M2 Upgrade Project Deed

Exhibit A

Scope of Works and Technical Criteria

Roads and Traffic Authority

M2 Motorway Upgrade Project Deed

EXHIBIT A

SCOPE OF WORKS AND TECHNICAL CRITERIA

Table of Contents

List of Appendices

1 INTRODUCTION

1.1 PROJECT OBJECTIVES

Without in any way limiting the Company's obligations under the M2 Upgrade Project Deed, the primary objectives are to ensure that the M2 Upgrade:

(a) improves traffic flow and reduces travel times in the M2 corridor through the reduction of congestion hot spots;

(b) minimises negative impacts on the surrounding road network;

(c) improves public transport, particularly along bus and transit lanes in the M2 corridor;

(d) minimises negative environmental impacts including those relating to noise during both the construction and operation and maintenance phases of the M2 Upgrade;

(e) restores pedal cyclist routes along the M2 corridor;

(f) rationalises speed limits in the M2 corridor;

(g) increases accessibility of the M2 corridor through the provision of road ramp connections;

(h) increases the capacity of the traffic and transport network to accommodate future demand and needs for growth in the M2 corridor;

(i) improves safety and amenity for the road users in the M2 corridor;

(j) ensures efficient and consistent function of the M2 as part of the Sydney road network; and

(k) provides a cost effective solution.

Additional objectives are to:

(l) investigate, design, construct and commission the Project Works to meet defined environmental requirements and limit any adverse impacts to the natural and built environment while maximising the environmental benefits;

(m) satisfy the technical and procedural requirements of RTA with respect to investigation, design and construction of the M2 Upgrade;

(n) apply urban design principles to ensure the final form, line, colour and texture of the Project Works is compatible with the existing landscape;

(o) provide all connections, modifications and improvements necessary to link the M2 Upgrade to the existing M2 Motorway;

(p) make temporary arrangements during construction to minimise disruption to local and through traffic and to maintain access to affected properties and land;

(q) consider and make allowance for the operation and maintenance of the M2 Upgrade during the design, construction and commissioning of the Project Works; and

(r) develop, operate and maintain effective systems to manage occupational health safety and rehabilitation, industrial relations, training and the environmental and quality aspects of the M2 Upgrade.

1.2 PURPOSE AND INTERPRETATION OF SCOPE OF WORKS AND TECHNICAL CRITERIA

(a) The criteria in this document are minimum criteria, including technical, operational and performance requirements for the Project Works which the Company must satisfy, to fulfil its obligations under the M2 Upgrade Project Deed. Appendix 5 identifies exceptions to the scope and technical criteria contained elsewhere in this document.

(b) If more than one criterion applies in respect of any part of the Company's Work then all criteria must be satisfied, subject to the provisions of section 2.14 of this Scope of Works and Technical Criteria. If there are criteria, which are mutually exclusive, then the criterion, which delivers the greatest level of service, or is of the highest standard, must apply.

(c) Reference to any work includes any additional activities necessary for the satisfactory completion and performance of that work and full compliance with these criteria.

(d) The Company bears the risk that compliance with this Scope of Works and Technical Criteria will not fulfil the Company's obligations under the M2 Upgrade Project Deed. In particular the Company will be required to carry out any work, tasks and activities (including satisfying upgraded design criteria if this is necessary) additional to that contemplated by this document to ensure that it satisfies its obligations under the M2 Upgrade Project Deed.

The Company must not depart from any aspect of this document other than:

(i) as necessary to comply with the requirements of the M2 Upgrade Project Deed where this is necessary to satisfy its design obligations under Clause 6 *of Annexure A* of the M2 Upgrade Project Deed, or

(ii) in accordance with the Clause 7 of Annexure A of the M2 Upgrade Project Deed

In either case the prior written approval of RTA's Representative, is required.

(e) Unless the context otherwise requires, terms which have a defined meaning in the M2 Upgrade Project Deed have the same meaning where used in this Scope of Works and Technical Criteria.

1.3 SITE BOUNDARIES AND ACCESS

(a) Appendix 1 contains a location sketch of the Project Works.

(b) Appendix 2 contains details of the Project Site and the areas to be provided for Local Road Works.

(c) The M2 Upgrade must be designed and constructed to lie completely within the Project Site.

(d) Local Roads must be constructed entirely within local road reserves and the Project Site and/or the areas to be provided for Local Road Works.

1.4 RTA SPECIFICATIONS AND AUSTRALIAN STANDARDS

(a) Any reference in this Scope of Works and Technical Criteria, to RTA Specifications must be read as a reference to the specifications contained in Appendices 6, 11, 47, 48 and 49.

(b) Any references in RTA Specifications to "Drawings" (or "drawings") must be read as a reference to drawings prepared by the Company that have been verified by the Independent Verifier in accordance with the M2 Upgrade Project Deed.

(c) For the Project Works and Temporary Works, any references in RTA Specifications to "testing" must be read as a reference to "RTA Test Methods" on RTA's website, (www.rta.nsw.gov.au) current at the date of the M2 Upgrade Project Deed unless specifically stated otherwise.

(d) Any reference in RTA Specifications to the "Works" or "Work" must be read as a reference to the Project Works, Temporary Works, or the Company's Work as the context requires.

(e) Any references in RTA Specifications to the "Contractor" must be read as a reference to the Company.

(f) Any reference in RTA Specifications to the "Contract" must be read as a reference to the M2 Upgrade Project Deed.

(g) Any reference in RTA Specifications to submissions, to RTA or otherwise, must be read to also be a submission to the Independent Verifier and the ER.

(h) For the Project Works and Temporary Works, references to Australian Standards or to codes refers to the publications of Standards Australia and, unless stated otherwise, to the version of each publication current at the date of the M2 Upgrade Project Deed.

1.5 DEFINITIONS

In this Scope of Works and Technical Criteria, unless the context otherwise indicates:

"M2 Upgrade Project Deed" means the deed to which this SWTC is attached as Exhibit A.

"Assets" means all components of the Project Works including all Asset Elements, Asset Types, Asset Items and Asset Sub Items.

"Asset Elements" are the broader categorisations of the Asset Types, such as rigid pavement, concrete bridge components, warning signs or longitudinal line markings.

"Asset Types" are the distinct class of Asset, such as plain concrete pavements, elastomeric bearings, fans, pumps, switchboards advisory speed signs, or barrier lines.

"Asset Items" are single occurrences of an Asset, such as a pavement section, a bridge bearing, specific items of plant or equipment, a warning sign or a length of barrier line.

"Asset Sub-Items" are components of Asset Items which have a specified design life or maintenance requirements which vary from that established for the Asset Items, of which it forms a part such as light lamps and fan bearings.

"**Hold Point**" means a point beyond which a work process must not proceed without the authorisation or release of a nominated authority.

"Incident" means any abnormal event which:

(a) prevents the M2 Upgrade or any part of it from being open to the public for the safe and continuous and efficient passage of vehicles; or

(b) otherwise requires an urgent response to:

(i) protect or repair the M2 Upgrade, other property or the public;

(ii) provide access to emergency services or traffic control; or

(iii) prevent any occurrence which may cause damage to the M2 Upgrade or compromise the safety of any person or property.

"M2 Motorway Control Centre" means the M2 Motorway administration control building and maintenance depot at Macquarie Park.

"M2 Motorway Carriageway Widenings" means the new pavements that are constructed adjacent to existing M2 Motorway mainline carriageway pavements to provide an increased carriageway width, including any associated emergency stopping bays.

"Witness Point" means a point in a work process which the Company must give prior notice to the RTA's Representative to allow the RTA's Representative to attend and witness the point in the work process should it choose do so.

"Widened M2 Motorway Carriageways" means the M2 Motorway and the M2 Motorway Carriageway Widenings.

"Widened Norfolk Road Twin Tunnels" means the Norfolk Road Twin Tunnels and the Norfolk Road Twin Tunnel Widening.

"Norfolk Road Twin Tunnels" means the existing M2 Motorway twin road tunnels.

"Norfolk Road Twin Tunnel Widening" means the new section of tunnel that is constructed as part of the Project Works

"RTA Transport Management Centre (TMC)" means the Transport Information and Coordination Centre (TICC)

2 BASIC REQUIREMENTS

2.1 GENERAL

(a) The Company must comply with, carry out and fulfil the conditions and requirements of all Environmental Documents, including those conditions and requirements which RTA is expressly or impliedly required under the terms of the Environmental Documents to comply with, carry out and fulfil. The Company must undertake the Company's Work in accordance with the requirements of the M2 Upgrade Project Deed, including this Scope of Works and Technical Criteria and the Environmental Documents.

(b) The Company must implement a fully integrated approach to the Company's Work which accommodates and addresses the Company's role as the designer and constructor for a key part of the Sydney road network.

(c) In particular, the Company must:

(i) ensure that its planning and programming is comprehensive and provides for the concurrent delivery of the performance and environmental requirements of the M2 Upgrade Project Deed;

(ii) proactively liaise with and satisfy the requirements of all relevant Authorities;

(iii) diligently address safety, function, durability, reliability and aesthetics in all aspects of the Company's Work, Project Works, Temporary Works;

(iv) preserve and protect existing infrastructure (including Services, structures, roads and buildings);

(v) design the Project Works to accommodate maintenance and maintain user convenience;

(vi) provide for operation of the M2 Upgrade which is coordinated with and complementary to the management of the road network, including the M2 Motorway;

(vii) implement a proactive community involvement strategy which enables the Company to respond to and accommodate reasonable community expectations;

(viii) incorporate appropriate urban and landscape design in all aspects of the Project Works; and

(ix) minimise disruption and inconvenience to road users, to the public and to other affected parties.

2.2 COMPANY'S WORK

2.2.1 Nature and Extent of the Company's Work

The Company's Work includes all tasks and things necessary to:

(a) investigate, design, construct and commission the Project Works and any Temporary Works;

(b) demolish, remove and rehabilitate all existing road tie-ins, structures, buildings, improvements and properties that are affected by or are redundant, except as identified otherwise by the Environmental Documents, as a result of the Project Works or the Temporary Works and must include the requirements of Appendix 28 for hand over, and if necessary correct all Defects, the relevant parts of the Project Works, in accordance with the requirements of the M2 Upgrade Project Deed

(c) secure, maintain, repair, reinstate and hand back (in the specified condition) areas occupied by or affected by Temporary Works;

(d) connect, modify, make arrangements and undertake improvements necessary to link the M2 Upgrade to the M2 Motorway and the surrounding traffic network;

(e) investigate, relocate and/or protect Services necessary as a consequence of the Company's Work;

(f) adjust properties and access as necessary as a consequence of the Company's Work;

(g) prepare all Design Documentation (including detailed construction drawings and specifications) and prepare all programs;

(h) enable the Independent Verifier to independently verify the Company's Work, the Project Works and the Temporary Works;

(i) provide quality assurance of the Company's Work;

(j) enable the ER to perform the Services identified in the Deed of Appointment of Environmental Representative;

(k) develop, implement and maintain an environmental management system including environmental monitoring;

(l) mitigate environmental impacts during the design and construction of the Project Works and the Temporary Works;

(m) develop, implement and maintain an occupational health, safety and rehabilitation management system;

(n) implement all necessary traffic management methods in accordance with the requirements of RTA to effectively manage traffic affected by the Project Works and the Temporary Works during construction;

(o) develop, implement and maintain the Project Plans in accordance with the M2 Upgrade Project Deed and Appendix 14;

(p) provide effective community involvement;

(q) maintain the Company's Work, the Project Works, the Temporary Works and the existing road infrastructure within the Project Site until the Date of Construction Completion or handover to the appropriate Authority; and

(r) open the M2 Upgrade and Local Roads affected by the Local Road Works to traffic in accordance with the M2 Upgrade Project Deed.

2.3 PROJECT WORKS AND TEMPORARY WORKS

2.3.1 Categories

The Project Works and the Temporary Works include the following categories of works:

(a) The M2 Upgrade

The M2 Upgrade includes:

(i) all the infrastructure necessary to provide the M2 Upgrade as envisaged in the Environmental Documents;

(ii) the items and the configurations contained in Appendix 30, but excluding the infrastructure associated with Property Works, Local Road Works, Services Works and Temporary Works;

(iii) all works to allow pedestrians, disabled persons and pedal cyclists to use routes nominated in the Environmental Documents;

(iv) drainage (including subsurface drainage), fencing, earthworks, all structures (including the Norfolk Road Twin Tunnel Widening, retaining walls, and ramps), pavements (including ramps and connections to the existing road network), all finishes and landscaping;

(v) all infrastructure necessary to operate and maintain the M2 Upgrade, including any buildings and an integrated operations management and control system;

(vi) all the necessary infrastructure and measures required to interface the M2 Motorway operations management and control system with the M2 Upgrade operations and management system and the Central Management Computer System at the RTA's Transport Management Centre;

(vii) the provision of all Services to any facility necessary to operate and maintain the M2 Upgrade;

(viii) pavement markings, signs, sign support systems, traffic light signals and the provision of all lighting (street, pedestrian and emergency lighting);

(ix) items of roadside furniture erected to provide safety (including safety barriers) and the provision of all fencing and other security measures necessary to prevent either unlawful or accidental access;

(x) all environmental safeguards and measures necessary to mitigate environmental impacts during operation of the M2 Upgrade, including those identified in the Environmental Documents;

(xi) all measures necessary to achieve discharge water quality during operation of the M2 Upgrade;

(xii) all measures necessary to mitigate noise during operation of the M2 Upgrade;

(xiii) all works required as a consequence of the community liaison process;

(xiv) all infrastructure required to connect the M2 Upgrade to the M2 Motorway and the surrounding road network;

(xv) all measures and infrastructure which are necessary as a consequence of the requirements in Appendices 21 and 22;

(xvi) all measures which are necessary as a consequence of the requirements in Appendix 3;

(xvii) those parts of the works identified in sections 2.3.2 of this Scope of Works and Technical Criteria, which are on, or in, the area of land upon which the M2 Upgrade is located;

(xviii) all infrastructure required to cater for accidents or incidents, including those incidents that prevent any part of the M2 Motorway and M2 Upgrade from being open to the public for the safe, continuous and efficient passage of vehicles;

(xix) all equipment necessary to monitor the operational and environmental performance of the M2 Upgrade, assess the durability of all elements and assist in the operation and maintenance of the M2 Upgrade. This includes the provision of all traffic management, monitoring and control systems, infrastructure and services to support traffic enforcement and the connection of such systems to RTA facilities; and communications systems and all data connections, including those required as a consequence of the Local Road Works.

(b) Property Works include:

(i) all adjustments and accommodation works to existing infrastructure or property, excluding Local Road Works or Services Works, which are necessary as a consequence of the Company's Work or as a consequence of the community liaison process;

(ii) all changes in access arrangements;

(iii) demolition and adjustment of built features;

(iv) adjustments to buildings;

(v) adjustments to property drainage;

(vi) all adjustments and accommodation works to property which are necessary as a consequence of the requirements in Appendix 3;

(vii) all other accommodation works and property adjustment works necessary as a consequence of the Company's Work including those identified in the Environmental Documents;

(viii) all adjustments to property which are necessary as a consequence of the requirements in Appendices 21 and 22; and

(ix) those parts of the works identified in section 2.3.2 of this Scope of Works and Technical Criteria, which relate to adjustments to property.

(c) Local Road Works includes:

(i) all works necessary to adjust any existing Local Road, footpath, cycleway, open space, landscaped area or street:

A. affected by the M2 Upgrade;

B. required by the Environmental Documents including, as a minimum, resurfacing and/or reconstruction of affected streets and roads to the requirements in Appendix 28; and/or

(ii) required as a consequence of the community liaison process; all fencing, drainage including subsurface drainage, erosion and sediment control works, earthworks, all structures (including retaining walls), pavements and planting;

(iii) all provisions to allow all road users, including public transport, pedestrians and pedal cyclists, to gain access to and from the surrounding road network to connections with the M2 Upgrade;

(iv) all permanent arrangements to allow people and vehicles access to properties affected by the Company's Work;

(v) all provision of adjustments to pavement markings, signs, sign support systems, traffic light control signals and street lighting;

(vi) items of roadside furniture erected to improve safety (including safety barriers) and the provision of all fencing and other security measures necessary to prevent either unlawful or accidental access;

(vii) measures to mitigate noise of the Local Road Works during their operation; all environmental safeguards necessary to mitigate environmental impacts which might arise as a consequence of the use of the Local Roads, including those identified in the Environmental Documents;

(viii) all work on Local Roads which is necessary as a consequence of the requirements of Appendices 21 and 22; and

(ix) those parts of the works identified in section 2.3.2 of this Scope of Works and Technical Criteria which relate to adjustments to Local Roads.

(d) Services Works include:

(i) the protection, adjustment of infrastructure related to Services which are affected by the Company's Work;

(ii) the preservation of Services throughout the design and construction of the Project Works and the Temporary Works;

(iii) the provision of all Services and Services' connections for undertaking the Company's Work and the operation of the M2 Upgrade;

(iv) all adjustments to Services which are necessary as a consequence of the requirements in Appendices 21 and 22;

(v) those parts of works identified in section 2.3.2 of this Scope of Works and Technical Criteria which relate to Services.

(e) Temporary Works include:

(i) temporary measures necessary to meet the needs of all road and pathway users during all stages of design and construction of the Project Works;

(ii) temporary arrangements to divert and control traffic and to provide public amenity, security and safety during all stages of design and construction of the Project Works;

(iii) temporary arrangements for people and vehicles to access all property affected by design and construction of the Project Works;

(iv) all environmental safeguards and measures necessary to mitigate environmental effects during design and construction of the Project Works;

(v) cleaning, maintenance, repair, replacement and reinstatement, as required, of all areas occupied by the Company during design and construction of the Project Works;

(vi) temporary site facilities required for design and construction of the Project Works;

(vii) the maintenance of Local Roads as specified in Appendix 33.

(viii) temporary infrastructure installed or erected to undertake design and construction of the Project Works.

2.3.2 Principal Items of Infrastructure to be Constructed

(a) The Project Works includes all permanent infrastructure, which must be constructed or modified (including any infrastructure associated with the M2 Motorway), to enable the Company to satisfy the requirements of the M2 Upgrade Project Deed, including this Scope of Works and Technical Criteria.

(b) The permanent infrastructure includes, but is not limited to, the following:

(i) a widened eastbound M2 Motorway mainline carriageway from the end of the Windsor Road entry ramp to the Pennant Hills exit ramp with three 3.5 metre wide lanes, a single 3.5 m wide bus lane and a single 2.5 metre wide breakdown/cycle lane as detailed in Section 20.1.4 in Appendix 20;

(ii) a widened eastbound M2 Motorway mainline carriageway from the end of the Pennant Hills Road entry ramp to the Beecroft Road entry ramp with three 3.5 metre wide lanes, a single 3.5 m wide bus lane (to approximately 1000m west of Beecroft Road Interchange) and a single 2.5 metre wide breakdown/cycle lane as detailed in Section 20.1.4 in Appendix 20;

(iii) a widened eastbound M2 Motorway mainline carriageway from Beecroft Road entry ramp to the Terry's Creek bridge with three 3.5 metre wide lanes and a single 2.5 metre wide breakdown/cycle lane as detailed in Section 20.1.4 in Appendix 20;

(iv) a widened eastbound M2 Motorway mainline carriageway from approximately the Terry's Creek bridge to the start of the Lane Cove Road exit ramp with two 3.5 metre wide lanes, a single 3.5 metre wide T2 lane and a single 2.5 metre wide breakdown/cycle lane as detailed in Section 20.1.4 in Appendix 20;

(v) a widened westbound M2 Motorway mainline carriageway from the end of the Lane Cove Road southbound entry ramp to the Beecroft Road Interchange with three 3.5 metre wide lanes and a single 2.5 metre wide breakdown/cycle lane as detailed in Section 20.1.4 in Appendix 20;

(vi) a widened westbound M2 Motorway mainline carriageway from the Beecroft Road Interchange to the Pennant Hills Road exit ramp with three 3.5 metre wide lanes, a single 3.5 m wide bus lane (commencing approximately 800m west of Beecroft Road Interchange) and a single 2.5 metre wide breakdown/cycle lane as detailed in Section 20.1.4 in Appendix 20;

(vii) west facing entry ramp from Windsor Road to the M2 Motorway westbound and west facing exit ramp from the M2 Motorway eastbound to Windsor Road, including widening of Windsor Road to provide for adequate ramp turning lanes, at the Windsor Road grade separated interchange as detailed in Figure C1, Attachment C in Appendix 20;

(viii) an east facing exit ramp from the M2 Motorway westbound to Herring Road, and modified intersection at Herring Road and Talavera Road as detailed in Section 20.1.4 and Figure D1, Attachment D in Appendix 20;

(ix) an east facing entry ramp from Christie Road to the M2 Motorway eastbound, modified intersection (signalised) at the top of the existing exit and entry Christie Road ramps, the widening of Christie Road bridge, the widening of Christie Road (north of Talavera Road), modified intersection at Christie Road and Talavera Road, and the widening of Talavera Road between Christie Road and Herring Road as detailed in Section 20.1.4 and Figure D2, Attachment D in Appendix 20;

(x) widened Norfolk Road Twin Tunnels with three 3.5 metre wide lanes and a single 2.5 metre wide breakdown/cycleway eastbound and westbound as detailed in Section 20.1.7 and Figure F1, Attachment F in Appendix 20;

(xi) emergency stopping bays on the widened eastbound and westbound M2 Motorway mainline carriageways as detailed in Section 20.8 in Appendix 20;

(xii) pavement construction, asphalt surfacing and line marking for the M2 Upgrade as detailed in Appendices 8 and 30;

(xiii) ventilation, fire detection, fire deluge, environmental instrumentation, CCTV, radio rebroadcast, lighting and electrical distribution systems for the Widened Norfolk Road Twin Tunnels;

(xiv) variable speed limit, lane usage and tunnel message signage, emergency and directional exit signage within the Widened Norfolk Road Twin Tunnels;

(xv) demolition of the Beecroft Road bus ramp;

(xvi) operations management and control elements including variable message signs, vehicle detection loops, CCTV, tunnel message signs, lane usage signs, variable speed limit signs, signposting, motorist emergency telephones, driver aid and traffic monitoring systems, as detailed in Appendix 30;

(xvii) all infrastructure necessary to operate and maintain the M2 Upgrade including any buildings and an integrated operations management and control system;

(xviii) all the necessary infrastructure and measures required to interface the M2 Motorway operations management and control system with the M2 Upgrade operations and management system and the Central Management Computer System at the RTA's Transport Management Centre;

(xix) adjustments to Local Roads and local road network;

(xx) all necessary property adjustments;

(xxi) all necessary adjustments to services including drainage, roadside equipment, conduits, pits and fibre optic cable;

(xxii) the incorporation of architectural, urban and landscape design in all visible elements of the Project Works;

(xxiii) the in corporation of environmental mitigation measures;

(xxiv) roadside furniture, including safety barriers;

(xxv) all required noise attenuation;

(xxvi) all required security fencing;

(xxvii) all infrastructure required for the maintenance and repairs to the M2 Upgrade;

(xxviii) access arrangements to all parts of the M2 Upgrade for maintenance;

(xxix) emergency vehicle access to all parts of the M2 Upgrade for response to accidents or Incidents; and

(xxx) additional infrastructure identified in the Environmental Documents.

2.4 NOT USED

2.5 COMMISSIONING AND TESTING

(a) The Company must undertake testing and commissioning of the Project Works to ensure that the Project Works comply with the requirements of the M2 Upgrade Project Deed.

(b) The testing and commissioning must be undertaken progressively to ensure that Construction Completion is not avoidably delayed.

2.6 ENVIRONMENT

2.6.1 Environmental Management System

The Company must develop, implement and maintain an Environmental Management System (EMS) for the Company's Work which:

(a) is in accordance with AS/NZS ISO 14000;

(b) complies with RTA Specification DCM G36 in Appendix 6;

(c) complies with the Environmental Documents;

(d) complies with New South Wales Government Environmental Management Systems Guidelines, November 1998; and

(e) is accredited by a New South Wales Government construction agency.

2.6.2 Environmental Representative

(a) The Company must provide an Environmental Representative from the commencement of construction until the Date of Final Completion.

(b) The Environmental Representative must:

(i) be engaged in the Company's Work exclusively for environmental management and environmental issues; and

(ii) not be allocated any other duties related to the Project Works.

2.7 OCCUPATIONAL HEALTH, SAFETY AND REHABILITATION

In addition to the requirements of Clause 5.18 of Annexure A of the M2 Upgrade Project Deed, the Company must:

(a) incorporate occupational health, safety and rehabilitation in all aspects of the Company's Work including Project Plans;

(b) have a Corporate OHS&R Management System that complies with the NSW Government Occupational Health & Safety Management Systems Guidelines and is maintained for the duration of the Company's Work;

(c) develop, implement and maintain a Project Occupational Health, Safety and Rehabilitation Management Plan for the Company's Work and comply with this Project Occupational Health, Safety and Rehabilitation Management Plan at all times;

(d) comply with the requirements of RTA Specification DCM G22 in Appendix 6; and

(e) provide a suitably qualified Site Safety Representative (SSR) who has authority and responsibility for issues relating to occupational health, safety and rehabilitation throughout the Company's Work. The SSR must be provided and allocated to occupational health, safety and rehabilitation management on a full time basis from the commencement of construction until the Date of Final Completion.

2.8 INDUSTRIAL RELATIONS

The Company must develop the Project Industrial Relations Plan in accordance with Clause 5.24 of Annexure A of the M2 Upgrade Project Deed and be consistent with the Industrial Relations Strategy in Appendix 45.

2.9 LOCAL INDUSTRY REQUIREMENTS

The Company must:

(a) adopt the NSW Government Purchasing policies and must ensure that its agents, consultants and others acting on its behalf adhere to those policies, in so far as procurement processes are to favour local (Australia and New Zealand) goods and services;

(b) ensure that Australian and New Zealand suppliers are favoured in the procurement of goods and services by the Company.

2.10 RISK MANAGEMENT

The Company must implement risk management techniques to determine hazards and associated risks which could affect the delivery of the requirements of the M2 Upgrade Project Deed. This includes the development and implementation of risk management strategies to manage those risks and hazards. The risk management strategies must include a formal Risk Management Plan as part of the Project Plans.

2.11 TRAINING

The Company must:

(a) comply with NSW Government Training Management Guidelines, dated December 2000;

(b) meet statutory obligations relating to OHS&R training;

(c) provide induction on OHS&R for all employees and persons engaged on the construction of the Project Works and the Temporary Works, including persons nominated by RTA, which meets the requirements of the NSW Occupational Health and Safety Regulation 2001 ("OH&S Regulation);

(d) provide induction on environmental systems for all personnel engaged on the construction of the Project Works and the Temporary Works;

(e) provide a structured training program to address the requirements of the M2 Upgrade Project Deed, including environmental and project specific requirements;

(f) establish a training facility on the Project Site;

(g) maintain on the Project Site an up to date copy of the Project Training Plan, the initial version of which appears as Appendix 44;

(h) provide RTA with access to all training management records, which must be retained on the Project Site, to enable RTA to undertake the implementation reviews identified in the Guidelines and Policy; and

(i) provide all reasonable assistance to the RTA reviewer during the review process, including attendance by RTA in the review process.

2.12 PROJECT PLANS

(a) The Company must prepare and update Project Plans in accordance with section 3 of this Scope of Works and Technical Criteria, Appendix 6 and Appendix 14 and the requirements of the M2 Upgrade Project Deed. All Project plans must incorporate the requirements and recommendations of the Independent Verifier and the Environmental Representative.

(b) Each Project Plan must be a quality assurance document prepared in accordance with AS/NZS ISO 9001-2000 and must be further developed from the initial Project Plans shown in Appendices 35, 36, 38, 40, 41, 43 and 44.

(c) All Project Plans must recognise and adhere to the requirements of the Quality Plan.

(d) Each Project Plan must be based upon the relevant initial Project Plans in this Scope of Works and Technical Criteria. Notwithstanding the contents of any of the initial Project Plans, the Company must develop each of the Project Plans to comply fully with the requirements of the M2 Upgrade Project Deed, including this Scope of Works and Technical Criteria.

(e) Each Project Plan must be initially submitted to RTA's Representative and the Independent Verifier within the time periods specified in Appendix 14.

(f) The Company acknowledges and agrees that:

(i) an intended purpose of each Project Plan is for the Company to provide a detailed description of how the Company intends to carry out the Company's Work in accordance with the requirements of the M2 Upgrade Project Deed and this Scope of Works and Technical Criteria with respect to the subject matter of each Project Plan; and

(ii) the Project Plans will require ongoing development, amendment and updating throughout the duration of the Company's Work to take into account:

A. non-compliance with the requirements of the M2 Upgrade Project Deed, including this Scope of Works and Technical Criteria;

B. Changes;

C. Changes in Law;

D. the commencement of new phases or stages of design and construction as shown in the Overall D&C Program and subsidiary programs;

E. those events or circumstances expressly identified in Appendix 14 for each Project Plan; and

F. any other events or circumstances which occur or come into existence and which have, or may have, any effect on the manner in which the Company carries out the Company's Work.

(g) The Company:

(i) must comply with each Project Plan which has been submitted to RTA's Representative; and

(ii) agrees that compliance by it with any Project Plan will not in any way lessen or affect:

A. its liabilities or responsibilities under the M2 Upgrade Project Deed and this Scope of Works and Technical Criteria or otherwise according to Law; or

B. RTA rights against it, whether under the M2 Upgrade Project Deed and this Scope of Works and Technical Criteria or otherwise according to Law.

(h) The Company must comply with the restrictions upon the carrying out of the Company's Work specified in Appendix 14.

(i) To the extent they are relevant to the operation and maintenance of the M2 Upgrade, all Project Plans must be incorporated into the Maintenance Manual, as relevant.

2.13 INFORMATION REQUIREMENTS

(a) Reports and submissions that are required to be submitted by the Company to any Authority must be simultaneously submitted to the Independent Verifier, the ER and RTA's Representative.

(b) Approvals obtained by the Company must be immediately issued to the Independent Verifier, the ER and RTA's Representative.

(c) The Company must prepare and submit to RTA's Representative, the ER and the Independent Verifier reports, updates of the Overall D&C Program and Subsidiary D&C Programs, durability assessment reports, Design Documentation, as constructed documentation and other documents in accordance with the M2 Upgrade Project Deed, including Appendix 24.

(d) The Company must prepare, update and submit to RTA's Representative and the Independent Verifier the Maintenance Manual in accordance with the M2 Upgrade Project Deed.

2.14 DURABILITY

(a) The Company must ensure the durability of all Assets. Durability must be addressed throughout the design, construction, operation and maintenance of all Assets and must be reflected in the Project Plans and the Maintenance Manual.

(b) The durability portions of the Project Plans and the Maintenance Manual must demonstrate how the selected design, materials, construction, operation and maintenance will achieve the durability objectives of each Asset in conjunction

with the specified Design Life for that Asset in section 5.2 of this Scope of Works and Technical Criteria. For each Asset which comprises part of the Project Works, the Project Plans must:

(i) define the characteristics of the environment;

(ii) identify the potential deterioration mechanisms in that environment;

(iii) determine the likely rate of deterioration;

(iv) assess the material life;

(v) define the required material performance;

(vi) assess the need for further protection;

(vii) if appropriate, develop procedures for replacement of Asset Items and Asset Sub-Items at intervals consistent with the Design Life specified in section 5.2 of this Scope of Works and Technical Criteria;

(viii) determine inspection and monitoring requirements for both critical and non-critical Assets; and

(ix) if appropriate, outline possible remedial measures.

(c) The durability requirements must be applied diligently and continuously throughout the process of design, including design review and design amendments, and during construction of the Project Works and include any subsequent affects on the maintenance of the M2 Upgrade.

2.15 APPLICATION OF RTA AND COMPANY SPECIFICATIONS

Without limiting any other requirements of the M2 Upgrade Project Deed, the Project Works, the Temporary Works and the Company's Work must, as a minimum, comply with the requirements of RTA Specifications, and the requirements of the Company's Specifications in Appendix 32.

2.16 EFFECTS OF THE PROJECT WORKS, THE TEMPORARY WORKS AND THE COMPANY'S WORK

(a) The Company must ensure that the Project Works, the Temporary Works and the Company's Work have no long term adverse impacts on the performance of any infrastructure (including bridges, roads, tunnels, Services, buildings, soil walls and cuttings).

(b) The Company must undertake a detailed and rigorous engineering analysis to predict the effects (the 'Predicted Effects') of the Project Works, the Temporary Works, the Company's Work on existing ground conditions and infrastructure (including bridges, roads, tunnels, Services, buildings, soil walls and cuttings). The Predicted Effects must include the limits of accuracy of the prediction and the expected statistical spread of measured results. The Company must also determine the extent to which the existing infrastructure may be acceptably affected (the 'Acceptable Effects'), consistent with satisfying the requirements of sub-section (a) above.

(c) Throughout the Company's Work, the Company must monitor the actual effects of the Project Works, the Temporary Works, the Company's Work and compare the actual effects to both the Predicted Effects and the Acceptable Effects.

(d) In the event that the actual effects of the Project Works, the Temporary Works and the Company's Work exceed the Predicted Effects, the Company must review and, if necessary, re-evaluate the Predicted Effects and make any

adjustment subsequently necessary to any aspects of the manner in which the Company's Work is carried out to ensure that the Acceptable Effects are not exceeded and to ensure full compliance with sub-section (a) above.

(e) Notwithstanding the Predicted Effects on infrastructure contemplated in paragraph (b), the Company must repair and reinstate infrastructure at the earliest opportunity so that the Company satisfies the requirements of paragraph (a) above in respect of each item of infrastructure.

(f) The Company must promptly and progressively provide RTA's Representative and the Independent Verifier with:

(i) analysis and determinations, including any revisions, of the Predicted Effects and the Acceptable Effects; and

(ii) results of monitoring the actual effects of the Project Works, the Temporary Works, and the Company's Work in a form which is directly comparable to the Predicted Effects and the Acceptable Effects.

2.17 TRAFFIC AND TRANSPORT MANAGEMENT AND SAFETY

(a) The Company must manage and minimise the impacts of the Company's Work on the capacity and performance of the traffic and transport network.

(b) The Company must manage traffic and transport during the performance of the Company's Work in accordance with the requirements of Appendix 18.

(c) Vehicles involved in the Company's Work must only enter, operate within or exit from a traffic flow in a manner which does not endanger the public or inhibit traffic flows and under suitably designed and appropriate traffic control measures.

(d) The Company must:

(i) develop and implement a Traffic Management and Safety Plan; and

(ii) update and develop the Traffic Management and Safety Plan in accordance with the M2 Upgrade Project Deed and Appendix 14 based on the Initial Traffic Management and Safety Plan which is attached as Appendix 43.

2.18 CERTIFICATION REQUIREMENTS

The Company must certify the Company's Work and ensure that all other certification is provided in accordance with the requirements of the M2 Upgrade Project Deed and Appendix 25.

2.19 AVAILABILITY OF PROJECT INFORMATION AND DATA

2.19.1 Local Area Network

(a) The Company must establish, operate and maintain a Local Area Network with a dedicated file control server on the Project Site for the duration of the Company's Work, which includes RTA's Representative, the ER and the Independent Verifier as users. The network must operate at a reliability of 99%.

(b) Information and data on the Company's Work must be stored in electronic format and be available, with access control and security, for searching, sharing and exchanging for all users of the Local Area Network. The Company must supply a minimum of three Local Area Network connections to personal computers located in the RTA site facilities.

(c) The Company's information and data to be exchanged, searched and shared with RTA's Representative, the ER and the Independent Verifier must include, as a minimum;

(i) progress and other reports, minutes of meetings, photographs, programs issues, requests, changes, correspondence register, site personnel and subcontract registers;

(ii) quality registers, lot registers, audit reports, NCR, CAR, checklists, conformance reports and test results;

(iii) the issues management database as specified in section 14.3 of Appendix 14;

(iv) environment inspection reports, incidents, action notes, improvement notices, reports required by the Environmental Documents and other environmental data;

(v) OHS&R induction registers, dangerous goods information, hazardous substances register, material safety data sheets, incident-accident registers and reports, work method statements, safe work procedures, inspections, site safety meetings and toolbox sessions;

(vi) risk information, identification, assessment, actions and reports;

(vii) Design Documentation including drawings, specifications, schedules and reports;

(viii) community complaints, comments, newsletters and notices, registers, fact sheets and meetings; and

(ix) training registers.

2.19.2 Information and Data on an Extranet

(a) The Company must establish, operate and maintain an "extranet" linked to a dedicated internet site for the duration of the Company's Work. Access must be controlled by the Company and be available to its agents, representatives of RTA, Independent Verifier, ER and others as approved by RTA's Representative.

(b) The extranet must use a document management system with a vault structure and determined user access. The Company must provide training for RTA personnel and other stakeholders in the use of the system.

(c) The Company must control advanced functions of changing workflow and access rights from the internet site. Access to the documents must be via a web browser client.

(d) Information and data must be made available on the extranet and must include general project information, project plans, reports, submissions, photographs and community newsletters and notices.

2.20 ABORIGINAL PARTICIPATION

The Company must comply with the NSW Government Aboriginal Participation in Construction Guidelines dated January 2007. For the purposes of the above Guidelines the Project is a Category 3 project. The Company must prepare and implement a Project Aboriginal Participation Plan before commencing any part of the Company's Work on the Project Site.

3 QUALITY AND PROJECT VERIFICATION

3.1 QUALITY ASSURANCE

3.1.1 Quality System

(a) The Company must provide a Quality Manager who is directly responsible to the Company's senior management and has responsibility for ensuring that the requirements of the Quality Plan are implemented and maintained throughout the Company's Work.

(b) The Company must implement and maintain a quality system for the duration of the Company's Work.

(c) The quality system must be in accordance with RTA Specification DCM Q6 in Appendix 6 and AS/NZS ISO 9001 - 2000, Quality management systems – Requirements.

(d) The Company must develop and implement a Quality Plan, which documents the quality system referred to in paragraph (b).

(e) The Company must comply with its quality system and its Quality Plan.

(f) All quality system records and all records relating to the quality of the Project Works and the Temporary Works must be freely accessible to RTA's Representative, the ER and the Independent Verifier at the Project Site up to the Date of Final Completion and at the M2 Motorway Control Centre thereafter.

3.1.2 Quality Plan

(a) Documents

(i) The Company must undertake surveillance, audit and review of its Quality Plan and report on all non-conformances in accordance with the requirements of RTA Specification DCM Q6 in Appendix 6.

(ii) The Quality Plan must be updated and developed in accordance with the M2 Upgrade Project Deed.

(b) The Company's Management Responsibilities

Without limiting section 3.1.1 of this Scope of Works and Technical Criteria, the Quality Plan must:

(i) nominate the Quality Manager who has the defined authority and responsibility for ensuring that the requirements of the Quality Plan are implemented and maintained;

(ii) define the responsibility and authority and reporting function of personnel primarily responsible for upholding the quality assurance provisions of the M2 Upgrade Project Deed;

(iii) identify how independent inspection, witnessing and monitoring and reporting will be carried out;

(iv) identify the interfaces, if any, between corporate support and on-site personnel in relation to sub-sections (i) and (ii) of this sub-section (b);

(v) identify the qualifications, experience and required competencies of personnel who must undertake the duties required in each of paragraphs (i), (ii) and (iii) of this sub-section (b);

(vi) contain systems, processes and procedures which give effect to and co-ordinate the implementation of each Project Plan;

(vii) address the durability of the Project Works in every aspect of the Company's Work; and

(viii) address safety in every aspect of the Company's Work.

3.1.3 Hold Points

(a) The Quality Plan must include a schedule of Hold Points and Witness Points.

(b) The schedule must include any Hold Points and Witness Points nominated in RTA Technical Specifications and Appendix 14. The schedule must contain sufficient additional Hold Points as are necessary to ensure that the Company's Work and related activities are undertaken in a manner consistent with the quality system under section 3.1.1 of this Scope of Works and Technical Criteria.

(c) RTA's Representative may nominate persons to attend or witness the release of any Hold Point or to attend any Witness Point.

3.1.4 Release of Hold Points

(a) Each Hold Point must be assigned a nominated authority ("Nominated Authority") to release the Hold Point.

(b) The Quality Manager must be satisfied that all activities in the Hold Point process (including methods of work, sequences of activities, inspections and tests preceding any Hold Point specified in the Quality Plan) comply fully with the requirements of the M2 Upgrade Project Deed and, once satisfied, must:

(i) release that Hold Point, where authorised according to the schedule of Hold Points, in order that work may proceed on that part of the Company's Work; or

(ii) obtain release from the Nominated Authority that work may proceed on that part of the Company's Work.

(c) The Company must not proceed beyond any Hold Point referred to in the Quality Plan without release by the Nominated Authority.

(d) The release of a Hold Point by the Nominated Authority, allowing the work to proceed beyond that Hold Point, will not relieve the Company of any responsibility for carrying out all or any part of the Company's Work in accordance with the requirements of the M2 Upgrade Project Deed.

(e) The Independent Verifier, the ER and RTA's Representative, where nominated, must be given reasonable notice of the release of any Hold Point and must be given reasonable opportunity to witness the release of any Hold Points.

3.1.5 Non-conformances and Continuous Improvement

(a) The Company must regularly update and develop the Quality Plan and the Project Plans in order to minimise the recurrence of any non-conformances.

(b) RTA's Representative, the ER and the Independent Verifier may advise the Company of apparent non-conformances. In this event the Company must treat the matter as a non-conformance to be addressed within the Company's quality system.

(c) The Company must review and analyse the cause of all non-conformances and develop a plan of corrective action to minimise the likelihood of recurrence. Details of such corrective action must be entered in a non-conformance report

or corrective action request as appropriate and such reports must be provided to RTA's Representative, the ER and the Independent Verifier.

3.1.6 Non-conformances During Construction

(a) The Quality Plan must make specific provision for recording and reporting all non-conformances that will impact the future durability or performance of the M2 Upgrade.

(b) All non-conformances must be reported to the Independent Verifier, the ER and RTA's Representative.

(c) Proposals for rectification work of such non-conformance must be reviewed by the relevant designer and Independent Verifier and must take all durability objectives and performance requirements into account.

3.1.7 Maintenance Manual

The Company must:

(a) develop aspects of its Project Plans, including the Quality Plan, which are relevant to maintenance; and

(b) incorporate these components of the Project Plans, including the Quality Plan, into the Maintenance Manual.

3.1.8 Records

The Company must satisfy the record management requirements of RTA DCM Q6, RTA Technical Specifications, the NSW State Records Act and other relevant legislation.

3.1.9 Audits and Monitoring

The Company must:

(a) have its compliance with any Project Plan audited, whenever reasonably requested by RTA's Representative, by an independent auditor;

(b) permit representatives of RTA and the Independent Verifier to be present during such audits;

(c) deliver copies of each audit report to RTA's Representative and the Independent Verifier within five Business Days of its completion; and

(d) permit the RTA or the Independent Verifier to conduct monitoring and testing of any aspect of the Company's Work at any time.

3.2 PROJECT VERIFICATION

Without limiting any other part of the M2 Upgrade Project Deed, or of the Deed of Appointment of Independent Verifier, the Company must ensure that the Independent Verifier:

(a) continually monitors the integrity and efficiency of the Company's quality system and certifies the Company's quality system;

(b) continually monitors and verifies that the design and construction of the Project Works and Temporary Works comply with the requirements of the M2 Upgrade Project Deed;

(c) until the Date of Final Completion, verifies the compliance of the M2 Upgrade with the M2 Upgrade Project Deed;

(d) ensures that non-compliance in any of the above will be rectified in accordance with a structured verifiable process, including reporting protocols; and

(e) certifies and verifies compliance of those aspects of the Company's Work, the design and construction of the Project Works and Temporary Works in the circumstances identified in the Independent Verifiers' certificates in Appendix 25.

4 INVESTIGATION, SURVEY AND CONDITION MONITORING

4.1 GENERAL

(a) The Company must undertake all site investigations, property and land surveys and ground and infrastructure condition surveys required for the Company's Work.

(b) The Company must promptly provide RTA's Representative and the Independent Verifier with two copies of all site investigation reports, property and land surveys and ground and infrastructure conditions surveys, including progressive copies of such documents as each is developed.

4.2 SITE INVESTIGATION

(a) Geotechnical site investigation work must be undertaken in accordance with AS1726, Geotechnical Site Investigation. The Company must maintain records of all tests, site investigation and geotechnical reports (including position and elevation survey).

(b) The geotechnical site investigation, in conjunction with the design process, must identify all ground conditions and infrastructure conditions (including the condition of roads, Services, buildings and slopes) which may be affected by the Project Works, the Temporary Works, the Company's Work or the operation and maintenance of the M2 Upgrade.

(c) Where it is expected that the Project Works, the Temporary Works, the Company's Work or the operation and maintenance of the M2 Upgrade will affect ground conditions or infrastructure the Company must monitor the actual effects in accordance with section 2.16 of this Scope of Works and Technical Criteria.

(d) All slopes in or affected by the Project Works, the Temporary Works, the Company's Work or the operation and maintenance of the M2 Upgrade must be assessed in accordance with "RTA Guide to Slope Risk Analysis Version 3.1 dated November 2001". All slope ratings must be carried out by personnel accredited by RTA in the use of the guide.

4.3 CONDITION SURVEYS

(a) In addition to inspections and surveys required by the M2 Upgrade Project Deed, including this Scope of Works and Technical Criteria and the Environmental Documents, and prior to commencing any activity which could affect existing infrastructure (including roads, railways, Services, buildings and slopes), the Company must undertake ground and infrastructure condition surveys (dilapidation surveys) to establish the condition of all existing infrastructure which could be affected by the Company's Work or any subsequent affects on the operation and maintenance of the M2 Upgrade.

(b) Ground and infrastructure condition surveys must be conducted with the agreement of the property owner and any occupier and must provide a detailed record (including dated photographs) of the pre-construction conditions of the infrastructure which may be affected. RTA's Representative, the Independent Verifier and the owner and/or occupier must be issued with a copy of the survey report prior to the Company commencing the relevant activity.

(c) Condition surveys must be carried out by an independent and appropriately qualified assessor.

4.4 SURVEY REQUIREMENTS

4.4.1 General

(a) The Company must verify survey control for the Company's Work.

(b) The Company's attention is directed to the possible existence of established survey marks within or in the vicinity of the Project Site. The Company must avoid where reasonably possible disturbance of such marks and must re-establish any such marks disturbed or affected by the Company's Work.

(c) The Company must verify any boundary survey undertaken or provided to it and must undertake a consolidated boundary survey of the Project Site and the Local Roads in a single document. As a condition precedent to Final Completion, the Company must undertake and give to RTA's Representative a consolidated as constructed survey of the Project Works to detail the actual location of the new infrastructure and to demonstrate that the M2 Upgrade is within the Project Site.

(d) All survey levels must refer to Australian Height Datum (AHD). All survey plan co-ordinates must refer to the MGA94 Zone 56 co-ordinates, based on the Geocentric Datum of Australia (GDA)

(e) Field survey data and final design strings must be supplied to RTA in electronic form as a MX database file (model.fil) or a genio file which can be inputted into MX using MX Major Option Genio. Any design data revisions are to be supplied to RTA to enable models to be updated.

(f) The Company must ensure that qualified surveyors, who are eligible for membership of the Institution of Surveyors to the grade of Associate Member (Associate Surveyor), or the Institution of Engineering and Mining Surveyors, Australia to the category of Member, take responsibility for all survey for the Company's Work.

4.4.2 Control Survey

(a) Control survey for the Company's Work must be conducted in accordance with the recommended survey and reduction practices specified in Part B of standards and Practices for Control Surveys Version 1.7 September 2007 (ICSM Publication SP1 www.icsm.gov.au/).

(b) The standards of accuracy for control surveys must be in accordance with the following classifications as detailed in Part A of Standards and Practices for Control Surveys Version 1.7 September 2007

(i) Horizontal Control Survey:- Class B

(ii) Vertical Control Survey (Differential Levelling):-Class LC

(iii) Vertical Control Survey (Trig & GPS Heighting):-Class B

(c) For the Company's Work, the existing permanent survey marks (PSMs) must be supplemented by new PSMs such that the spacing between adjacent PSMs is a maximum of 500 metres.

(d) Prior to the Date of Final Completion the Company must submit to RTA's Representative:

(i) a breakdown of the existing state control survey network (MGA/AHD) affected by the Company's Work and carried out in accordance with the Surveying Act 2002 and Surveying Regulation 2001. The existing PSMs must be connected into the Company's control survey;

(ii) Survey documentation must be in accordance with the recommended documentation practices specified in Part D of Standards and Practices for Control Surveys Version 1.7. A copy of the adjustment (e.g. HAVOC) input files used for adjustments must be submitted;

(iii) a plan of the control survey showing all marks adopted and values assigned; and

(iv) a locality sketch for each new mark placed and for any existing marks that need to be re-drawn because of substantial access changes.

5 PERFORMANCE REQUIREMENTS

5.1 GENERAL

(a) The Company must ensure that all investigation, design and construction, are entirely integrated and compatible and that together they mutually satisfy all the requirements of the M2 Upgrade Project Deed. The required performance of the Project Works and the Temporary Works must be taken into account during all stages of the Company's Work.

(b) Subsequent sections of this Scope of Works and Technical Criteria provide details of further specific requirements in respect of the design and construction of the Project Works and any subsequent affects on the operation and maintenance of the M2 Upgrade.

(c) Without limiting any other requirements of the M2 Upgrade Project Deed, the Project Works and the Temporary Works must comply with the performance requirements in this section 5 of this Scope of Works and Technical Criteria.

(d) Safety requirements must be taken into account in all aspects of the Project Works, the Temporary Works and the Company's Work.

In particular, the Company's design must address:

(i) safety during construction;

(ii) safety during operation; and

(iii) safety during maintenance.

5.2 DESIGN LIFE

(a) Design Life is defined as the period over which an Asset must perform its intended function without replacement, refurbishment or significant maintenance. Assets include Asset Items and Asset Sub-Items which for the purpose of project Asset management are also identified by Asset Element and Asset Type.

(b) The following Assets must have a minimum Design Life as specified. Where the Asset is integrated with an existing Asset, the Design Life should be adjusted to account for the age of the existing Asset:

(i)	tunnel and underpass structures, supports and structural linings	100 years
(ii)	inaccessible drainage elements	100 years
(iii)	bridges and roadway support structures	100 years
(iv)	retaining walls including reinforced soil walls	100 years

(c) Except as specified in Appendix 29, the various Assets must have the following minimum Design Life:

(i)	tunnel and underpass secondary linings	35 years
(ii)	drainage elements that are accessible for refurbishment including building drainage, sedimentation and detention ponds	20 years

(iii)	fixed sign faces	10 years
(iv)	sign support structures	40 years
(v)	roadside furniture, including bridge safety screens	40 years
(vi)	fences	20 years
(vii)	lighting	20 years
(viii)	noise barriers (noise attenuation devices)	40 years
(ix)	Windsor Road and Herring Road ramp pavements	45 years
(x)	Local Road pavements	20 years
(xi)	Reconstructed Local Road pavements	10 years
(xii)	pavement wearing surface - dense graded asphalt	12 years
(xiii)	pavement wearing surface - open graded asphalt	10 years
(xiv)	buildings	50 years
(xv)	mechanical and electrical equipment	20 years
(xvi)	traffic management and control systems	10 years
(xvii)	full width gantries and signposting structures	40 years
(xviii)	temporary works including pavements	2 years
(xix)	other Assets not detailed in sections 5.2 (b) and 5.2(c) above (with the exception of the M2 Motorway Carriageway Widenings) or in Appendix 29	Typical industry values for similar Assets of a high standard and quality.

5.3 TRAFFIC

As a minimum the Project Works must be designed, and constructed to cater for:

(a) the design speeds and posted speed limits specified in Appendix 20;

(b) the design and performance criteria for interchanges and intersections specified in Appendix 19;

(c) the vehicle classifications in Figure 7.1 and Table 7.1 of "Pavement Design – A Guide to Structural Design of Road Pavements" Austroads 2004;

(d) all possible traffic conditions for M2 Upgrade operations;

(e) the design loadings in section 7 of this Scope of Works and Technical Criteria;

(f) personnel movement associated with breakdowns, accidents and other incidents, including incidents that prevent any part of the M2 Motorway and M2 Upgrade from being open to the public for the safe, continuous and efficient passage of vehicles;

(g) access by emergency service vehicles, personnel and plant;

(h) access by maintenance vehicles, personnel and plant;

(i) pedestrian, pedal cyclist and disabled persons movements as detailed in the Environmental Documents;

(j) turning movements of a 25m B double vehicle except as required otherwise by the Environmental Documents; and

(k) integration with the traffic management and control systems operated by RTA's Transport Management Centre.

5.4 INTERCHANGES AND INTERSECTIONS

(a) The design of interchanges and intersections must provide for the traffic movements shown in Appendix 19.

(b) Interchanges and intersections must provide for the levels of service required by the Environmental Documents.

(c) All entry and exit interchange ramps must be provided with kerbed ramp noses.

5.5 AUTHORITIES AND EMERGENCY SERVICES REQUIREMENTS

(a) The Company's Work, the Project Works and the Temporary Works must satisfy the requirements of all relevant Authorities including emergency service providers.

(b) The Project Works must include the necessary infrastructure to provide access for M2 Upgrade operation and maintenance purposes, including responses to Incidents.

5.6 DURABILITY

(a) RTA Technical Specifications have been developed in the context of RTA design guidelines and details.

(b) The Company must make its own assessment of the performance requirements of the M2 Upgrade Project Deed (including this Scope of Works and Technical Criteria) in relation to each Asset, including Asset Items and Asset Sub-Items in terms of:

(i) the micro-environment;

(ii) potential deterioration mechanisms in this micro-environment;

(iii) rate of deterioration;

(iv) the likely material life;

(v) the feasibility and cost of in-situ monitoring, maintenance and/or repair and replacement;

(vi) the necessity of providing additional protection (e.g.. coatings); and

(vii) the significance of failure.

(c) The Company must make its own determination of whether the performance criteria are satisfied by RTA Technical Specifications or the Company's Specifications set out in Appendix 32 or if additional controls are required. The Company must incorporate additional controls necessary to comply with the Agreement. Additional controls must be contained in the Design Documentation.

5.7 EARTHWORKS FORMATION

5.7.1 Embankments

(a) The Company must design and construct the embankments to limit level changes in the pavement as a result of settlement of foundation layers, changes in moisture and compression within the constructed embankment.

(b) The level changes in embankments must be limited to:

(i) no increase in levels after construction of the pavement;

(ii) a maximum decrease in levels of 10 mm over any twelve month period following the construction of the pavement; and

(iii) a maximum decrease in levels of 50 mm following the construction of the pavement until the end of the Term.

5.7.2 Batters

(a) The Company must design and construct excavation and embankment batter slopes so that the slopes do not erode, fret or change shape during the Term.

(b) All new slopes and new batters and slopes and batters affected by the Company's Work must have an Assessed Risk Level (ARL) in accordance with "RTA Guide to Slope Risk Analysis, version 3.1 November 2001" of ARL4 or better following construction.

(c) Material which becomes detached from excavation batters must be prevented from reaching the road shoulder. Prevention measures must ensure that material detached from excavation batters does not result in a consequence which could lead to an Assessed Risk Level of ARL1, ARL2 or ARL3.

(d) Access to the final batter slopes must be available for plant and equipment to allow ready installation of any treatment measures which may become necessary and to facilitate inspection of the face of the batter.

(e) Batters must conform to the design and be constructed within the batter tolerances in RTA Specification DCM R44.

(f) To provide a baseline profile to monitor batter changes, the Company must undertake a survey of the completed batters within 4 weeks of the completion of construction of the adjacent section of pavement.

(g) The design life of the batter remediation works must be 100 years.

5.8 WATER MANAGEMENT

(a) The Company must develop drainage system design solutions which comply with the Environmental Documents and avoid or minimise any potential damage or loss that may result from or be contributed to by water discharge from the Project Site

(b) The Company must provide a drainage system that requires a minimum of maintenance consistent with the need to ensure appropriate water quality discharge from the Project Site.

(c) The drainage system must:

(i) manage both the quality and quantity of stormwater as close to its sources as possible;

(ii) be capable of being partitioned to prevent environmental damage due to a spillage event;

(iii) ensure that additional runoff, stormwater or spillage is not directed onto other roadways outside of the Project Site;

(iv) be designed for ease of maintenance;

(v) be structurally safe in any storm; and

(vi) ensure that flood levels meet the requirements of Clause 5.13 of this SWTC.

(d) Bridge drainage and the Widened Norfolk Road Twin Tunnels drainage must be connected to the road drainage system.

(e) The drainage system must provide for separation of cross drainage from the pavement drainage system.

5.9 PAVEMENTS

(a) Pavements must, as a minimum:

(i) deliver the level of performance specified in Appendix 8;

(ii) have a wearing surface which produces noise levels and tonal noise characteristics that contribute to noise mitigation and compliance with the noise design requirements shown in the Environmental Documents;

(iii) incorporate drainage practices that maintain a constrained moisture regime which prevents significant variations in the capacity of the sub-base and subgrade to support the pavement;

(iv) accommodate movements of the subgrade associated with changes in moisture content (particularly near batters);

(v) accommodate settlement and deformation of the embankments and subgrade resulting from settlement of foundations;

(vi) minimise spray in wet conditions;

(vii) separate surface and subsurface drainage systems to avoid overloading subsurface systems; and

(viii) at all times conform to the surface flow requirements detailed in section 7.12.5 (e) of this Scope of Works and Technical Criteria.

(b) Performance Measures

Pavement performance must be assessed using the traffic mix, volumes and loads identified in Appendix 20, and the following performance measures, as a minimum:

(i) pavement deflection;

(ii) pavement curvature;

(iii) rutting;

(iv) cracking;

(v) roughness;

(vi) skid resistance; and

(vii) texture.

(c) Assessment of performance measures must be based on maximum segment lengths of 100m unless otherwise defined in test or assessment procedures.

(d) The pavement wearing surfaces of structures must comply with the performance requirements of 5.9 (a) (b) and (c) of this Scope of Works and Technical Criteria.

(e) Pavements provided as part of the Project Works must not be cut except as necessary for the installation of traffic loop detectors in asphaltic concrete.

5.10 DELINEATION AND SIGNPOSTING

(a) Delineation and signposting must be appropriate to the climatic, lighting and traffic conditions reasonably expected in the M2 Upgrade, Local Roads and all areas accessible by the public which are affected by the Project Works.

(b) In respect to delineation, the Company must provide:

(i) a high standard of definition of the M2 Upgrade and Local Roads, particularly under adverse weather conditions;

(ii) well sited intersections and interchanges with layouts that clearly identify to motorists the permitted manoeuvres, including those required to enter and exit the M2 Motorway and Local Road;

(iii) clear visibility of merge and diverge areas; and

(c) In respect to signposting, the Company must:

(i) provide signposting in accordance with the Environmental Documents and Appendix 13 and Appendix 48;

(ii) provide regulatory signs including merging traffic and curve advisory signs;

(iii) ensure that all signs are legible to drivers in vehicles travelling at the posted speeds, taking into account the possible range of climatic conditions;

(iv) ensure consistency and compatibility between the signs on the M2 Upgrade and those contained in the M2 Motorway and the surrounding road network;

(v) provide signs associated with warning speed zones, place names, height clearances, feature names and appropriate symbols;

(vi) provide motorists with progressive information (particularly where interchanges occur) and reassurance about the route selected and trip distances involved;

(vii) provide supporting structures, that if located in the design clear zone (refer to section 3.7 of the RTA Road Design Guide) must collapse on impact or be protected using a safety barrier;

(viii) provide signs giving directions for diversion of dangerous goods and over-height vehicles;

(ix) provide signage for pedestrians and pedal cyclists; and

(x) provide signage associated with the operations management and control system and the traffic enforcement systems, including variable message signs and variable speed limit signs.

5.11 TRAFFIC SAFETY

(a) Provision must be made (including through the selection, provision and adoption of appropriate work practices, equipment, infrastructure and operating procedures) for the safe passage and movement of all road users, including pedestrians and pedal cyclists, under all conditions (including the occurrence of, or potential for, traffic congestion within the Widened Norfolk Road Twin Tunnels) and at all times during the Company's Work.

(b) The relevant Authority must approve the use and care of Local Roads by the Company.

(c) As a minimum, all traffic management must comply with the Environmental Documents and RTA Specification DCM G10, traffic management practices set out in relevant Australian Standards and the RTA publication titled Traffic Control at Worksites.

(d) Work practices and equipment must provide for the safe passage of all road users, including public transport, pedestrians and pedal cyclists, at all times during the Company's Work.

(e) The Company must define the traffic and safety management responsibilities of all relevant construction and maintenance staff in regard to all aspects of construction and maintenance.

(f) The Company must carry out road safety audits of all temporary traffic management proposals.

(g) For Local Roads the Company must obtain all required Approvals from relevant Authorities including a Road Occupancy Licence as detailed in Appendix 23 and other relevant Approvals from relevant Authorities prior to implementing any traffic adjustments or interruption. RTA's Representative may order removal or cessation of any activity which causes delay to traffic or threatens the safety of the public, notwithstanding that approval has been given to the traffic change.

5.12 AESTHETICS

(a) The Company must:

(i) design, construct, develop, establish and maintain urban design solutions, which comply with the requirements of the Environmental Documents and Appendix 7; and

(ii) in doing so, incorporate no lesser standards than those provided in Appendix 31.

(b) The Company's urban and landscape design outcomes must provide integrated design solutions for all components of the Project Works, including signage, electrical and mechanical plant and fittings, acoustic controls, communications, traffic management systems and road furniture.

(c) The Company must engage suitably qualified and experienced architectural and landscape designers in the design process from commencement of design.

(d) The Company must ensure that the development of the design is such that appropriate architectural and landscape design is developed for all visible features of the Project Works and that the designs of all visible features are endorsed by the Company's architectural and landscape designers.

(e) The structures, fixtures and fittings required for Services must be coordinated with the Company's urban and landscape design for the Project Works.

5.13 FLOOD LEVELS

(a) The Project Works and the Temporary Works must be designed to minimise changes to afflux and flooding behaviour and the 1 in 100 year average recurrence interval (ARI) flood event must be contained within the flood level limits defined in Clause 20.7 of Appendix 20.

(b) The drainage system must prevent any flooding inside the Widened Norfolk Road Twin Tunnels for a 1:20 year average recurrence interval (ARI) flood event and any flooding inside cycleway underpasses for a 1:2 year average recurrence interval (ARI) flood event

(c) Flood immunity must be provided in accordance with the Environmental Documents.

5.14 TUNNELS AND UNDERPASSES

(a) The Widened Norfolk Road Twin tunnels must comply with the requirements in Appendix 48 and provide for:

(i) the safe and efficient movement of traffic at speeds up to the design speeds set out in Appendix 20;

(ii) a level of service reliability consistent with high quality modern road tunnels servicing heavily trafficked urban areas;

(iii) rapid and effective response to Incidents;

(iv) safe egress for pedestrians from all areas of the Widened Norfolk Road Twin Tunnels and their approaches in the event of Incidents;

(v) the support and preservation of existing infrastructure (including roads, Services and buildings);

(vi) the continuous control of internal air quality to meet the requirements of the M2 Upgrade Project Deed (including this Scope of Works and Technical Criteria), relevant Authorities (including those as set out in any relevant Approvals) and the Environmental Documents, for all traffic conditions; and

(vii) the dispersion of vehicle emissions to provide external air quality that meets the requirements of the M2 Upgrade Project Deed (including this Scope of Works and Technical Criteria), relevant Authorities and the Environmental Documents, for all traffic conditions.

5.15 GROUNDWATER AND SEEPAGE

(a) The Company must ensure that visible retaining structures are impermeable. Visible weep holes are not permitted.

(b) No water must be permitted to drip onto road pavements or walkways in the Widened Norfolk Road Twin Tunnels or under bridgeworks.

(c) Without limiting paragraph (b) above, groundwater inflows into the Widened Norfolk Road Twin Tunnels that cannot be stopped completely must be channelled from roofs and walls to tunnel and underpass drainage systems. The channelling must be easily maintainable and non corrodible.

(d) The Company's Work must limit the affect on the groundwater regime such that there is minimal adverse effect on the natural or built environment.

5.16 OPERATIONS MANAGEMENT AND CONTROL SYSTEM

The Company must provide an operations management and control system, in accordance with the requirements of Appendix 47; to operate and maintain the M2 Upgrade that:

(a) is capable of operating continuously and uninterrupted until the end of the Term;

(b) supplements the existing M2 Motorway surveillance systems;

(c) supplements existing M2 Motorway traffic monitoring and accident and incident management systems;

(d) incorporates a driver advisory system including variable message signs, variable speed limit signs and driver advisory signs;

(e) interface with the M2 Motorway operations and management and control systems;

(f) incorporates centralised traffic management and control functions which must be interfaced with and allow for monitoring from the RTA's Transport Management Centre; and

(g) supplements the existing capability for redirecting traffic as a consequence of traffic conditions.

5.17 M2 UPGRADE RELIABILITY

The Company must carry out the Company's Work such that the M2 Upgrade OMCS Works as defined in Section 47.2 of Appendix 47 has a level of reliability as specified in Section D4 System Integrity Requirements of the SEMP in Appendix 32.

6 PROPERTY WORKS, LOCAL ROAD WORKS AND SERVICE WORKS

6.1 PROPERTY WORKS

(a) The Company must carry out all Property Works arising from the Company's Work including work as may be necessary to satisfy RTA's obligations arising from the Environmental Documents.

(b) The Company must repair any damage to property caused by the Company's Work as soon as possible and at no cost to the owner or occupier of the relevant property. The property must be reinstated to a condition at least equivalent to the condition it was in immediately prior to the occurrence of the damage.

(c) In respect of all Property Works, the consent of the owner and any occupier of each property affected by the Property Works must be obtained prior to any work commencing. The Property Works must be designed and implemented to the standards specified in the Scope of Works and Technical Criteria or, in the absence of any such specification, to reasonable engineering standards and must be fit for its intended purpose. Access to properties affected by the Property Works must be provided by the Company to RTA's Representative at all times while the Company has access to the relevant property.

6.2 LOCAL ROAD WORKS

(a) The Company must carry out the modification, reinstatement and reconstruction of Local Roads as described in section 2.3 of this Scope of Works and Technical Criteria.

(b) The Local Road Works must be designed and constructed in accordance with the standards and requirements specified in this Scope of Works and Technical Criteria and must be in accordance with the requirements of all relevant Authorities.

(c) The Company must carry out the Local Road Works in such a way that it minimises delay and disruption to local and through traffic, including pedestrians, the disabled, pedal cyclists and public transport services, and must maintain access to and minimise disruption to affected businesses, properties and land throughout construction. Appropriate signposting must be provided to assist safe movements and to demonstrate access arrangements.

(d) The Company must communicate its planned processes, solutions and program to the tenants, occupiers and owners of properties that have the potential to be affected by Local Road Works.

(e) The form and finishes of footpaths, land, public areas, street furniture and landscape areas must be constructed at least to the standards specified in Appendix 7, and Appendix 31.

6.3 SERVICE WORKS

(a) The Company must identify all the Services potentially affected by the Company's Work to determine requirements for adjustment, protection and support. This must be undertaken in consultation with the relevant Service owner or Authority.

(b) The Company must identify all Services required for the Company's Work and must do all things necessary to connect such Services to the M2 Upgrade.

(c) The Company must investigate, adjust, protect, support, relocate, and/or provide for all Services that are affected by the Company's Work or required for the Company's Work and the operation and maintenance of the M2 Upgrade whether or not the existence or extent of the existing Services were known prior to the execution of the M2 Upgrade Project Deed.

(d) The Company must ensure that there are no unplanned disruptions to Services resulting from the Company's Work and that planned disruptions are minimised. The Company is responsible for advising local residents and businesses prior to any disruption of any Service.

(e) The Company must arrange and coordinate the relocation of all Services and must ensure that the requirements of each Service owner or Authority are met. The Company must obtain written approval and acceptance of all works to and around any Service from the relevant Service owner or Authority in accordance with Clause 4.1 and Clause 11.6 of Annexure A of the M2 Upgrade Deed.

(f) The Company must approach all relevant Service owners and Authorities to determine whether they require allowance for a provision of future Services on and in any of the proposed M2 Upgrade structures. If so, subject to negotiations between the Company and the Service owner, the Company must adequately provide for such Services and advise RTA's Representative of such negotiations and provisions.

(g) The Company must inform RTA's Representative of the status of the Service owner or Authority arrangements and must arrange for RTA's Representative to attend Service owner or Authority meetings as may be required from time to time.

(h) Maintenance points for Services may be located within the Project Site only with the prior written approval of RTA's Representative.

(i) Records of the location of Services must be maintained throughout the Maintenance Period. Permanent location markers must be provided as required by the relevant owner or Authority. As constructed details of the locations of Services must be provided to RTA's Representative

(j) All Services exposed to view as a consequence of the Company's Work, must be permanently concealed in a manner consistent with the Company's Urban and Landscape Design in Appendices 7 and 31.

7 DESIGN

7.1 GENERAL REQUIREMENTS

7.1.1 General

(a) Without limiting Clause 6 of Annexure A of the M2 Upgrade Project Deed, including this Scope of Works and Technical Criteria, the design of the Project Works and the Temporary Works must:

(i) be generally as shown in the Concept Design subject to such changes as may be necessary to ensure compliance with the M2 Upgrade Project Deed or may be necessitated by any of the factors referred to in Clause 6.1 of Annexure A of the M2 Upgrade Project Deed;

(ii) be fit for its intended purposes; and

(iii) integrate all the design components, including but not limited to;

A. structural design;

B. pavement design;

C. geometric road design;

D. environmental works design;

E. geotechnical design (including foundations, earthworks, subgrade and batters);

F. stormwater and drainage design (both permanent and temporary);

G. safety design (including guardrail and signage);

H. durability design;

I. maintenance specifications;

J. Services design (including lighting, electrical design and Services relocations);

K. urban and landscape design (including landscape);

L. signage, furniture and roadside furniture; and

M. all other elements of the Project Works and Temporary Works carried out by the Company.

(b) The Company must not make any adjustment to the Concept Design which will reduce the:

(i) durability;

(ii) aesthetics and visible features;

(iii) whole of life performance;

(iv) user benefits and/or increase user costs; or

(v) functional performance

of any part of the Project Works.

(c) Except where the provisions of the M2 Upgrade Project Deed specify otherwise, materials, manufactured articles and workmanship must as a minimum conform, to the Reference Documents referred to in section 7.2 of this Scope of Works and Technical Criteria.

(d) All visible elements of the Project Works must have an attractive appearance of no lesser standard than the urban and landscape design requirements of the Project Works as described in Appendix 7 and Appendix 31.

(e) The Project Works must be:

(i) designed so that the M2 Upgrade is contained within the Project Site;

(ii) designed so that road furniture located on the part of the M2 Upgrade is positioned in a way which is compatible, where practical, with other sections of the existing M2 Motorway and surrounding road network; and

(iii) designed and constructed so that the Local Roads comply with the requirements of relevant Authorities, including RTA.

7.1.2 Safety

The Company must consider and address all safety issues and requirements in the development and production of the Design Documentation, including:

(a) hazards involved in the Company's Work, Project Works, Temporary Works and the operation and maintenance of the M2 Upgrade;

(b) occupational health and safety (OHS) legislative requirements, OHS goals and objectives and generic hazards associated with the Company's Work, Project Works, Temporary Works and operation and maintenance of the M2 Upgrade;

(c) health and safety issues, including generic issues, associated with the Company's Work;

(d) hazards which cannot be managed or mitigated by the design and the measures to be adopted in the construction and maintenance phases to manage and mitigate the hazards;

(e) hazards that require the development of specific procedures in the construction and maintenance phases;

(f) health and safety issues related to the on-going repair, maintenance, upgrading and demolition of Assets, including issues related to shoulder widths, bridge widths, accessibility and working in confined spaces;

(g) issues relating to working adjacent to or with live Services, including high voltages, overhead clearances, dangerous excavations and asbestos materials;

(h) the risks identified as part of the risk management process;

(i) the OHS implications of the site layout for the Company's Work, Project Works, Temporary Works and the operation and maintenance of the M2 Upgrade, including the:

(i) positioning of site access and egress points;

(ii) location of site accommodation;

(iii) location of traffic/pedestrian routes;

(iv) safe height work requirements for bridge construction and repair; and

(v) proximity to traffic during the performance of the Company's Work and the operation and maintenance of the M2 Upgrade.

(j) specific site rules that include specific permit-to-work rules and emergency procedures.

(k) health hazards which arise from the materials specified for the Company's Work, Project Works, Temporary Works and operation and maintenance of the M2 Upgrade require precautions either because of the nature of the materials or the manner of their intended use.

(l) health hazards including exposure to hazardous substances (including lime as a stabilising agent, preservatives used on timber materials, removal of lead based paint and asbestos) and those relating to manual handling on site.

The safety issues identified in section 7.1.1 (a) to (j) of this Scope of Works and Technical Criteria must also be addressed in the OHS Development Plan in accordance with the requirements of Appendices 14 and 41.

7.2 REFERENCE DOCUMENTS

7.2.1 General

(a) Subject to the provisions of section 2.14 of this Scope of Works and Technical Criteria, the Project Works and the Temporary Works must meet the standards of RTA and Austroads publications and relevant Australian Standards. Some of these documents are included in the listing of Reference Documents contained in Appendix 9. If suitable Australian Standards do not exist for the design of any element of the Project Works or the Temporary Works, the Company may use international standards that reflect industry best practice, subject to the written approval of RTA's Representative; and

(b) Notwithstanding any other requirements in this Scope of Works and Technical Criteria, the design of the Project Works and the Temporary Works must comply with the requirements of Appendix 19 and Appendix 20.

7.2.2 Order of Precedence

Unless otherwise stated, the following order of precedence must apply in the event of any inconsistency, ambiguity or discrepancy within Reference Documents (Appendix 9) and Reference Documents and other specifications and standards:

(a) any specific provisions in the M2 Upgrade Project Deed

(b) RTA publications,

(c) Austroads;

(d) Australian Standards;

(e) Standards Australia handbooks; and

(f) Other reference documents and standards.

7.2.3 Standard Units

Unless otherwise specified, SI units must be used on the Project Works and in all Design Documentation.

7.2.4 Design Datum

Design datum, design and Design Documentation must be in accordance with section 4.4.1(d) of this Scope of Works and Technical Criteria.

7.3 AESTHETICS

(a) The urban and landscape design must;

(i) be consistent with the urban and landscape design concepts contained in the Environmental Documents;

(ii) comply with the requirements of Appendix 7; and

(iii) be generally as shown in the Company's Urban and Landscape Design in Appendix 31.

(b) The development of urban and landscape design solutions must be integrated into a cohesive urban and landscape design that incorporates good design practice.

(c) New structures of the same type as the existing adjacent structure must match the appearance and method of construction of the existing adjacent structures.

(d) New retaining structures must be aesthetically pleasing and form an integral part of the total design theme.

(e) On all exposed concrete surfaces on structures, including Type F barriers:

(i) the finishes and colour must be uniform;

(ii) form tie holes must be aligned in a uniform pattern;

(iii) patching of Defects must match the appearance of the remainder of the surface; and

(iv) external barriers on bridge structures must not be slip formed.

(f) The architectural design of all visible Service structures, including substations, exhaust fan houses and stacks, must be consistent with the architectural style of the surrounding landscape.

(g) Exposed rock batters must have neat, stable and uniform slopes. Exposed rock beneath structures must have continuous slopes and not be benched.

(h) Services and fixings within the Widened Norfolk Road Twin Tunnels, such as mechanical plant, lighting, cable trays, hangers, pipes, signs and cameras, must be above the top level of tunnel wall linings and tunnel portals.

(i) Lighting under new bridges must be fixed directly to the soffit of the bridge and not suspended below the soffit.

(j) All services, roadside furniture, signposting, plant and equipment within the Widened Norfolk Road Twin Tunnels and at the portals, including variable message signs, variable speed limit signs, access ladders and antennae, must be incorporated into and integrated with the overall urban and landscape design.

(k) Sign gantries must be incorporated into and integrated with the urban and landscape design concept.

(l) All electrical switchboards and substations must be integrated with the urban and landscape design.

(m) Barriers and walls must be selected and designed to fit where possible with the prevalent and high quality barrier style of the locality. Where a chain mesh fence type is used, mesh and posts must match existing.

(n) All new grassed areas that are open to the public such as adjacent to footpaths and cycleway must be turf.

(o) Fixings and panel joints for precast panels must be aligned and uniformly spaced according to the intent of the Urban Design.

7.4 ENVIRONMENTAL CONSIDERATION FOR DESIGN

The design must be developed for the Project Works, considering:

(a) erosion, sedimentation and water quality infrastructure;

(b) provision for groundwater movements;

(c) fish friendly structures , including waterway design;

(d) management and mitigation measures for environmentally sensitive areas, including marine environments; and

(e) construction and operational noise measures.

The design must be developed in consultation with appropriate agencies and in accordance with the requirements of Appendix 4 and RTA Specification DCM G36.

7.5 M2 UPGRADE CLASSIFICATION

The M2 Upgrade forms part of the M2 Motorway and must be regarded as a freeway as defined in AS1348.1 -1986.

7.6 TRAFFIC SEPARATION

(a) Median barriers must be used in road and bridge medians where the median width (between edges of traffic lanes) is less than 13 metres. Adequate sight distance must be provided.

(b) Unprotected ends of concrete barriers and railings, bridge piers and other solid objects are not permitted within the design clear zone.

7.7 BRIDGEWORKS AND OTHER STRUCTURES

7.7.1 General

(a) This section 7.7 covers the requirements for the design of structural aspects of the Project Works and Temporary Works, including:

(i) bridges;

(ii) tunnel and tunnel structures;

(iii) overpasses and underpasses;

(iv) sign support structures;

(v) retaining walls and other associated structures;

(vi) noise walls; and

(vii) major components of drainage.

(b) The Company must provide Bridge Inventory Details to RTA in accordance with the requirements of Appendix 12.

(c) For each bridge, the Design Documentation must include design summary drawings and bridge load ratings sufficient to assess the bridge's ability to accommodate wide, high and/or heavy loads.

7.7.2 Structural Design Objectives

(a) Structural design must conform to a high level of technical competence and must incorporate the most appropriate technology available.

(b) All new bridges, ramps, culverts and underpasses on the M2 Upgrade must be designed for the loadings contained in Section 6 of AS 5100.2. The structures must be designed and detailed to ensure an economic life of 100 years in accordance with AS 5100.1 Bridge Design (Part 1), section 6.2.

(c) New bridge decks must be continuous between abutments with deck joints located only at the bridge abutments.

(d) All modifications and changes to existing, bridges, ramps, culverts and underpasses must be designed for the traffic loadings contained in Section 2 of the Austroads 1992 Bridge Design Code.

(e) The deck widening of the Darling Mills, Yale Close, Devlin's Creek, Terry's Creek, Christie Road and Khartoum Road bridges must be structurally integral with the existing bridge superstructures to form a single structure. The location of transverse movement joints for the bridge widening structures must match the location of the transverse movement joints in the existing bridge structures.

(f) The widening of the Windsor Road bridge on the western side of the existing bridge may be structurally separated from the existing bridge.

(g) Bridge widening structures must match with the spans, piers, profile and type of construction of the existing bridge structures and comply with the requirements specified in Appendix 20.

7.7.3 Engineering Standards

(a) Design Reference Documents

The design of structural works, including tunnel structures and bridges, must be in accordance with the Reference Documents in Appendix 9 and the additional requirements identified in Appendix 20. The Company must design structures, including tunnel structures where applicable, to comply with the RTA Bridge Technical Direction Manual which contains design and design detailing requirements that are additional to the requirements of Australian Standard AS 5100, Bridge Design, Parts 1 to 7 inclusive, and other relevant Australian Standards and Codes, except as noted in section 7.7.2 of this Scope of Works and Technical Criteria.

(b) Application of AS 5100, Bridge Design, Parts 1 to 7 inclusive.

(i) AS 5100.1, Section 6.2: Design Life

The bridges, tunnel, drainage and retaining structures must be designed and detailed to ensure the design lives detailed in section 5.2 of this Scope of Works and Technical Criteria.

(ii) AS 5100.1, Section 9.7: Vertical Clearance

The minimum vertical clearance for structures must be in accordance with section 7.10.4 of this Scope of Works and Technical Criteria.

(iii) AS 5100.1, Section 10: Road Traffic Barriers

RTA standard bridge safety barriers, or other safety barrier systems complying with part 6 of RTA Road Design Guide, must be provided at locations determined in accordance with the procedures given in that part of the Road Design Guide, New safety barriers or systems must be of the same type as the adjoining and/or connecting existing safety barriers or systems to the maximum extent possible.

(iv) AS 5100.1, Section 14: Drainage

The drainage system must be designed so that the amount of water which flows across deck joints is minimised. Water leaking from the Widened Norfolk Road Twin Tunnels and approach structures must be collected at the wall and prevented from flowing across the pavement surface. Free draining scuppers through decks must not be used. All pipework for structure drainage must be corrosion and fire resistant and must be concealed from all public view except from directly underneath or as otherwise required in Appendix 7. All drainage structures must be readily accessible for cleaning and maintenance purposes.

(v) AS 5100.4, Section 7.4 Provision for Replacement of Bridge Bearings

The superstructure and substructure of bridges must be designed to allow for jacking of bridge superstructures for the future replacement of bridge bearings. Jacking points must be located at the top of the bridge piers and abutments and the design of the bridges must allow for jacking under traffic. The location of the jacking points and the associated maximum jacking loads must be addressed and detailed in the Design Documentation.

(vi) AS 5100.4, Section 17: Deck Joints

For small movement joints where the movement range is less than or equal to 10 mm, the joints must be detailed in accordance with RTA standard drawing No. RTAB035A. For small to medium movements, prefabricated rubber extrusion type joints between heavy reinforcing angles must be used. For larger movements, free draining, finger plate type joints must be used, except where the bridge can be used by cyclists, in which case joints that meet the cycle test of AS 3996 (such as multi element joints) must be used. In all cases bonded steel/rubber type joints must not be used.

Where finger plate type joints are used, adequate measures, including drainage, must be taken to prevent water or other liquids from staining any pier or abutment, causing any damage to any bearing or restraint or causing corrosion or deterioration to concrete or metal surfaces.

Where modular expansion joints are used, adequate space must be provided in the voided zone under the expansion joints to permit future inspection, maintenance and replacement of the individual components of the modular expansion joints.

Joints must not inhibit the proper placement of concrete and must have adequate provision for maintenance and inspection access. Joints must be detailed and constructed such that the noise generated by traffic crossing the joint is kept to a minimum.

Steel cover plates must be provided at deck expansion joints, to cover openings in traffic barriers, where the maximum opening in the traffic barriers is equal to

or greater than 60 mm under ultimate limit state conditions. The openings in the traffic barriers must be measured in the longitudinal direction of the bridge. Steel cover plates must not be less than 10 mm thick and must cover both the inside face and the top of the traffic barriers. The faces of traffic barriers must be recessed such that the exposed faces of the steel cover plates and the traffic barriers are on the same plane.

(vii) AS 5100.4, Section 17.3.2: Deck Joints – Design Load

Modular expansion joints and their associated anchorages must be designed for the load cases contained in RTA Specification DCM B316.

For deck joints other than modular expansion joints, the joints and their associated anchorages must be designed for the load cases contained in Section 17.3.2 of AS 5100.4.

(viii) AS 5100.4, Section 17.6: Specific Provisions for Modular Deck Joints

Modular deck joints must be designed, fabricated and installed in accordance with RTA Specification DCM B316.

(ix) AS 5100.5, Section 4.10.3: Cover for Corrosion Protection.

References to concrete cover to steel reinforcement in standard RTA bridge drawings and in the RTA Bridge Technical Direction Manual refers to "nominal" cover as defined in section 4.10.3.1 of AS 5100.5 unless stated otherwise. Concrete covers in the design of reinforced concrete structures must be given as nominal covers in accordance with section 4.10.3 of AS 5100.5.

7.7.4 Durability

(a) General

Durability standards and guidelines for the various materials and components used in all permanent structures must be in accordance with sections 2.14 and 5.6 of this Scope of Work and Technical Criteria, AS 5100, Bridge Design (Parts 1 to 7 inclusive) and amendments, RTA Bridge Technical Direction Manual and the requirements of RTA Specification DCM B80 and the additional requirements in section 7.7.4(b) of this Scope of Works and Technical Criteria.

(b) Additional Requirements

(i) Materials, components and processes for all parts of the Project Works must provide the required durability for each element of the works.

(ii) The durability standards and guidelines for all structures with a design life greater than or equal to 40 years must be in accordance with AS 5100, Bridge Design (Parts 1 to 7 inclusive) and amendments, RTA Bridge Technical Direction Manual and must meet or exceed the requirements of the appropriate RTA Specifications.

(iii) Durability design for concrete structures with a design life equal to or exceeding 40 years must be in accordance with AS 5100, Bridge Design (Parts 1 to 7 inclusive) and amendments, RTA Bridge Technical Direction Manual and the requirements of RTA Specification DCM B80 or RTA Specification DCM B80(SS) with the following additional requirements:

A. Dense, durable high strength concrete must be used. The minimum strength concrete to be used must be 40 MPa, except for blinding or mass concrete. The concrete must contain between 20% and 25%

approved fly ash (by mass of cementitious). Fly ash shall conform to AS 3582.1 and shall be obtained from an approved source. Only Fine Grade fly ash shall be used as defined in Table 1 of AS 3582.1. Fly ash shall be sued in accordance with AS 3582.1. Fly ash shall have a maximum total alkali content of 2% and a maximum available alkali content of 0.5% (Na2O equivalent).

B. Concrete mix design must include design for the prevention of the deleterious effects of erosion, delayed ettringite attack, acid attack and sulphate attack as applicable.

(iv) Provision must be made for possible future cathodic protection of all concrete in accordance with the requirements of RTA Bridge Technical Direction BTD 2008/13.

(x) Special measures must be taken to minimise the possible deleterious effects of heat of hydration in thick concrete sections, including for example the use of blended cements, cooling the concrete during curing, insulated forms and the use of larger aggregates. Thermocouples and insulated forms shall be installed if the expected temperature differential from centre to outside is greater than 15 deg C.

(xi) The durability of reinforcement in Asset Item and Asset Sub Items which incorporate soil reinforcement techniques must comply with. the requirements of RTA Specification DCM R57.

(xii) Exposed steelwork must be either:

A. of suitable grade to resist corrosion; or

B. protected by a high grade protective coating having a minimum maintenance free life of 15 years. At the end of the maintenance free life, the coating must remain soundly adhered to the steel substrate and must be suitable for overcoating without removal. Lead based coatings, chlorinated rubber based coatings and alkaloid based coatings must not be used. The re-coating must have a minimum maintenance life of 15 years.

(xiii) Structures must be designed to readily enable items such as bearings (except elastomeric strip bearings conforming to RTA Specification DCM B280), expansion joint seals, railings and drains to be maintained or replaced. Structures must be designed to enable all steel coatings to be maintained.

(xiv) Where an item is not readily accessible for maintenance or replacement, it must be designed so that it will function for the life of the structure without maintenance.

(xv) Protection against stray electrical currents must be provided.

(c) Classification of Concrete in Potential Acid Sulphate Soils (PASS)

Based on the testing of the soil pH and the SO4- - of the water, the concrete exposure classification for structures must be determined from the following Table 7.7.4.1. If the exposure classification is B2, there are no special requirements for the concrete structures. If the exposure classification is C, C* or C1, the special requirements detailed in Table 7.7.4.2 (maximum water/cement ratio and minimum cementitious materials content) must be applied to the concrete structures.

SO_4 in water (mg/l or ppm)	Acidity (pH)			
	< 3.5	3.5 to 4.5	4.5 to 5.5	> 5.5
< 1500	C1	C*	C	B2
1500 to 3000	C1	C*	C	B2
3000 to 6000	C1	C1	C	B2
> 6000	C1	C1	C1	C

Table 7.7.4.1 Concrete Exposure Classifications for Concrete Structures in PASS

Notes:

(a) Exposure Classifications B2 and C are as defined in AS 5100 – Bridge Design.

(b) Classification C1 = C plus full isolation of the concrete surface exposed to the aggressive environment.

7.7.5 Bridge Approach Slabs

Bridges must be provided with adequately designed and suitably proportioned approach slabs. The design of bridge approach slabs must be in accordance with RTA Bridge, Bridge Policy Circular BPC 2004/10. In fill areas provision must be made to jack the bridge approach slabs after any settlement occurs. The methodology for re-levelling of bridge approach slabs after settlement occurs must be included in the Maintenance Plan.

7.7.6 Not Used

7.7.7 Anti Graffiti Coatings

Publicly accessible surfaces of all structures, tunnel linings, noise walls, walls, barriers, doors, louvres and other features must be treated with non-sacrificial anti graffiti coating in accordance with the following requirements:

(a) the anti graffiti coatings must match the adjacent surface and the colour and appearance of the structure must not be altered by the application of the coating;

(b) treatment of the surfaces must be to a minimum height of 3 metres above surrounding reinstated ground levels or any accessible footholds; and

(c) to protect surfaces prior to applying the permanent anti graffiti coating, the Company may use a sacrificial coating provided that it in no way interferes with the adhesion of the permanent coating.

The design of all structures, tunnel linings, noise walls, walls, barriers, doors, louvres and other features must consider and address the aesthetic impact of anti graffiti coatings on the element, the structure and the family of structures.

7.7.8 Safety Screens

(a) Safety screens must be provided on new bridges and existing bridges in accordance with Technical Direction TD 2002/RS02 (Policy for Safety Screening of Bridges), section 31 of the RTA's Structural Drafting and Detail Manual and Appendix 7. Notwithstanding the requirements of section 31.3 of the Structural Drafting Manual, all joints in the safety screen mesh panels in the longitudinal direction of the bridge must be located at the safety screen posts

7.7.9 Hydrology

The Company must perform a hydrology study for each new structure and modified existing structures including bridges, tunnel and approach structures, major drainage structures and major retaining walls that include:

(a) Serviceability effects of afflux on adjacent properties and the stability of the adjacent road embankment - 100 years average return interval;

(b) Ultimate limit state of bridges, Widened Norfolk Road Twin Tunnels and approach structures, major drainage structures and major retaining walls - 2000 years average return interval; and

(c) Ultimate effects of the M2 Upgrade on regional flooding - Probable Maximum Flood.

7.7.10 Geotechnical Studies for Structures

(a) The Company must undertake a geotechnical and foundation study for each new structure and modified existing structures in the Project Works and the Temporary Works and for each existing structure that may be affected by the Project Works and the Temporary Works.

(b) This study must;

  (i) be sufficient to identify and provide all the information required to design, construct and maintain each new structure and to preserve and protect existing structures;

  (ii) encompass the structural adequacy, long term deformation and durability of the foundation, including the effects of the placement of fill in embankments near or adjacent to structures; and

  (iii) predict the in-situ ground movement, structural movement and groundwater movement.

(c) If, during the course of the Company's Work the actual conditions vary from those predicted in the Design Documentation, the Company must treat that variance as a non-conformance in accordance with sections 3.1.5 and 3.1.6 of this Scope of Works and Technical Criteria.

7.7.11 Girder and Plank Bridges

(a) Stepped or half-joints must not be used in new bridge superstructures.

(b) Precast concrete or steel bridge girders must be supported on bridge bearings:

  (i) The minimum requirements for steel reinforcement in link slabs for both girder and plank bridges must be as detailed in RTA Standard Drawing RTAB034.

7.7.12 Not Used

7.7.13 Not Used

7.7.14 Stainless Steel Dowel Bars

Stainless steel dowel bars must be provided where bridge approach slabs are connected to bridge abutments and in other situations where the dowel bars are acting structurally, including horizontal restraints between the bridge substructure and the bridge superstructure. Stainless steel dowel bars must be Grade 304 conforming to AS 2837.

7.7.15 Installation of Elastomeric Bearings

The installation of elastomeric bearings supporting concrete bridge girders must comply with the requirements of RTA Bridge Policy Circular BPC 2005/03. Recesses to the underside of the girders to fix the top of the elastomeric bearings must not be used.

7.7.16 Reinforced Concrete Piles with Column Extensions

Reinforced concrete piles that support single column extensions must have diameters greater than the diameters of the column extensions to account for construction tolerances when installing the piles. The outside faces of the column extensions must be located within the outside faces/perimeters of the supporting piles. The diameters of the supporting piles must be at least 200 mm greater than the diameters of column extensions. The construction joints between the tops of the supporting piles and the bottom of the column extensions must be located at least 500 mm below the constructed ground levels for columns.

7.7.17 Application of the RTA Structural Drafting and Detailing Manual

The reference numbers referred to in this section 7.7.18 refer to section numbers used in the RTA Structural Drafting and Detailing Manual and are prefixed with SDM to signify Structural Drafting and Detailing Manual. For example: SDM4.2 refers to section 4.2 in the RTA Structural Drafting and Detailing Manual. The design must comply with the RTA Structural Drafting and Detailing Manual, including

(a) SDM1.0
Structural drawings for the M2 Upgrade and Local Roads must conform to the drafting practices described in the Austroads Report, Guide to Bridge Technology – Part 5 : Structural Drafting and must clearly identify the design requirements.

(b) SDM3.8
Each set of structural drawings must have a "Registration Number of Plans". Registration Numbers of Plans will be provided by RTA's Representative.

(c) SDM17.1
A locality plan must be provided on the cover sheet of each set of structural drawings. The details provided on the locality plan must be as specified in the RTA Structural Drafting and Detailing Manual.

(d) SDM20.0
In accordance with section 1.2 of AS 5100.2, the cover sheet of the set of drawings for each bridge must state all the loads for which the bridge has been designed. In addition to the design loads, the cover sheet must state the Bridge Earthquake Design Category (BEDC) and the three components that determine the BEDC, namely the acceleration coefficient, the site factor and the bridge classification.

(e) SDM23.0

The detailing of the steel reinforcement on drawings must conform to the requirements stated in the RTA Structural Drafting and Detailing Manual. In particular, bar shapes for reinforcement must be provided.

7.7.18 Design of Bridge Abutments Affected by Embankments

(a) For abutment piles, displacement restraint and rotational restraint at the pile head must be minimised to reduce the internal pile forces (bending moments, shear forces) induced by lateral soil movement. Downdrag (negative skin friction) effects due to settlement on piles must be allowed for in the design of such piles together with methods to reduce such effects.

(b) For bridge abutments, the maximum lateral soil movement after the construction of abutment piles must be no greater than that designed in advance of construction. The design and prediction of soil movement must be undertaken by a recognised geotechnical engineer.

7.7.19 Traffic Barriers for Bridges

(a) Traffic barriers (parapets) on all bridges must contain, as a minimum, one 100 mm inside diameter UPVC, SWV pipe ducts and suitable fittings to AS 1415 for future utilities in addition to any ducts that may be required for lighting. For crossings that consist of twin bridges, utility ducts need only be provided in the outside parapets of each of the bridges i.e. those parapets located furthest from the median.

(b) Traffic barriers on all bridges must be designed as medium performance level barriers in accordance with the requirements contained in Appendix 20.

(c) Cyclists must be considered in determining the height of the bridge traffic barriers.

7.7.20 Sign Structures

(a) Signs must incorporate structures that satisfy the requirements of test 3-60 of the US National Cooperative Highway Research Program – Report Number 350 (NCHRP350). If structures are not designed to collapse, protection must be provided in accordance with part 6 of the RTA Road Design Guide.

(b) Sign structures must comply with RTA Specification DCM R143 and documents referred to therein, including AS1170.2 for wind loading. The wind loads as specified in AS/NZS1170.2 take precedence over the wind loads specified in the Australian Bridge Design Code.

(c) Sign structures must be designed for fatigue in accordance with Section 11 of AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals 4th Edition 2001 with Interims to 2006. The natural wind gust fatigue loading must be taken to act normal to the sign.

(d) The criteria for the design of traffic signs are included in Appendix 20

7.7.21 Utility Provisions on Bridges

Subject to the requirement in Clause 6.3(f), the Company must accommodate and provide for existing and future Services within and on the bridges.

7.7.22 Soil and Slope Structures

In addition to the requirements of 7.7.1 to 7.7.19 of this Scope of Works and Technical Criteria the design of reinforced soil walls and reinforced soil slopes, including soil nail walls, must comply with the following requirements:

(a) Reinforced soil wall structures must be designed in accordance with RTA Specification DCM R57;

(b) Reinforced soil and slope structures, including soil nail walls and slopes, must be designed in accordance with BS 8006;

(c) The design must address all drainage issues associated with the structure, including the provisions for cleaning and maintenance of the drainage infrastructure;

(d) The design must incorporate suitable free draining backfill and/or drainage systems to ensure there is no build up of water pressure behind the structure;

(e) Structures supported by reinforced walls or strengthened soil structures must be designed to accommodate all movements resulting from settlement and creep of the reinforced walls or strengthened soil structures;

(f) Dead loads due to the retaining wall weight and all superimposed dead loads, including those from other structures, must be determined and used in the design;

(g) Assessment of foundation conditions must be detailed in design calculations and geotechnical models and must be reported in the Design Documentation. The factor of safety in the design must be selected to ensure that the structure does not suffer from long term distortion or failure of the foundation;

(h) The design of structures must consider and address, but not be limited to, the following geotechnical failure mechanisms, both internal and external to the structure:

  (i) Ultimate Limit States:

    A. Bearing failure;

    B. Sliding; and

    C. Slip failure.

  (ii) Serviceability Limit State:

    A. Settlement, tilting, eccentricity, rotational and lateral movement; and

    B. Slip failure.

(i) The following load combinations must be considered and addressed in the design:

  (i) Load Combination A — Loads applicable during construction;

  (ii) Load Combination B — Maximum values of all loads, excluding earthquake effects;

  (iii) Load Combination C — Maximum overturning loads with minimum gravity loads, excluding earthquake effects;

  (iv) Load Combination D — Dead loads with partial live loads, earthquake and differential settlement effects;

(v) Load Combination E Maximum overturning loads with minimum gravity loads, partial live loads, earthquake and differential settlement effects;

(vi) Load Combination F Dead and live loads with mining subsidence/ differential settlement effects at the serviceability limit state.

(j) Soil nails must be designed to have:

(i) a minimum design life of 100 years in accordance with section 5.2(b); and

(ii) double encapsulation consisting of, as a minimum:

A. steel reinforcement bar which must be hot-dipped galvanised to AS4680, except that a minimum average coating weight must be 600 g/m2 (85 microns);

B. corrugated plastic sheath which must be made from high density polyethylene in accordance with AS 4130 and have a minimum uniform wall thickness of at least 2.0mm; and

C. grouting within the corrugated plastic sheath must extend for the full embedded length of the corrugated plastic sheath.

7.8 LIGHTING

7.8.1 General

(a) Lighting is not required on the Widened M2 Motorway Carriageways. Street lighting must be provided for interchanges, ramps, intersections, roundabouts and Local Roads.

(b) Lighting must be provided at interchanges, ramps, intersections, roundabouts and Local Roads in or affected by the Project Works in accordance with AS/NZS 1158 - 2007 "Code of Practice for Public Lighting" and RTA Specification DCM R151 and RTA Specification 3851. The lighting must be continuous.

(c) All wiring, except that internal to poles, must be underground and must be installed in accordance with AS 3000-2007 "Electrical Installation-Buildings, Structures and Premises (SAA Wiring Rules) and any further requirements of relevant Authorities. Heavy duty rigid conduit to AS 2053 (current) "Conduits and Fittings for Electrical Installations" must be used throughout.

(d) Low loss control gear must be used.

(e) The design of lighting must ensure that light spillage into residential and commercial properties and other sensitive areas are avoided.

7.8.2 Local Roads

(a) Lighting must be provided on Local Roads and to all other areas accessible to the public, which are affected by the Project Works and Temporary Works. This lighting must be designed and installed by the Company to be compatible with existing lighting systems and standards.

(b) Lighting design and construction must comply with the requirements of relevant Authorities, including local councils, and the Company must liaise with the relevant Authorities and local councils to ensure acceptance of the lighting design.

(c) Where existing street lighting is modified, the final lighting must not result in a standard of lighting less than that existing prior to the modifications and must comply with AS/NZS 1158:2007 Lighting for roads and public spaces.

7.8.3 Lighting for Bridges

(a) Lighting on new bridge structures must be from the side of the deck with poles aligned behind the bridge rail.

(b) Lighting must be installed on the underside of the bridges where required.

7.8.4 Lighting for Underpasses

(a) Underpass lighting must comply with a category P10 of AS/NZS 1158.3.1:1999 (Road Lighting Part 3.1: Pedestrian Area (Category P) lighting – Performance and installation design requirements).

(b) Light fittings must be vandal proofed or housed in vandal-proofed enclosures. Enclosures must not affect lighting performance of the luminaires.

7.8.5 Herring Road, Christie Road and Windsor Road Interchange Lighting

(a) Lighting installation must be carried out in conformance with Category V3.

(b) For road lighting maintenance criteria monthly intervals for maintenance must be stated.

(c) The point of supply must be negotiated with the supply Authority

7.8.6 Widened Norfolk Road Twin Tunnels Lighting

7.8.6.1 General

(a) The Widened Norfolk Road Twin Tunnels lighting must be in accordance with AS/NSZ 1158.5 "Lighting for roads and public spaces Part 5: Tunnels and Underpasses". Counter beam lighting must not be used in any part of the tunnel.

(b) A minimum of six stages of lighting levels with automatic luminosity control must be provided with the lowest level being for night time conditions and the highest level for bright sunshine conditions.

(c) The stages of tunnel lighting must be designed for an access zone luminance relevant to the tunnel entry portal and lighting levels in the various zones must be controlled by the operations management and control system and adjusted as the conditions outside the tunnel vary. Photometers must be used to measure the luminance at the tunnel portals and be interfaced to the operations management and control system to control required lighting levels within the various zones inside the tunnel.

(d) The lighting system must consist of longitudinal spaced rows of HPS luminaires.

(e) Super high pressure sodium lamps must be used in the HPS luminaires.

(f) Lighting must be designed for the design speeds identified in section 20.1.7 of Appendix 20.

(g) Lighting must be located in the tunnels so that replacement of tubes and discharge lamps can be undertaken without total closures of a carriageway or a ramp.

(h) The visual impact at tunnel portals of cable trays supporting luminaires and cables must be addressed in the urban and landscape design. Luminaires and their supports must not be located within one metre of tunnel portals.

7.8.6.2 Luminaires

(a) All luminaires, including all accessories, must be manufactured for the specific purpose of lighting road tunnels and must comply with the requirements of AS/NZS60598.1:2003 - Luminaires - General requirements and tests. The refractor of luminaires must be safety glass.

(b) The luminaires must be vandal resistant, corrosion proof, robust and to a minimum standard of IP 65 to AS 1939 "Degrees of Protection Provided by Enclosures for Electrical Equipment".

(c) Any screws and catches must be made captive. Other items that require removal or opening for maintenance purposes, including refractors, must be firmly attached to the body of luminaires when the luminaires are opened, with provisions for removal. All toggles, catches, hinges and screws must be grade 304 stainless steel. Sharp edges must be avoided. Gaskets must be synthetic rubber and must be temperature resistant, damp proof, non ageing and resistant to the atmosphere in the tunnels.

(d) Where twin (or more) lamp luminaires are provided, lamps must be switched during periods of low lighting levels to ensure that the cumulative average burning time for each lamp is approximately the same.

(e) The lighting system must comply with AS 3168 "Approval and Test Specification Fluorescent Lamp Ballasts" for the limitation of harmonic feedback and AS/NZS 1044 "Limits and Methods of Measurement of Radio Interference characteristics of Household Electrical Appliances, Portable Tools and Similar Electrical Apparatus" to ensure electro magnetic radiation will not affect any radio rebroadcast system that may be installed in the Widened Norfolk Road Twin Tunnels. As well as radio rebroadcast systems, emitted electromagnetic radiation from the lighting system must not affect other similar systems in or around the Widened Norfolk Road Twin Tunnels.

7.8.6.3 Galleries and Escape Passages

Lighting (with uninterruptible power supply back up) must be provided in all service galleries, emergency egress galleries and passages.

7.9 EMERGENCY STOPPING BAYS AND EMERGENCY TELEPHONES

Emergency stopping bays must be provided in accordance with the requirements of Appendix 20.

Emergency telephones must be installed:

(a) at the emergency stopping bays;

(b) at the emergency points in the Widened Norfolk Road Twin Tunnels; and

(c) in accordance with the requirements for emergency telephones detailed in Appendix 27 and for motorist emergency telephone systems detailed in Appendix 47.

7.10 GEOMETRIC DESIGN REQUIREMENTS

7.10.1 General Standards and Applications

(a) The geometric design of the Project Works must be fit for its intended purpose. The design of the M2 Upgrade must be such that it forms an integral part of the M2 Motorway in visual and functional respects.

(b) The M2 Upgrade and Local Road Works must comply with the RTA Road Design Guide and the requirements of section 7.10 of this Scope of Works and Technical Criteria and Appendix 20.

(c) Sections 2 and 3 of the Road Design Guide must be used as the basis of design.

(d) Posted speeds on the M2 Upgrade and Local Roads must be as detailed in Appendix 20.

(e) The road geometry design must be integrated with the urban and landscape design to gain benefits from the views and to reduce the adverse affects of glare from sunlight and opposing vehicle headlights.

(f) Except as identified in Appendix 20, the clearance between the road formation and the Project Site boundary must be a minimum of 3 metres.

(g) The M2 Upgrade must connect to and match the geometric design of the existing M2 Motorway, in accordance with the design criteria shown in Appendix 20.

7.10.2 Horizontal Alignment

(a) Section 2 of the RTA Road Design Guide must be used to determine superelevation values, lengths of transition curves, co-ordination of superelevation transition with plan transition and minimum curve deflection angles. Plan transitions are not required when the radial shift is less than 0.15 metres.

(b) Plan transitions are not required for horizontal curves on the widened M2 Motorway carriageways.

(c) Compound curves and broken back curves must be avoided on the widened M2 Motorway carriageways. Where compound curves are unavoidable the ratio of the large radius to the small radius must be at least 1:0.75. Increasing radius compound curves on one-way carriageways are acceptable.

(d) Reverse horizontal curves are only allowed when the minimum length measured between adjacent curve tangent points is equal to or greater than the design speed expressed as metres.

7.10.3 Vertical Alignment

The vertical alignment of the Widened M2 Motorway Carriageways and Local Roads must comply with the requirements of Appendix 20.

7.10.4 Cross Section and Clearances

(a) Subject to section 7.10.4 (c) below, the design of the Project Works must comply with the cross section dimensions and clearances in Appendix 16 and Appendix 20.

(b) Notwithstanding the working widths in the Road Design Guide, the Project Works must comply with the working widths shown in sketch no. "WW" in Appendix 20.

(c) The cross section dimensions and clearances in paragraph (a) above must be adjusted to comply with the requirements of the RTA Road Design Guide, including sight distances, widening on curves and working widths, to meet the clearance requirements to all Assets, including Service installations.

(d) The minimum vertical clearances for the Project Works, from the surface of roads and shoulders to the soffits of structures, or underside of plant, equipment or fittings, must comply with the vertical clearances nominated in Appendix 20.

(e) The minimum vertical clearances for the Temporary Works, from the surface of roads and shoulders to the soffits of structures, or underside of plant, equipment or fittings, must be 4.6m.

7.10.5 Local Roads

(a) Horizontal and vertical alignment of Local Roads must be of similar standard to existing roads. All Local Roads must have a sealed wearing surface.

(b) The cross sections of Local Roads must comply, as a minimum, with the requirements of Appendix 20.

7.10.6 Interchanges

(a) Interchanges must be designed in accordance with the design criteria shown in Appendix 19, Appendix 20 and "Grade Separated Interchanges – A Design Guide" NAASRA 1984

(b) Entry and exit ramps must be in accordance with Appendix 19 and Appendix 20.

7.11 Functional M2 Upgrade Design Requirements

7.11.1 Cross Carriageway Access

(a) Emergency cross carriageway facilities must be provided to allow the transfer of traffic between eastbound and westbound carriageways at the Widened Norfolk Road Twin Tunnels. Emergency cross carriageway facilities must be located immediately outside each Widened Norfolk Road Twin Tunnels portal and provide for turning of an Austroads single unit truck/bus between either carriageway to the opposite direction of the other carriageway.

(b) Emergency cross carriageway facilities must be located to achieve sight distances that provide for the safe use of each facility.

(c) The emergency cross carriageway facilities are for maintenance and Incident management, not for unrestricted use, and must be designed and signposted accordingly

7.11.2 Noise Mitigation and Structures

(a) Noise mitigation measures and structures must be provided in accordance with the requirements of the Environmental Documents.

(b) The design of noise barriers must be in accordance with the requirements of the RTA Specification DCM R271 "Design and Construction of Noise Walls", must comply with Appendix 20 and must be integrated with the urban design.

(c) The noise design must comply with the requirements of section 20.6 of Appendix 20.

7.11.3 Connections to Road Network

(a) Connections to the road network must be as prescribed in Environmental Documents and must comply with the requirements of Appendix 19 and Appendix 20.

(b) Grade separated interchanges must be designed in accordance with Grade Separated Interchanges (A Design Guide) NAASRA 1984.

(c) All exits from and entries to existing M2 Motorway carriageways must be provided with deceleration and acceleration auxiliary lanes in accordance with the requirements of the RTA Road Design Guide and Appendix 19 and 20.

7.11.4 Pedal Cyclists

(a) A single 2.5 m wide breakdown/cycle lane must be provided as identified in the Environmental Documents for the use of pedal cyclists.

(b) On-road provision for bicycles must be made at the Windsor Road and Christie/Herring/Talavera Road interchanges in accordance with RTA NSW Bicycle Guidelines.

(c) All Local Roads Works must include provisions for pedal cycle access at intersections with the M2 Upgrade and M2 Motorway.

(d) Elsewhere the Company must design bicycle paths to comply with the requirements for pedal cyclists as required by the Reference Documents and the Environmental Documents. The surfaces must be concrete or asphaltic concrete.

(e) The vertical alignment for bicycle paths must be in accordance with section 6.4 of Austroads "Guide to Engineering Practice Part 14 - Bicycles". Bicycle paths must be designed as commuter paths using a design speed of 50km/h, Approaches to underpasses and to footpaths and bicycle paths under bridges must be open and clearly visible.

7.11.5 Pedestrian Facilities

Access must be provided for pedestrian movements associated with Local Roads and emergencies including accidents and incidents as identified in the Environmental Documents.

7.11.6 Traffic Congestion in the Widened Norfolk Road Twin Tunnels

(a) The design of the Project Works must accommodate all of the impacts of traffic congestion within the Widened Norfolk Road Twin Tunnels and provide safe passage to all road users and must include:

(i) an analysis to determine the likelihood and extent of traffic congestion occurring in the Widened Norfolk Road Twin Tunnels, including that resulting from events elsewhere on the road network;

(ii) the identification and assessment of all risks associated with the occurrence of traffic congestion within the Widened Norfolk Road Twin Tunnels, including those related to the occurrence of fire within the Widened Norfolk Road Twin Tunnels and the associated safety impacts, and the development of a strategy to manage these risks; and

(iii) infrastructure and operational measures to minimise the occurrence of and to mitigate the impacts of traffic congestion.

(b) The design of the Project Works must, as a minimum, address the impacts of:

(i) traffic speed;

(ii) vehicle spacing;

(iii) traffic flow rate;

(iv) traffic queue lengths;

(v) driver behaviour; and

(vi) driver awareness.

7.12 DRAINAGE

7.12.1 General

(a) The drainage systems in the Widened Norfolk Road Twin Tunnels and underpasses must comply with the requirements in Appendix 48.

(b) The drainage design must be in accordance with RTA Standards, Australian Rainfall Runoff (ARR) and the requirements of all relevant Authorities.

(c) Approval of the drainage design must be obtained from relevant Authorities.

(d) For all drainage design, the storm modelled must be the storm producing the largest peak discharge.

(e) The drainage system design must:

(i) model pit entry capacity;

(ii) model by-pass flow to next pit;

(iii) model detention basins;

(iv) model overland flow times;

(v) model infiltration rates; and

(vi) provide a routed reach outlet hydrograph.

(f) The drainage pipeline network must be self cleaning.

(g) All outlets of the drainage system must incorporate energy dissipation, erosion and sediment control measures.

7.12.2 Catchment Drawings

The Design Documentation must include documentation for:

(a) catchment areas;

(b) pervious and impervious percentages;

(c) coefficients of runoff;

(d) overland flow times;

(e) extent of proposed work; and

(f) existing and design contours, pits and pipes.

7.12.3 Drainage Pipes

Drainage pipes must:

(a) comply with RTA Specification DCM R11 "Stormwater Design";

(b) comply with the pipe classification and installation requirements in the Concrete Pipe Associate's "Concrete Pipe Selection and Installation" guide;

(c) not have a diameter less than 375 mm;

(d) be at a depth to provide for connection of subsoil drainage systems; and

(e) be designed to accommodate construction activities.

7.12.4 Transverse Drainage

The transverse drainage system must be designed for the following minimum average recurrence intervals (ARI) events:

(a)	culverts where surcharges are allowable	50 years
(b)	structures where surcharges are undesirable	100 years

7.12.5 Pavement Surface Drainage

(a) Drainage of the pavement wearing surface must be designed for a 1 in 20 year ARI event.

(b) A 1 in 100 year ARI event must be modelled to ensure nuisance flooding is avoided.

(c) Runoff from ramps and intersections must not flow across main carriageways for flows generated by less than the 1 in 2 year ARI events.

(d) Concentrations of water and long surface drainage paths on pavement superelevation transition areas must be prevented.

(e) For a design event of 50mm per hour rainfall intensity:

  (i) water depths in the through lanes at any point on the pavement must be less than 5mm;

  (ii) water depths at any point on the pavement at intersections and on auxiliary lanes on the approach to intersections must be less than 5mm; and

  (iii) change in the depth of flow across any 10m of the pavement must not exceed 5mm.

(f) The design width of flow against kerbs must not encroach onto the adjacent trafficked lane by more than 1 metre for a 1 in 20 year ARI event.

(g) The drainage design must accommodate the flows generated at the interfaces between open-graded asphalt and dense-graded asphalt, concrete shoulders, pits and pavements.

7.12.6 Longitudinal Drainage

Longitudinal pipe and pit drainage networks must be designed for a 1 in 20 year ARI event.

7.12.7 Sediment Basins

All operational stormwater drainage basins must be designed with a first-flush weir system that captures a 1 in 1 year ARI event.

7.12.8 Subsurface Drainage

(a) A comprehensive subsurface and subpavement drainage system must be provided for all new pavements.

(b) Subsurface Drainage

(i) All pavements located in cuttings and false cuttings formed by earth mounds must have a trench drain with a 100mm diameter perforated pipe installed on each side of the pavement. The trench drains must be installed to a minimum of 150mm below the design floor level of the cutting and must be designed to drain the pavement and to intercept seepage from the cutting.

(ii) Rock cuttings and wet cuttings must be assessed by a qualified Geotechnical Engineer to determine the requirements for a drainage blanket as part of the subsurface drainage system. A drainage blanket must be provided if there is an existing drainage blanket. The drainage blanket must outlet into trench drains installed to a minimum depth of 150mm below the underside of the drainage blanket. Outlets to the trench drains must be detailed in the Design Documentation.

(iii) In cuttings, other than rock, subsurface drains must be installed to a minimum of 150mm below the design floors of cuttings.

(c) Subpavement Drainage

(i) Edge drains must be installed at the sides of pavements to drain the interface between the concrete or asphalt base and the sub-base. The edge drains may be connected to trench drains to facilitate the removal of water. Where edge drains are not connected to other drainage systems, the maximum outlet spacing must be in accordance with the RTA Model Drawings.

(d) Subsurface and subpavement drainage must include clean outs provided in accordance with RTA Model Drawings.

7.12.9 Surface Drainage

(a) Surface drainage must be provided where the works intercept runoff, floodplains, watercourses, depressions or drainage lines.

(b) All outlets of the surface drainage system must incorporate energy dissipation, erosion and sediment control.

(c) Construction of the drainage system must be consistent with the acid sulphate soils management plan.

(d) The drainage system must meet the requirements of Scope of Works and Technical Criteria all relevant Authorities.

(e) Batter catch drains or alternatives must be provided upslope of all cut batters.

7.12.10 Temporary Drainage

Temporary drainage systems used for the Project Works must be designed in accordance with RTA Standards, Australian Rainfall Runoff (ARR) for a minimum 2 year recurrence

interval. The temporary drainage system must satisfy the requirements of all relevant Authorities.

7.12.11 Scour Protection

The Company must design scour protection for all areas susceptible to scouring, including batters and bridge abutments. Scour protection must be designed to provide a level of protection and performance no less than that provided for the M2 Motorway. Scour protection for waterway areas must be designed in consultation with the relevant Authorities.

7.13 DESIGN OF BATTERS

The Company must provide slope inventory details to RTA in accordance with the requirements of Appendix 12 for all new slopes.

7.13.1 Design of Batters in Cuttings

(a) Batters in cuttings must be designed to satisfy the following criteria:

(i) batters must satisfy the performance requirements in section 5.7.2 of this Scope of Works and Technical Criteria;

(ii) the overall batter slope must be stable with no foreseeable possibility of a failure involving the whole slope or a major part of it;

(iii) limited failures during construction are acceptable but must not extend beyond one bench;

(iv) batters must be designed so that material which may become detached is prevented from reaching the road shoulder. Prevention measures must ensure that material detached from batters does not result in a consequence which could lead to an Assessed Risk Level of ARL1, ARL2 or ARL3; and

(v) plant and equipment access must be available to the final batter slope to allow ready installation of any treatment measures which may become necessary and to facilitate inspection and maintenance of the face of the batter.

(b) Benches must be provided on batter slopes in accordance with the requirements of the following table, to restrict the length of unbroken batter face and to minimise erosion of soil and weathered materials.

(c) The vertical spacing of benches must not exceed the limits specified in the following table

Batter Slope	Maximum Vertical Spacing Between Batters	Bench Width
Steeper than 2:1 H:V	7 metres	Minimum 4.0 metres
2:1 H:V or flatter	10 metres	Minimum 4.0 metres

(d) Bench widths must be designed to accommodate safe access for maintenance plant items and to control runoff.

(e) Designs for cutting batters must include:

(i) logic for selection and application of batter protection for:

D. soft seams;

E. shattered, fractured or jointed rock;

F. degradable rock; and

G. stress release in rock cuts.

(ii) a schedule of estimated quantities for the various cutting batter protection systems proposed.

(f) Batter designs must detail the required surface condition and roughness of cut batters including:

(i) measures to control water flow and inhibit erosion; and

(ii) measures to retain topsoil and seed.

(g) Batter designs must detail measures to mitigate erosion of material from the seams in cuttings that are prone to rapid weathering.

(h) Batters must conform to the batter tolerances in RTA Specification DCM R44 in Appendix 11.

(i) Batter slopes between 0.75:1 H:V and 1.5:1 H:V are not permitted, except for transitions at the ends of cuts.

7.13.2 Design of Embankments

Embankment batters must be designed to satisfy the following criteria:

(a) embankments must be globally and locally stable with no foreseeable possibility of a failure involving the whole embankment or a major part of it. The design must detail the proposed methods for the treatment of all embankment foundations;

(b) embankments must be designed to limit post construction movements;

(c) embankment design may incorporate the use of light weight fills;

(d) embankment design must include measures to ensure that scour and erosion of batters is minimised or protected;

(e) benches must be provided on all embankment batters which are revegetated, in accordance with the requirements of the following table. The benches must be designed to satisfy the requirements of the proposed maintenance methodology

Batter Slope	Vertical Height of Batter
Steeper than 2:1 H:V	Maximum 7 metres
2:1 H:V or flatter	Maximum 10 metres

(f) where revegetation is proposed on batters steeper than 2:1 H:V benches must be a minimum of four (4) metres wide and must be designed to accommodate safe access for maintenance plant items; and

(g) benches are not required on rockfill batters or on rock-faced embankment batters.

7.14 PAVEMENT

7.14.1 M2 Motorway Carriageway Widenings

7.14.1.1 Pavement Types and Surfacing

(a) The pavements for the M2 Motorway Carriageway Widenings must match the adjacent existing pavement construction including pavement materials and thicknesses, subject to a minimum sub base thickness of 150 mm being provided.

(b) The M2 Motorway Carriageway Widening configurations must be in accordance with Appendix 8.2 and must be at the locations and to the extents shown in Appendix 8.3.

7.14.1.2 Pavement Surfacing in the Widened Norfolk Road Twin Tunnels

(a) The pavement wearing surfacing within the Widened Norfolk Road Twin Tunnels must be dense graded asphaltic concrete.

7.14.1.3 Pavement Interface Requirements

(a) Longitudinal drainage at the interface of the M2 Motorway Carriageway Widenings and the existing M2 Motorway carriageway pavements must be provided as detailed in Appendix 8.

(b) Edge drains at the outside edge of the M2 Motorway Carriageway Widening must be provided as detailed in Appendix 8.

(c) The M2 Motorway Carriageway Widenings and the existing M2 Motorway carriageway pavements must be structurally integrated in accordance with RTA Rigid Pavements – Standard Details drawings and as detailed in Appendix 8.

7.14.2 Other M2 Upgrade Pavements

7.14.2.1 Pavement Types

(a) The structural pavements for Windsor Road, Christie Road and Herring Road ramps and Local Roads must comprise one or more of the pavement types listed below.

(i) full depth asphalt;

(ii) thick asphalt over heavily bound or roller compacted concrete sub-base; or

(iii) rigid pavement.

(b) The structural pavement for bus stops must be of the same pavement type as the adjacent pavement.

(c) Pavement configurations must be in accordance with Appendix 8.2 and must be provided at the locations and to the extent shown in the Appendix 8.3. Notwithstanding any other requirements of the Scope of Works and Technical Criteria, including those in section 7.14.2.4 of the Scope of Works and Technical Criteria, pavement layer constructed thicknesses must not be less than those shown in the configurations in Appendix 8.2.

7.14.2.2 Pavement Reference Documents

(a) Pavement designs for Windsor Road, Christie Road and Herring Road ramps and Local Roads must be carried out in accordance with the requirements in this Scope of Works and Technical Criteria and with the Documents in Appendix 9. For the purposes of pavement design, the following documents are to be used:

(i) RTA supplement to the Guide Pavement Technology – Part 2: Pavement Structural Design (Draft May 2009).

(ii) Circly – Geomechanics Computer Program Version 5 or later version

(iii) RTA Rigid Pavements Standard Details – Model Drawings

A. Volume 1 – Continuously Reinforced Concrete Pavements (MD.R84.CC.A).

B. Volume 2 – Plain Concrete Pavements (Drawing MD.R83.CP.A)

(iv) RTA Interim Guide to the Maintenance of Concrete Roundabout Pavements (March 2004).

(v) Pavement Design – Guide to Pavement Technology – Part 2: Pavement Structural Design (AUSTROADS 2008).

7.14.2.3 Pavement Surfacing

(a) A dense graded asphaltic concrete pavement wearing surface must be provided on:

(i) the Windsor Road, Christie Road and Herring Road ramps.

(b) A dense graded asphaltic concrete pavement wearing surface to match the existing wearing surface must be provided on Local Roads:

(c) For the purposes of pavement design, the wearing surface must not be considered as contributing to the structural pavement thickness.

(d) Existing Local Road pavement, tie-ins may be achieved by asphalt overlays where level adjustments allow, provided sub-surface drainage is provided at interfaces between different pavement configurations.

7.14.2.4 Pavement Design

(a) For the purpose of this Scope of Works and Technical Criteria:

(i) Rigid pavements include continuously reinforced concrete;

(ii) Flexible pavements include:

A. full depth asphalt; and

B. thick asphalt over heavily bounded or roller compacted concrete subbase or lean mix concrete sub base.

(b) The minimum criteria for calculations of pavement design traffic for Windsor Road ramps, Christie Road ramp and Herring Road ramp must be as those detailed in Appendix 20.4.

(c) The design of flexible pavements for Windsor Road, Christie Road and Herring Road ramps and Local Roads must comply with the following criteria:

(i) for thick asphalt, a minimum asphalt thickness of 175 mm (excluding open graded asphalt layers) must be provided over heavily bounded or roller compacted concrete sub-base or lean mix concrete sub base;

(ii) for full depth asphalt pavements, a minimum asphalt thickness of 280mm (excluding the wearing surface) must be provided over the selected material zone.

(iii) the modulus values given in RTA supplement to the Guide to Pavement Technology – Part 2: Pavement Structural Design (Draft May 2009) must be taken as maximum values;

(iv) the maximum allowable design modulus for subgrade materials (including capping layers, the upper zone of formation materials and selected material) is 150 MPa;

(v) asphalt modulus must be determined in accordance with "Pavement Design – Guide to Pavement Technology – Part 2: Pavement Structural Design (AUSTROAD 2008), with vehicle speeds 10 km/hr less than the posted speed;

(vi) the nominal aggregate size of all asphalt pavement layers must be less than or equal to 20mm;

(vii) flexible pavements must not include a high-bitumen (Hibit) asphalt layer;

(viii) tyre contact stress for mechanistic design must be 750 kPa;

(ix) fatigue of asphalt must be calculated using the relationship given in "Pavement Design – Guide to Pavement Technology – Part 2: Pavement Structural Design (AUSTROAD 2008);

(x) subgrade failure must be calculated using the relationship given in "Pavement Design – Guide to Pavement Technology – Part 2: Pavement Structural Design (AUSTROAD 2008);

(xi) post cracking fatigue life of cemented layers must not be considered in the initial 45 year design life of flexible pavements;

(xii) a minimum 300mm thickness selected material zone, with CBR>15%, must be provided beneath the pavement. Where the CBR of any layer of the selected material zone is less than 30%, a minimum 2% modifying agent (such as hydrated lime) must be added to at least the upper 150mm of the selected material zone. The selected material zone must be covered by a 7mm primer seal;

(xiii) where the subgrade is soft (CBR < 3%) or expansive (CBR test swell > 2.5%), a capping layer of minimum thickness 300mm must be provided beneath the selected material zone. The capping layer must have a CBR > 7% and a swell < 1.0%. The swell must be determined in accordance with RTA Test Method T117a (10 day soak) with 4.5kg surcharge and 95% standard compaction; and

(xiv) if materials in the zones or layers noted in sub-sections 7.14.4(b)(xii) and (b)(xiii) are subject to breakdown under compaction and/or wetting and drying cycles, such as shales, pre-treatment (which involves crushing to size, artificial weathering and repeated compaction) as detailed in RTA Test Methods T102 (Method A) and T103 must be carried out prior to strength testing.

(d) The design of rigid pavements for Windsor Road, Christie Road and Herring Road ramps and Local Roads must comply with the following criteria:

(i) the sub-base must be lean mix concrete with a minimum thickness of 150mm;

(ii) the base must be either plain concrete or reinforced concrete with minimum design thicknesses that comply with Table 9.7 of the "Pavement Design – Guide to Pavement Technology – Part 2: Pavement Structural Design (AUSTROAD 2008);

(iii) a minimum 300 mm thickness selected material zone or a selected material zone greater than 300 mm to match the existing adjacent selected material zone with CBR>15%, must be provided beneath the lean mix concrete subbase. Where the CBR of any layer of the selected material zone is less than 30%, a minimum 2% modifying agent (such as hydrated lime) must be added to at least the upper 150mm of the selected material zone. The selected material zone must be covered by a 7mm primer seal;

(iv) where the sub-grade is soft (CBR < 3%) or expansive (CBR test swell > 2.5%), a capping layer of minimum thickness 300mm must be provided beneath the selected material zone. The capping layer must have a CBR > 7% and a swell < 1.0%. The swell must be determined in accordance with RTA Test Method T117a (10 day soak) with 4.5kg surcharge and 95% standard compaction;

(v) if the materials in the zones or layers noted in subsections 7.14.4(c)(iii) and 7.14.4 c(iv) are subject to breakdown under compaction and/or wetting and drying cycles, such as shales, pre-treatment (which involves crushing to size, artificial weathering and repeated compaction) as detailed in RTA Test Methods T102 (Method A) and T103 must be carried out prior to strength testing;

(vi) the jointing layout and structural design, including reinforcement, tie-bars and dowels, must be in accordance with RTA Rigid Pavements – Standard Details drawings;

(vii) longitudinal jointing under wheel paths must be avoided as far as is reasonably practicable;

(viii) in roundabouts, the jointing layout and structural design must be in accordance with the RTA Guide to the Design & Construction of Concrete Roundabout Pavements (March 2004);

(ix) where asphalt surfacing is placed over a rigid pavement base, the curing compound for the base must be bitumen emulsion applied at not less than 0.5 L/m2 residual bitumen or a bitumen emulsion/hydrocarbon blend applied at not less than 0.3 L/m2;

(x) base concrete must not be cut for detector loops;

(xi) branch or skew cracking in base concrete must be mapped and reported as a non-conformance within 48 hours of detection and dispositions accepted prior to further paving; and

(xii) the wax debonding layer must be fully intact prior to base concrete paving and must be placed immediately prior to placing reinforcing steel.

(e) Where Local Road traffic information is not sufficient, design traffic loadings for flexible and rigid pavements must be calculated using the Austroads (2008) presumptive traffic load distribution for urban roads

7.14.2.5 Pavement Transitions

Transitions between new and existing pavements, including Local Road pavements, must be provided.

7.14.2.6 Pavement Design Calculations

Pavement designs must be supported by documented design calculations and methodology and will include a proposed maintenance, and rehabilitation schedule for the full design life.

7.14.2.7 Cover over Culverts and Underpasses

The minimum cover over culverts and underpasses must comprise the pavement layers plus 300mm of the selected material zone unless provision for control of reflective cracking above the edges of culverts is made.

7.14.2.8 Pavement Construction Thickness

The minimum actual constructed thickness of the total structural pavement must exceed the design thickness by a minimum of 10mm. The additional thickness must be added to the layer identified as the most critical in the thickness design calculations for the pavement. The additional thickness requirements do not apply to widened section of existing Local Road pavements.

7.14.3 Pavement Durability

The pavement design must include a methodology for assessment of durability of the pavement during the construction and operation and maintenance periods. This methodology must consider the impact of the in-situ pavement layer strengths and layer thicknesses actually constructed.

7.14.4 Existing Pavements

Existing pavement materials that comply with requirements for select material or general fill material nominated in the Scope of Works and Technical Criteria, including Appendix 11, may be used for as select material or general fill material in the construction of new pavements.

7.14.5 Bicycle Pavements

Pavements for bicycle paths must conform, as a minimum, to the requirements of Figure 8.1 (a), (b) or (c) of NSW Bicycle Guidelines, as amended by current RTA jointing detail for concrete cycleways. Pavement thickness must be designed to cater for maintenance vehicle access.

7.15 ROADSIDE FEATURES

7.15.1 General

(a) The roadside areas must comply with the requirements of parts 3.6, 3.7 and Section 6 of the Road Design Guide.

(b) Road furniture must be positioned in a way which is compatible with other sections of the surrounding road network.

(c) The Company must design and install all fixed and variable signage and barriers required for the operation of:

(i) the M2 Motorway and M2 Upgrade;

(ii) the Local Roads affected by the Project Works and the Temporary Works; and

(iii) traffic diversion in the event of total or partial closure.

(d) Unprotected ends of concrete barriers and railings, bridge piers and other non-frangible objects, including trees which (when mature) will be non-frangible, must comply with section 7.15.1(a) of this Scope of Works and Technical Criteria.

7.15.2 Signposting

(a) Directional, regulatory, warning, advisory and information signposting must be provided in accordance with RTA Specifications, Design Reference Documents and relevant Australian Standards.

(b) Directional, regulatory, warning, advisory and information signposting must include the signposting specified in Appendix 13 and Appendix 48.

7.15.3 Roadside Furniture

(a) No roadside furniture is to be placed within the roadway shoulder. Road verges must be kept free of furniture.

(b) Any furniture within the design clear zone (refer to section 3.7 of the RTA Road Design Guide) that is non frangible must be protected using a safety barrier, which must be designed for impact from a passenger car travelling at the relevant design speed.

(c) Batters or walls of cuttings must be shaped and constructed to provide either a clear zone run-off area, or a rigid safety barrier, or features that emulate a rigid safety barrier.

(d) Bridge piers will only be permitted in the clear zone if they incorporate an appropriate safety barrier.

(e) Safety barriers must follow design practices detailed in section 6 of the RTA Road Design Guide.

7.16 FENCES AND GATES

(a) Fencing to the boundary of the Project Site must be provided where the existing fencing is affected by the Company's Works.

(b) Fencing must be designed to prevent pedestrians from accessing the M2 Upgrade.

(c) Gates must be provided where required for maintenance or for access by relevant Authorities, including emergency services.

(d) Materials used for fencing must fit sympathetically into the local environment.

7.17 ROAD SAFETY AUDITS

(a) The Company must arrange for independent road safety audits to be undertaken, in accordance with RTA's Accident Reduction Guide, at the final

concept design (stage 1) and final design stages and immediately prior to opening any part of the Project Works to traffic.

(b) The Company must consider and respond to the recommendations of the independent road safety audits and to the recommendations of any road safety audits which may be undertaken by RTA.

(c) Copies of all safety audits must be promptly issued to RTA's Representative and the Independent Verifier.

7.18 ELECTRICAL

(a) All voltage drop calculations must be based on a maximum voltage drop under the maximum expected load from any operational condition of 5% calculated from the point of supply to any point in the installation.

A voltage drop of 7% may be used for voltage drop calculations for electrical services in the Widened Norfolk Road Twin Tunnels, in accordance with AS/NZS 3000:2007, where the point of supply is the low voltage terminals of a substation located on the premises containing the electrical installation and dedicated to the installation.

Cable sizes must be selected accordingly.

(b) All cables must be colour coded for the appropriate phase as per AS 3000 "Electrical Installation-Buildings, Structures and Premises (Wiring Rules)" and must be fitted with permanent labels at the point of connection in the switchboard identifying the destination and circuit number.

(c) Circuit protection devices must be fully coordinated to achieve complete discrimination so that in the event of a fault there is no interruption to upstream supplies to earthed circuits.

(d) Traffic control systems must be connected to a different sub-main switch to lighting. The traffic control systems power circuit must be provided with a warning "not to turn off" attached next to the switch.

(e) All electrical switchboard doors must be fitted with a three point locking system.

(f) The design and installation of electrical components must be to the standards documented in AS3000 "Electrical Installation-Buildings, Structure and Premises (Wiring Rules)" and to the standards required by the relevant Authorities.

7.19 TRAFFIC CONTROL SIGNALS

(a) Traffic control signals must comply with the requirements in section 20.10 of Appendix 20 and in Appendix 10.

7.20 NOT USED

7.21 MANAGEMENT, CONTROL AND MONITORING INFRASTRUCTURE SYSTEMS

7.21.1 Control Centre

(a) The Company must modify the existing M2 Motorway Control Centre to provide any other infrastructure, buildings, plant, equipment, facilities and systems, which are required for the purposes of operating the M2 Upgrade and for Incident management.

(b) Any infrastructure, buildings, plant, equipment, facilities and systems required for operation of the M2 Upgrade must be designed in accordance with relevant

Authorities' requirements, the relevant codes published by Standards Australia and the Building Code of Australia.

(a) The modified M2 Motorway Control Centre must comply with the requirements in Appendix 47

7.21.2 Operations Management and Control System

(a) A comprehensive operations management and control system must be provided to monitor and control all M2 Motorway and M2 Upgrade functions and traffic movements into and within the M2 Motorway and M2 Upgrade

(b) The operations management and control system must comply with specified requirements in Appendix 47.

7.22 NOT USED

7.23 SOFTWARE

The design of all software must comply with the requirements of the Company's Specification M2 Upgrade ITS Project Systems Engineering Management Plan in Appendix 32.

8 CONSTRUCTION

8.1 GENERAL

The Company must construct the Project Works and the Temporary Works in a manner and to standards which meet the requirements of the M2 Upgrade Project Deed, including this Scope of Works and Technical Criteria.

8.2 WORK METHODS

The work methods to be used by the Company must result in the use and application of materials and workmanship which, as a minimum, comply with RTA Specifications and current Australian Standards.

8.3 QUALITY OF MATERIAL AND WORKMANSHIP

All workmanship and materials must be of the quality necessary to meet the requirements of the Scope of Works and Technical Criteria.

8.4 WORKING HOURS

(a) The working hours must be in accordance with the Environmental Documents.

(b) The Company must obtain all necessary Approvals from the relevant Authorities in order to carry out any work outside the working hours prescribed by the Environmental Documents and must provide a copy of all such Approvals to RTA's Representative prior to commencement of such work on the Project Site (or elsewhere).

(c) Except in emergencies, in the interest of safety or to protect life or property, work must not be executed outside of the working hours contained in the Environmental Documents. In such cases the Company must promptly notify RTA's Representative in writing of the circumstances giving rise to any emergency work undertaken outside of the approved or amended working hours.

8.5 SPECIAL EVENTS

A special event is a local or regional event which generates increased traffic volumes, reduces traffic speed or lowers the capacity of the road network.

Where special events are expected to generate additional vehicle or pedestrian traffic in any areas directly or indirectly affected by the Project Works or Temporary Works, the Company must co-operate with RTA's Representative, RTA and other Authorities to facilitate traffic and pedestrian flows on the existing road network or through the Project Site.

8.6 ADVERTISING AND SITE SIGNS

(a) All signs must be maintained in good condition for the full period of display and must be removed no later than the Date of Construction Completion of Stage 3 or when directed by RTA's Representative.

(b) The Company must provide four (4) project signs on the approaches to the Project Site. The project signs must be located as directed by RTA's Representative and be similar to the signs detailed in Appendix 26, including

sign layout, wording and letter sizes. Final design requirements for the signs will be provided to the Company by RTA's Representative.

8.7 EARTHWORKS STOCKPILING

(a) The Company must make its own arrangements for temporary or permanent stockpiles of materials arising from the Company's Work.

(b) Materials which are not suitable for incorporation in the Project Works must be disposed of outside the Project Site.

(c) Stockpiles located on land outside the Project Site are subject to the land owners and occupiers written consent, compliance with the Law, consent of relevant Authorities and compliance with the Environmental Documents. Stockpiles must not be placed in drainage lines, channels or paths.

8.8 EXPLOSIVES AND BLASTING

(a) Blasting must be avoided to the maximum extent possible.

(b) Blasting on the Project Site must comply with the requirements of relevant Authorities.

(c) At least 48 hours in advance of any proposed blasting, the Company must provide RTA's Representative with:

(i) the proposed location and timing of the operation;

(ii) the name of the person who will have control of the operation and proof of his/her licence;

(iii) documentary evidence of all necessary licences and permits from the relevant Authorities;

(iv) precautions proposed to be taken for the protection of the public and property during the operation;

(v) full details of explosives, blasting patterns and any other relevant information;

(vi) methods of monitoring blast vibration; and

(vii) additional information required by the M2 Upgrade Project Deed or RTA's Representative, including RTA Specifications.

(d) The Company must give occupants of the nearby premises, relevant Authorities and affected Service owners' reasonable notice of intended blasting.

(e) Blasting must only be undertaken during the hours permitted by the local authority concerned.

8.9 AS CONSTRUCTED INFORMATION

The Company must provide RTA's Representative with "as constructed" documentation as required by Appendix 24.

8.10 CONSTRUCTION VEHICLE LOADS

(a) The Company must comply with the requirements of the NSW Roads Act (1993) when operating vehicles on public roads.

(b) The Company will be permitted to operate vehicles with axle loads in excess of the requirements of the NSW Roads Act (1993) within the Project Site subject to the following conditions:

(i) the operation of vehicles with above legal axle loads must be limited to vehicles that remain within the Project Site and are being used in association with the construction of embankments;

(ii) the vehicles must not be permitted to travel along or across any existing pavement or over any structure unless the pavement or structure has been designed to carry the vehicle or has been otherwise protected from damage; and

(iii) vehicles with excess axle loads, with the exception of purpose designed compaction equipment, must not be operated on any partially or fully completed pavement work.

8.11 TEMPORARY SITE FACILITIES

(a) The Project Site must be maintained in a clean and tidy manner throughout the Company's Work. The extended storage of rubbish or loose items on the Project Site or elsewhere is not permitted.

(b) Site sheds must be as new and must be maintained in good condition. Site sheds must be established at locations and positions that minimise the impact on adjoining properties. All facilities utilised for the purpose of the Company's Work must be sited, constructed and maintained to meet the requirements of relevant Authorities.

(c) The Company must install and maintain temporary screening and fencing as necessary to provide for safety and security in the performance of the Project Works and Temporary Works. The screening and fencing must be erected prior to work commencing in the affected areas. The Company must provide office space within accommodation facilities located within or adjacent to the Project Site for the use of the RTA, Independent Verifier and ER

8.12 SITE RESTORATION, REGENERATION AND PLANTING

(a) The Company must reinstate the Project Site and complete its urban design and landscaping works progressively as each part of the Project Works and Temporary Works is completed. Without limiting the preceding sentence, all such reinstatement work must be completed as a condition precedent to Construction Completion.

(b) The Company must undertake regeneration works and planting progressively as each part of the Project Works and Temporary Works is completed. The regeneration works and planting must be in accordance with the requirements of the RTA Specifications and must comply with the Company's Urban and Landscape Design.

(c) All land outside the Project Site (including Extra Land) which has been occupied by the Company for the purpose of the Company's Work, including storage and site facilities, must be reinstated to a condition at least equivalent to that existing before that occupation.

8.13 DISCHARGE WATER QUALITY

(a) Water to be discharged from the Project Site must meet the requirements of relevant Authorities.

8.14 MAINTENANCE DURING CONSTRUCTION

(a) As a part of the Company's Work, the Company must maintain and repair, from the date that substantial construction of the Project Works and/or Temporary Works commences until the Date of Construction Completion:

(i) the Project Works;

(ii) the Temporary Works;

(iii) all other existing infrastructure within the Project Site; and

all other areas affected by the Company's Work.

(b) The Company must ensure that all infrastructure, assets, facilities and amenities in the areas being maintained are at all times fit for their intended purpose, clean and tidy and in a condition that provides for public safety and maintains functional performance. For the avoidance of doubt, the Company must maintain functional performance of the existing M2 Motorway operations management and control system, tolling systems, traffic enforcement systems and the deluge, electrical and mechanical systems in the Norfolk Road Tunnels until the Date of Final Completion.

(c) The Company must maintain and repair Local Roads from the commencement of construction activities (including Temporary Works) within the limits of Local Road Works until the final handover of Local Roads to the relevant Authority.

8.15 ACID SULPHATE SOILS

(a) The Company must treat and dispose of acid sulphate soils and rocks in accordance with:

(i) Guidelines for the Management of Acid Sulfate Materials: Acid Sulfate Soils, Acid Sulfate Rock and Monosulfidic Black Ooze. RTA, April 2005;

(ii) Department of Environment and Climate Change requirements;

(iii) Acid Sulfate Soil Manual, NSW Acid Sulfate Soils Management Committee, August 1998;

(iv) EPA publication "Assessing and Managing Acid - Sulphate Soils"; and

(v) Acid Sulphate Soils Manual – DUAP.

8.16 ROAD CONDITIONS

(a) The Company must ensure that any road, footpath or cycleway which is open to the public is at all times kept free of mud, dirt, deleterious material or debris arising from the Company's Work.

(b) Any spillage or build up of such material or debris must be cleaned up promptly and any damage caused by such an occurrence must be immediately repaired.

8.17 TRAFFIC MANAGEMENT PROCEDURES

8.17.1 General

(a) The Company must comply with the traffic management requirements detailed in RTA Specification DCM G10 in Appendix 6, Appendix 18 and Appendix 23 when performing the Company's Work.

(b) All activities associated with the Company's Work must be planned to minimise delays that will inconvenience motorists and other road users or interfere with traffic during periods of heavy traffic flows.

(c) Prior to undertaking any activity that will alter the alignment or configuration of the traffic lanes or shoulder (other than a permitted lane closure in accordance with Appendix 18), the Company must prepare a Traffic Management Plan that addresses the movement of traffic affected by the Company's Work.

(d) Traffic Management Plans for any activity associated with the Company's Work, including the use of temporary warning signs, must be developed on the basis of the following documents listed:

i) RTA Specification DCM G10;

ii) RTA Traffic Control at Worksites Manual;

iii) AS1742.3 – 2009 "Manual of Uniform Traffic Control Devices Part 3: Traffic Control for Works on Roads"; and

iv) Traffic Management and Safety Plan.

(e) Traffic Management Plans must be submitted to RTA for approval at least ten (10) Business Days before any proposed change to traffic flow, vehicle and pedestrian/cycle movements and arrangements for control of traffic on roads.

(f) Traffic control plans contained in the Traffic Management Plan must be regularly reviewed and modified in conjunction with RTA's Representative and traffic management personnel and emergency services personnel.

(g) Communication must be undertaken by the Company to advise stakeholders and the local community and road users of proposed changes to traffic flow, vehicle and pedestrian/cycle movements and arrangements for control of traffic on roads.

8.17.2 Road Occupancies, Detours and Closures

(a) The Company must obtain approval from RTA and other relevant Authorities for all road occupancies, detours and closures on Local Roads. RTA or relevant Authorities may elect to prohibit road occupancies, road closures or lane closures due to special events or other high traffic demands.

A Road Occupancy Licence must be obtained from RTA, in accordance with Appendix 23, for all road occupancies, detours and closures on the existing Local Roads.

The Company must obtain a Work Permit from The Hills Motorway Group for all road occupancies on the M2 Motorway. The Hills Motorway must consult with RTA prior to issue of the Work Permit.

(a) When any unplanned closure of a lane or a restriction in the flow of traffic occurs on the M2 Motorway, the Company must immediately advise RTA's Representative and the relevant Authorities of the nature of the closure or restriction and of the schedule for reopening of the lanes. The Company must take all required measures to open the lane as quickly as possible.

8.17.3 Compliance with Traffic Instructions

(a) The Company must comply with any traffic direction or instruction given by a relevant Authority, RTA's Representative or the New South Wales Police Service in respect of any traffic control proposal.

(b) A relevant Authority, RTA's Representative or the New South Wales Police Service may, at any time, instruct the Company to re-open any traffic lane or shoulder to traffic without delay, whether or not that lane or shoulder was closed by prior agreement. The Company must immediately comply with such instructions.

8.17.4 Bicycle Provisions

Following consultation with relevant user groups and authorities a bicycle detour route with suitable signage must be provided, in accordance with Austroads Guide to Traffic Engineering Practice - Part 14 Bicycles, on Local Roads to divert pedal bicycles off the Motorway from west of Windsor Road to east of Lane Cove Road. The detour route must available for the duration of the Company's Works.

8.17.5 Traffic Controllers

The Company must ensure that all persons who are required to perform the duties of a traffic controller undertake the relevant training package(s) and are examined and certified as competent to perform their respective traffic controller duties including:

(a) Package T89.4 Guidelines for the Selection of Traffic Controllers; and

(b) Package T89.5 So You Think You are Going to be a Traffic Controller?

(c) Yellow Card: Introduction to Traffic Control at Roadworks.

8.18 TRAFFIC ACCIDENTS ON WORKSITES DURING CONSTRUCTION

(a) In the event of a traffic accident occurring at the Project Site or at other locations affected by the Company's Work, the Company must record its knowledge of the facts and must photograph the approach to the accident site including the location of all safety devices as soon as possible after the accident. A report with this information is to be forwarded to RTA's Representative within two days of the accident

(b) The Company must ensure that the free flow of traffic is maintained on all Local Roads affected by the Company's Work from 6am to 10am and from 3pm to 8pm on weekdays and from 8am to 1pm on Saturdays. During construction, the Company must provide a breakdown and towing service and must, where agreed by the vehicle owner or as permitted by Law, remove vehicles which obstruct the free flow of traffic within the Project Site.

8.19 CONSTRUCTION NOISE AND VIBRATION

(a) The Company must prepare a construction noise and vibration assessment that complies with the NSW Government Construction Noise Guidelines and the DECC's *Assessing Vibration: A Technical Guideline*. The construction noise and vibration assessment must include the following as a minimum:

(i) Determination of relevant construction noise, vibration and blasting criteria;

(ii) Descriptions of construction activities and machinery to be used in the performance of the Company's Works along with their relative sound power levels;

(iii) Ambient background noise level data;

(iv) Rating background levels and construction noise goals;

(v) Regenerated noise impacts associated with the widening of the Norfolk Road Twin Tunnels noise prediction modelling including assessments of noise and vibration levels; and

(vi) Construction noise and vibration mitigation measures including best practice measures to minimise noise and vibration impacts of the construction of the Project Works and Temporary Works.

(b) Regenerated noise from the Company's Works must not exceed the following criteria as measured at the nearest sensitive receptor:

(i) LAeq(15 min) 40 dB(A) between the hours of 6:00 pm and 10:00 pm; and,

(ii) LAeq (15 min) 35 dB(A) between the hours of 10:00 pm and 7 am.

The Company must take all measures necessary to comply with the noise and vibration requirements in the Environmental Documents and the mitigation measures identified in the noise and vibration assessment referred to in paragraph (a).

8.20 Provision for New Weigh in Motion Stations

The RTA currently owns and operates two Weigh In Motion (WIM) stations at the following locations:

(a) Approximate chainage 5350, west of the Barclay Road overbridge at North Rocks, and

(b) Approximate chainage 13150, east of the eastern portals of the Norfolk Tunnels at North Epping.

The RTA intends to install new weigh in motion stations at these locations utilising as much of the existing devices as possible, after completion of the M2 Upgrade Project.

The Company must:

(a) Remove the existing WIM equipment as described in Appendix 50 to the Scope of Works and Technical Criteria;

(b) make provision for the new weigh in motion stations as detailed in Appendix 50 to the Scope of Works and Technical Criteria; and

(c) co-operate with the RTA and its nominees in relation to the installation, testing and verification of the new WIM installations at the above locations.

8.21 Property Access and Services

(a) The Company must ensure that suitable access is maintained at all times to all properties unless it has obtained approval of all persons having legal access to the affected property. Appropriate detours must be arranged and provided.

(b) The Company must make all arrangements with all affected persons in relation to the impacts and consequences of the interruption of any Services.

8.22 SECURITY DURING CONSTRUCTION

(a) During construction, the Company must secure work areas within the Project Site or any Extra Land by screening and fencing to prevent unlawful access.

(b) The fencing and screening must be made from as new materials and must be maintained in a neat and tidy condition and be sympathetic with its surroundings.

8.23 CONSTRUCTION COMPLETION REPORT

The Company must prepare and submit to RTA's Representative, the ER and the Independent Verifier a construction completion report in accordance with the requirements of Appendix 24.

8.24 TESTING AND COMMISSIONING

(a) Testing must be carried out progressively throughout the construction of the Project Works and the Temporary Works.

(b) Off site manufactured equipment must be tested at the point of manufacture prior to delivery wherever this is practical and further on site tests carried out during commissioning.

(c) The commissioning of plant must be carried out, in a progressive manner during the construction phase to determine whether there are any shortcomings in performance of any part of the plant, equipment or installation.

(d) Commissioning procedures must include full operational tests in all modes that are anticipated during the Term, including:

  (i) normal operation, for varying periods;

  (ii) emergency operation; and

  (iii) total and partial power failure.

(e) Consideration must be given to interruption to electricity supply and communication facilities and the consequent effect on electrical and electronic equipment. Commissioning procedures must be implemented to determine the effect on installed systems under such conditions.

(f) The uninterruptible power supply systems must be commissioned under actual operating conditions for the full duration of the required stand-by period.

(g) Where redundancy forms part of the design of any system, this aspect must be fully tested and commissioned including removing the active component from service under the most arduous conditions that are likely to occur in practice.

(h) All commissioning operations must be documented with the performance results clearly recorded against comparative design criteria.

(i) The deluge system must be tested in accordance with Appendix 48.

(j) Software must be tested and commissioned in accordance with the requirements of the Company's Specification M2 Upgrade ITS Project Systems Engineering Management Plan in Appendix 32.

8.25 ACCESS TO PUBLIC ROADS

The Company must arrange access to public roads for the purposes of performing the Company's Work in accordance with section 17.1 of Appendix 17.

8.26 ACCESS FOR COMPANY'S WORK

The Company must minimise its use of Local Roads that contain or are adjacent to residences. The Company must only use the Local Roads listed in section 17.2 of Appendix 17 for the purpose of gaining access to the Construction Site.

9 COMMUNITY INVOLVEMENT OBLIGATIONS

9.1 GENERAL COMMUNITY INVOLVEMENT OBLIGATIONS

(a) The Company must meet the reasonable needs and desires of the community, including those relating to the provision of information and consideration of their views on details of the Company's Work that materially affect the community.

(a) The Company is responsible for overall management and coordination of community involvement and consultation.

(b) The Company must undertake community liaison and engagement activities that inform the community and stakeholders of the Company's Work and the M2 Upgrade. Community and stakeholder input from the community liaison process must be addressed and the Company must provide documentation to RTA's Representative demonstrating how issues raised by the community have been addressed in relation to the M2 Upgrade, Property Works and Local Road Works.

(c) The Company must:

(i) develop and implement a Community Involvement Plan;

(ii) update, develop and implement the Community Involvement Plan in accordance with Appendix 14 based on the Initial Community Involvement Plan which is attached as Appendix 40; and

(iii) comply with RTA community engagement standards, principles and guidelines.

(d) The Company must be proactive in keeping the community informed of progress of the Company's Work, significant milestones, design changes, changed traffic conditions, opportunities for input and other matters which either affect or concern the community.

(e) During the design and construction of the Project Works and the Temporary Works, the Company must ensure that:

(i) the local community is informed of and wherever possible contributes to decisions taken on the details of the Company's Work which materially affect the local community;

(ii) users of the affected road network are informed of planned traffic arrangements including any temporary traffic switches or likely delays;

(iii) affected and concerned residents and occupants are informed of all investigation and construction operations and the likely impact on residents;

(iv) unless otherwise advised by RTA's Representative, the Company must arrange and chair all stakeholder group meetings/workshops relating to the Company's Work;

(v) unless otherwise advised by RTA's Representative, the Company must arrange all meetings/workshops involving the community relating to the Company's Work and provide a suitably qualified and experienced person to chair the meetings/workshops;

(vi) all relevant Authorities are informed of planned construction activities;

(vii) RTA's Representative is informed of all community issues, consulted on all decisions affecting the community and invited to all meetings, presentations and site tours attended by members of the community;

(viii) RTA's Representative is informed of all issues raised by Authorities in relation to the Company's Work and invited to all meetings, presentations and site tours attended by Authorities; and

(ix) RTA's Representative is contacted immediately in relation to planned or unplanned local community protests that may arise during the Company's Work.

(f) The Company must notify RTA's Representative of any approach by the media (including industry magazines), political representatives or their staff as soon as possible and within 24 hours of that approach. The Company must advise RTA's Representative prior to releasing information about the Company's Work to the media, political representatives or their staff. The Company must ensure that all of its personnel and all personnel engaged on the Project Site are aware of and abide by the requirements of this section 9.1(f) of this Scope of Works and Technical Criteria and evidence of this must be provided to RTA's Representative in the monthly progress reports.

(g) The Company must notify RTA's Representative of all enquiries from Federal, State and/or Local Government representatives about the Company's Work. The Company will advise RTA's Representative before releasing any information about the Company's Work to these government representatives. Any briefings for these government representatives will be jointly arranged by the Company and RTA's Representative.

(h) Community involvement obligations must be included in the site induction of all personnel engaged in the Company's Work and records of this must be provided in the monthly progress reports.

(i) The Company must recognise and identify RTA's role in any promotional material or award submissions that it develops in relation to the M2 Upgrade.

(j) The Company must take and provide RTA with photographs (digital) of the progress of the Company's Work every three months until the Date of Final Completion. The photographs must be of a professional quality (minimum 300 dpi) suitable for RTA use in publications, project communications and promotions of a broader nature and for enlargement to use in display materials.

9.2 SPECIFIC COMMUNITY INVOLVEMENT OBLIGATIONS

9.2.1 Community Relations Manager

(a) The Company must provide a Community Relations Manager, or a delegate that is authorised by the Company to carry out the functions of the Community Relations Manager, until the Date of Final Completion.

(b) The Community Relations Manager or authorised delegate must be available for contact by local residents and community representatives between 9 am and 5pm on Business Days and at all times when construction operations are underway to answer any questions and to address any concerns or complaints in relation to the Company's Work, in particular:

(i) information on planned traffic arrangements, including any temporary traffic switches being sought by users of the M2 Motorway and adjacent road network;

(ii) information on planned construction operations being sought by affected and concerned residents and occupants;

(iii) information on current construction operations being sought by affected and concerned residents and occupants; and

(iv) responding to complaints received and providing an overview of any action to be taken by the Company in response to the complaint.

9.2.2 Independent Community Liaison Representative

If required by the Planning Minister's Approval:

(a) The Company must provide an Independent Community Liaison Representative (ICLR) until the Date of Final Completion. The ICLR must:

(i) be experienced in facilitating community consultation processes and mediating disputes;

(ii) be independent of the RTA, the Company and its construction contractors;

(iii) regularly report concurrently to both the RTA and the Company on community involvement and consultation issues.

(b) The Independent Community Relations Liaison Representative must:

(i) review Community Involvement Plans and be satisfied that the Community Involvement Plan meets the requirements of the M2 Upgrade Project Deed prior to its submission to RTA's Representative;

(ii) monitor the community involvement, community consultation and community notification activities required to be undertaken by the Company under section 9 of the Scope of Works and Technical Criteria;

(iii) provide advice to the RTA and the Company on any suggested improvements to community involvement, community consultation and community notification;

(iv) be available to assist RTA and the Company in the resolution of complaints; and

(v) provide support for the communications activities undertaken by the Company.

9.2.3 Community Groups

(a) The Company must establish community groups to inform and consult with the community on specific issues and hold street meetings to inform and consult with neighbouring, indirectly affected property owners and residents.

(b) The Company must provide a suitable meeting room or areas for community group meetings at locations that are convenient for the groups. The Company must provide administrative support to the community groups, including the preparation and distribution of agenda, records of agreed actions, plans, documentation and any other relevant materials required by the community groups.

9.2.4 Project Displays, Local Events and Activities

(a) The Company must hold up to a total of six temporary displays, promotional displays, key local events and activities (local shows or exhibitions) as nominated by RTA's Representative. The Company must not participate in any

promotional displays, local events or activities without prior approval from RTA's Representative.

(b) The Company must provide materials and support for temporary or promotional displays including, but not limited to:

(i) community brochures;

(ii) project exhibition display and presentation materials;

(iii) a dedicated project information line;

(iv) personnel to staff display(s); and

(v) other items required by RTA's Representative.

(c) Any materials provided for display purposes must be easily understood, legible and in a suitable format to enable a professional quality display to be provided that encourages and enables the public to inform themselves comprehensively about the Project Works.

9.2.5 Site Inspection by Visitors

(a) The construction of the Project Works is expected to attract considerable interest from the community, educational institutions and engineering profession. This interest is expected to result in numerous requests to visit the Project Site.

(b) RTA may also arrange public visits subject to co-ordination with Company. The Company must give reasonable access to visitors at all reasonable times. The visitors must at all times be accompanied by representatives of RTA or other persons authorised in writing by RTA's Representative. The Company must nominate, in writing, a representative with whom RTA's Representative must co-ordinate site visits.

9.2.6 Local Information

(a) The Company must keep the local community and relevant Authorities informed about Project Works and Temporary Works that affect individual properties, residences and businesses. The Company must prepare and distribute leaflets to letterboxes of affected properties and persons of the project section that is affected by the Project Works and Temporary Works at least ten Business Days before any such changes occur. All proposed leaflets (letterbox drops) must be submitted to RTA's Representative for approval at least ten Business Days prior to the planned distribution date.

(b) The Company must, at 3 monthly intervals from commencement of construction until the Date of Final Completion, place media advertisements, including advertisements in the local and regional newspapers as agreed by RTA's Representative, giving notice of the nature of works proposed for the forthcoming 3 months, the areas in which these works are proposed to occur, the hours of operation and the Company contact details for use by the community to obtain information or register complaints.

(c) The Company must provide RTA's Representative with drafts of advertisements (including text and drawings), in a format agreed by the Company and RTA's Representative not less than seven Business Days prior to the proposed advertisement date.

(d) Where the Company becomes aware that any part of the Project Works or Temporary Works that is the subject of an advertisement is to be changed or

varied so as to make the advertisement incorrect, it must immediately advise RTA's Representative.

9.2.7 Community Information

(a) The Company must keep the local community informed, as a minimum, by way of advertisements, community updates (newsletters), leaflets (letterbox drops), letters to the householder (householder letters) and community noticeboard information as a minimum, of the progress of the Company's Work and of any traffic disruptions and controls, construction of temporary detours and work required outside the working hours contained in the Environmental Documents prior to such works being undertaken.

(b) The Company must distribute community updates (newsletters) leaflets (letterbox drops) or letters to the householder (householder letters) as agreed by RTA's Representative at not more than four monthly intervals from the commencement of construction until the Date of Final Completion.

(c) Newsletters must outline construction status, construction progress, upcoming construction stages and environmental management and community involvement achievements of the Company's Work. Newsletters must be distributed in all areas of the local community affected by the Company's Work and to relevant Authorities. Newsletters must contain website details and contact details for the Company and RTA, including contact phone numbers, and return addresses.

(d) The Company must develop, produce and distribute all community updates (newsletters) leaflets (letterbox drops) or letters to the householder (householder letters) and community noticeboard information. All community updates (newsletters) leaflets (letterbox drops) or letters to the householder (householder letters) and community noticeboard information must be submitted to RTA's Representative for approval no less than ten Business Days prior to the proposed distribution date.

(e) The Company must advertise detours, traffic disruptions or controls and work outside the working hours contained in the Environmental Documents in local and State newspapers and on the radio, as appropriate, at least seven days before the detour, disruption or changes commence. All advertisements must be submitted to RTA's Representative for approval no less than ten Business Days prior to the proposed publication or broadcast date.

(f) The Company must develop and implement procedures for community contact and complaints handling and investigation. The Company must obtain the RTA Representatives agreement to the procedures. The management of the receipt and response to complaints must include:

(i) appropriate responses to each complaint received;

(ii) the establishment and maintenance of a complaints register from the start of construction on the Project Site until two months after the completion of all construction works on the Project Site; and

(iii) reporting on the receipt and responses to complaints received in the monthly progress report.

(g) The Company must establish staff and publicise a 24-hour toll-free complaints telephone service prior to the commencement of construction on the Project Site and which is operational until two months after the completion of all construction works on the Project Site. The call centre for 24-hour toll-free complaints telephone service must be located in Australia and call centre

personnel must be fully briefed on the Project Works and the surrounding locality.

(h) The Company must expeditiously address and seek the early resolution of all complaints and claims, directed against the Company or others, by members of the community in relation to the Company's Work. The Company must make use of dispute resolution mechanisms and procedures to enable the prompt resolution of any claims which are not quickly solved bilaterally.

(i) The Company must establish and maintain a dedicated website to assist in disseminating information, receiving feedback and providing responses to enquiries. Feedback and enquiries via the website must be recorded and reported in accordance with section 9.2.8 of this Scope of Works and Technical Criteria. The Company must submit all material proposed for the website to RTA's Representative for approval at least fifteen Business Days prior to granting public access to the material. Work progress and consultation activities must be updated monthly on the website.

The website branding style must be approved by RTA's Representative.

The website must include as a minimum:

(i) RTA logos on the opening page of the website, along with the Company's and M2 Upgrade logos;

(ii) a link to RTA's website (www.rta.nsw.gov.au);

(iii) a feedback facility;

(iv) a visitor or hit number recorder on the home page;

(v) background information on the Project Works, the Temporary Works and the Company's Work;

(vi) a description of the various approval Authorities and their roles and responsibilities;

(vii) a photo gallery containing images of past and current construction, community and environmental management activities associated with the Company's Work;

(viii) display information;

(ix) copies of newsletters;

(x) copies of all approved publications that are relevant to the M2 Upgrade;

(xi) copies of advertisements;

(xii) electronic copies of environmental documents that are publicly available and the executive summaries of these reports;

(xiii) details of the impacts of the Company's Work on the road network and traffic systems;

(xiv) a listing of "frequently asked questions" and responses as agreed with RTA's Representative;

(xv) contact phone numbers of the Company's community involvement team and RTA's Representative and any other items or information of interest; and

(xvi) a comment or feedback facility.

The website must operate continuously over the period from eight weeks after the date of the M2 Upgrade Project Deed until one year after the Date of Final Completion. The Company must review and update the website on a weekly basis. All material must be approved by RTA's Representative before being loaded onto the website.

9.2.8 Response to Community Representations

(a) The Company must establish systems for the receipt and tracking of progress of all forms of representation from the community. The Company must comply with the requirements of these systems.

(b) Representations received by RTA's Representative will be forwarded to the Company within ten Business Days of receipt and must be recorded and monitored by the Company, together with any representations received directly by the Company.

(c) The Company must reply to all representations within five Business Days of receipt.

(d) The Company must maintain a register of all representations, written, electronic and verbal, concerning the Project Works including complaints. The Company must provide a report on the status of responses to all representations to RTA's Representative on a monthly basis. This report must include the average and maximum times taken to respond to representations.

9.2.9 Media Events

(a) The Company must give RTA's Representative at least 8 weeks written notice of the dates for commencement of construction activities on the Project Site and the opening of the M2 Upgrade to traffic to enable RTA to organise the associated official media events.

(b) Other opportunities for media events, including the achievement of project milestones and the opening of Local Roads, must be addressed in the Community Involvement Plan and discussed at the Project Control Group meetings prior to the expected event.

(c) RTA will manage all official media events and will be responsible for coordinating community, media and political participation in such events, in consultation with the Company. The Company must co-operate with RTA in the running of the media events and must provide the site logistics associated with media events. The Company must not erect or display company specific promotional banners during such media events. The Company must develop a traffic management and safety strategy for opening of the M2 Upgrade to traffic, together with associated action plans, for submission to and approval by RTA's Representative. The Company must work cooperatively with RTA and key community representatives on matters related to traffic management and pedestrian safety associated with the opening of the M2 Upgrade to traffic.

9.2.10 Logos

RTA will specify the inclusion and placement of logos in relation to all public communications, including advertisements, publications (brochures, community updates, fact sheets, etc.) and display posters for the Project Works.