identified in the ICNG.	**Amend condition** As construction design and planning has progressed since the EIS and SPIR, the proponent is proposing to delete reference to the ancillary facility options (A or B) as presented in Chapter 6 of the EIS. The proponent is proposing to use the Parramatta Road West and Parramatta Road East civil sites for parking and other works that do not exceed the 'Noise affected' Noise Management Levels as identified in the ICNG, which is consistent with the intent of condition of approval C19.
C20	~~Should Option B, as presented in Chapter 6 of the EIS, be progressed, a comparative analysis of environmental impacts of the use of the sites during construction of the project (excluding Site Establishment Works and erection of acoustic enclosures), must be undertaken. The comparative analysis must be undertaken for the following key environmental impacts: noise and vibration, traffic and transport, visual amenity and socio-economic.~~	**Remove condition** The proponent is not proposing to proceed with ancillary facility option B as proposed in Chapter 6 of the EIS. The condition is no longer required.
C21	~~In the event that Option B is progressed, for purposes other than for parking and works that do not exceed the 'Noise affected' Noise Management Levels as identified in the ICNG, the Proponent must submit a report outlining the findings of the comparative analysis required by Condition C20 to the to the Secretary for approval at least one (1) month prior to the establishment of the Option B construction ancillary facilities. The report must demonstrate how management and mitigation measures, consistent with those included in the documents referred to in Condition A1 and as required by the terms of approval, would be implemented to achieve, on balance, comparable environmental outcomes when compared to Option A.~~	**Remove condition** The proponent is not proposing to proceed with ancillary facility option B as proposed in Chapter 6 of the EIS. The condition is no longer required.
E59	Enhanced cycle facilities at Rozelle Bay ~~and Leichhardt North~~ light rail stop~~s~~ must be investigated and implemented if possible in consultation with Transport for NSW and incorporated into the Pedestrian and Cycle Implementation Strategy required by Condition E60.	**Amend condition** The proposed modification would remove the Darley Road site from the project. Therefore this condition should be amended to remove reference to works at this location.

No.	Description of CSSI or condition of approval	Action and reason
E71	~~Notwithstanding Conditions E70 and E73 spoil haulage from the Darley Road construction ancillary facility must only be undertaken during the hours specified in Conditions E68 and E69. Onsite deliveries to the Darley Road ancillary facility may only be undertaken outside the hours specified in Conditions E68 and E69 in accordance with Condition E73(e).~~	**Remove condition** The proposed modification would remove the Darley Road site from the project as described in **Chapter 4** (Proposed modification). With the Darley Road site no longer forming part of the project this condition is no longer required.
E73	Notwithstanding Conditions E68 to E72 works may be undertaken outside the hours specified under those conditions in the following circumstances: (a) for the delivery of materials required by the NSW Police Force or other authority for safety reasons; or (b) where it is required in an emergency to avoid injury or the loss of life, to avoid damage or loss of property or to prevent environmental harm; or (c) where different construction hours are permitted or required under an EPL in force in respect of the CSSI; or (d) works approved under an Out-of-Hours Work Protocol for works not subject to an EPL as required by Condition E77; or (e) construction that causes LAeq(15 minute) noise levels: (i) no more than 5 dB(A) above the rating background level at any residence in accordance with the Interim Construction Noise Guideline (DECC, 2009), and (ii) no more than the 'Noise affected' noise management levels specified in Table 3 of the Interim Construction Noise Guideline (DECC, 2009) at other sensitive land uses, and (iii) continuous or impulsive vibration values, measured at the most affected residence are no more than the maximum values for human exposure to vibration, specified in Table 2.2 of *Assessing Vibration: a technical guideline (DEC, 2006)*, and (iv) intermittent vibration values measured at the most affected residence are no more than the maximum values for human exposure to vibration, specified in Table 2.4 of *Assessing Vibrations: a technical guideline (DEC,2006).* *Note: Section 5.24(1)(e) of the EP&A Act requires that an EPL be substantially consistent with this approval. ~~For example, an EPL cannot authorise spoil movements at the Darley Road construction ancillary facility outside of the hours specified in Conditions E68 and E69.~~ Out of Hours Works considered under Conditions E73(c) and (d) must be justified and included an assessment of mitigation measures.*	**Amend condition** The note attached to the condition makes reference to the Darley Road construction ancillary facility. The proposed modification would remove this site from the project. As such the condition note should be amended to remove reference to the Darley Road construction ancillary facility.

The proposed changes would ensure that the conditions of approval are consistent with the proposed modification.

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8 Environmental management measures

Chapter 29 of the Environmental Impact Statement (EIS) for the project summarised the identified environmental management measures that would be adopted to avoid or reduce potential environmental impacts. These measures were revised in Part E of the Submissions and Preferred Infrastructure Report (SPIR) after consideration of the issues raised during the EIS public exhibition period.

This chapter:

- Amends or deletes existing environmental management measures that are no longer required or need to be amended as a result of the proposed modification
- Identifies additional environmental management measures that are required to address potential impacts associated with the proposed modification.

Chapter 6 (Environmental assessment) indicated that potential impacts for the following environmental issues would be effectively managed through the implementation of the approved environmental management measures for the project as summarised in the SPIR:

- Traffic and transport
- Noise and vibration
- Air quality
- Surface water and flooding
- Land use and property
- Groundwater
- Non-Aboriginal heritage
- Resource use and waste
- Social and economic.

Chapter 6 (Environmental assessment) indicated that for the following environmental aspects, new or revised environmental management measures would be required to manage potential impacts associated with the proposed modification:

- Urban design and visual amenity.

Table 8-1 lists the environmental management measures which would be deleted or amended as a result of the proposed modification, including the removal of the Darley Road site from the project.

Where environmental management measures have been added or new text has been added to an existing measure, this new text is highlighted in red. Where an environmental management measure has been deleted or text from the measure deleted, it appears as strikethrough text (e.g. ~~strikethrough~~).

Table 8-1 Environmental management measures to be amended by proposed modification

Impact	Ref #	Environmental management measure	Timing	Comment
Urban design and visual amenity				
~~Impacts to visual amenity as a result of the Darley Road motorway operations complex~~	~~LV11~~	~~Investigate options for planting of vegetation to screen residents on the southern side of Darley Road from the Darley Road motorway operations complex. Include feasible and reasonable measures in the relevant UDLP.~~	~~Construction~~	No construction activities or permanent operational infrastructure would be provided at the Darley Road site.
	~~LV12~~	~~Architectural design and detailing of the water treatment facility, substation and front fencing should achieve articulation, visual interest, and integrate with the streetscape.~~	~~Construction~~	No construction activities or permanent operational infrastructure would be provided at the Darley Road site.
Impacts to visual amenity at St Peters interchange	LV20	The architectural design, detailing, fencing and landscaping of the water treatment plant would consider potential views from the proposed adjacent open space areas for the New M5 project.	Construction	New measure for the management of potential visual impacts associated with the operational water treatment plant.
Non-Aboriginal heritage				
~~Potential impacts to heritage items at Leichhardt (Darley Road)~~	~~NAH15~~	~~Landscaping, following the construction of the substation, should consider screening the substation and water treatment plant, from the Leichhardt (Charles Street) Underbridge. The design and location of the landscaping will be informed by a heritage specialist and should seek to create a visual separation between the new structure and the heritage item.~~	~~Construction~~	No construction activities or permanent operational infrastructure would be provided at the Darley Road site.

Impact	Ref #	Environmental management measure	Timing	Comment
Soil and water quality				
Operational impacts on surface water quality	OSW16	The operational water treatment facilities will be designed and managed such that effluent will be of suitable quality for discharge to the receiving environment. ~~Opportunities to incorporate nutrient treatment within the plant at Darley Road will be investigated during detailed design.~~ Discharge criteria will be developed in accordance with the ANZECC (2000) and relevant NSW WQOs, including the following discharge criteria: • 0.3 milligrams per litre for iron • 1.9 milligrams per litre for manganese. The discharge criteria for the treatment facilities will be nominated during detailed design in consultation with relevant stakeholders and included in the OEMP.	Construction and operation	No construction activities or permanent operational infrastructure would be provided at the Darley Road site.

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9 Justification and conclusion

Approval for the construction and operation of the M4-M5 Link (the project) was granted on 17 April 2018 by the NSW Minster for Planning (application number SSI 7485). The approved project allows construction and operation of the M4-M5 Link in two stages. The proposed modification relates to Stage 1 of the project, the mainline tunnels between the M4 East Motorway at Haberfield and the New M5 Motorway at St Peters.

Since approval was granted for the M4-M5 Link, a contractor has been appointed to construct Stage 1 of the project on behalf of the proponent, NSW Roads and Maritime Services (Roads and Maritime).

Construction design and planning has progressed since the assessment contained in the Environmental Impact Statement (EIS) and Submissions and Preferred Infrastructure Report (SPIR) and a review of the concept design for the approved project has occurred. As a result, the proponent has further optimised the construction site arrangements assessed in the EIS and SPIR to reduce environmental and community impacts and to decrease the overall number of construction sites required for the project

Chapter 6 (Environmental assessment) assesses the likely potential environmental impacts associated with the proposed modification and provides a comparison of the potential environmental impacts for the proposed modification and the approved project.

The proposed modification would result in the following key benefits and impacts:

- The removal of the Darley Road civil and tunnel site from the project will ensure that potential noise, air quality, traffic and other impacts associated with tunnelling are avoided in this area. In addition potential ground-borne noise and vibration impacts associated with the proposed construction of a temporary access tunnel at this location would also be avoided
- The removal of the Darley Road civil and tunnel site from the project will result in tunnelling works at other project tunnelling sites being extended by around six months. This would result in an increase in the duration of traffic, air quality, noise and other impacts directly associated with tunnelling at these locations
- The use of the Northcote Street civil and tunnel site will extend tunnelling operations and associated noise, air quality, traffic and parking impacts at this site for a further four years. This site is being used for tunnelling by the M4 East project. This enables existing infrastructure at the site such as the acoustic shed, driveways, water treatment plant, site offices and other structures to be re-used thereby reducing impacts associated with site establishment activities
- The new construction access tunnel at the Northcote Street civil and tunnel site will be at a depth of over 30 metres where it passes under a limited number of residential properties in the vicinity of Walker Avenue and Alt Street. Construction of the access tunnel will result in minimal ground borne noise impacts to these properties when road headers are being used. During rock-breaker tunnelling works it is predicted that the night time criterion would be exceeded at a number of sensitive receivers in the vicinity of the access tunnel. Predicted settlement impacts are minimal and well within accepted criteria
- The proposed spoil haulage routes for the Northcote Street civil and tunnel site would be more direct and less constrained by comparison to the proposed spoil haulage route for the Parramatta Road West civil and tunnel site described in the EIS and SPIR. The proposed spoil haulage routes would be restricted to state roads that are controlled by Roads and Maritime. Use of the G-loop would allow spoil haulage vehicles the option of using the M4 East motorway tunnels and as a result reduce impacts on the surface road network. Reconstruction and demobilisation works for the G-loop would have some short-term and temporary noise impacts for a few sensitive receivers during limited night works requiring Wattle Street occupancy
- The Parramatta Road West and Parramatta Road East civil sites would be used as civil sites in accordance with condition of approval C19 and other conditions of the project approval. The sites would be used for site offices, light and heavy vehicle car parking, shuttle bus services, workshop and storage of equipment, materials and construction vehicles. Both sites would operate 24 hours a day, seven days a week. No tunnelling, tunnel spoil stockpiling and handling or tunnel spoil

haulage would occur at these sites. It is considered the operation of the Parramatta Road West and Parramatta Road East civil sites would be consistent with the assessment presented in the EIS and SPIR and in accordance with the conditions of approval, noting that tunnelling activities previously proposed at this site would be removed

- The temporary overhead pedestrian walkway between the Parramatta Road West and Parramatta Road East civil sites would allow for the safe and efficient movement of construction workers over Parramatta Road. The walkway structure has been designed to achieve a clearance of 6 metres above Parramatta Road to allow for the safe movement of traffic. The visual impacts of the structure will be minimal when considered in the context of visual environment along this section of the Parramatta Road corridor. A small number of sensitive receivers would experience short-term, temporary noise impacts during the limited night works requiring Parramatta Road occupancy to complete the lifting of the bridge span overhead pedestrian walkway
- The relocation of the operational water treatment plant to the Campbell Road motorway operations centre will occupy a small area of additional land at the St Peters interchange. However, the additional footprint would result in only a minimal impact on the proposed area of open space and landscaping on the southern side of Campbell Road that is being delivered as part of the New M5 project. The visual impact of the water treatment plant will be minimal
- The relocated operational water treatment plant would be designed so that treated water would be in accordance with the discharge criteria specified in condition of approval E187 of the project approval. Treated water would be discharged to Alexandra Canal either via the proposed stormwater infrastructure for the New M5 project or via existing drainage infrastructure. Alternatively it would be discharged to sewer via a Trade Waste Agreement.

The environmental assessment has considered the existing environmental management measures provided in the EIS and SPIR and the conditions of approval for the project. The impacts associated with proposed modification can generally be accommodated by the environmental management measures provided in the EIS and SPIR. An additional environmental management measure has been recommended in relation the visual impacts associated with the relocation of the operational water treatment plant to St Peters. Some environmental management measures have been amended or deleted as a result of the removal of the Darley Road civil and tunnel site from the project.

Changes to the conditions of approval have been proposed to accommodate the proposed modification. The proposed changes to the conditions of approval would provide certainty regarding the arrangement of construction ancillary facility sites at Haberfield and Ashfield and the removal of the Darley Road site at Leichhardt. All other conditions of approval would continue to apply to the project.

Consultation has been carried out with the community, local councils, government agencies and other stakeholders during the preparation of the modification as outlined in **Chapter 5** (Consultation). This modification report will be exhibited for 14 days from 12 September 2018. Following exhibition of the modification, Roads and Maritime will review the submissions received and respond to the issues raised in a Response to Submissions Report.

10 References

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