

7 Environmental management

This chapter describes how the proposal would be managed to reduce potential environmental impacts throughout detailed design, construction and operation. A framework for managing the potential impacts has been provided with reference to environmental management plans and relevant RMS QA specifications. A summary of site-specific environmental safeguards is provided as detailed in chapter 6 and the licence and/or approval requirements required prior to construction have also been listed.

7.1 Environmental management plans (or system)

A number of safeguards and management measures are identified in order to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the proposal. Should the proposal proceed, these management measures would be incorporated into the detailed design, and applied during the construction and operation of the proposal.

A project environmental management plan (PEMP) and a construction environmental management plan (CEMP) would be prepared to describe safeguards and management measures identified. These plans would provide a framework for establishing how these measures would be implemented and who would be responsible for their implementation.

The plans would be prepared prior to construction of the proposal and must be reviewed and certified by the RMS regional environmental officer, Sydney region, prior to the commencement of any on-site works. The CEMP would be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The CEMP and PEMP would be developed in accordance with the specifications set out in the QA Specification G36 – Environmental Protection (Management System), QA Specification G38 – Soil and Water Management (Soil and Water Plan) and the QA Specification G40 – Clearing and Grubbing].

7.2 Summary of safeguards and management measures

Environmental safeguards outlined in this document would be incorporated into the detailed design phase of the proposal and during construction and operation of the proposal. These safeguards would minimise any potential adverse impacts arising from the proposal on the surrounding environment. The safeguards and management measures are summarised in table 7-1.

Table 7-1 Summary of site specific environmental safeguards

No.	Impact	Environmental safeguards	Responsibility	Timing
1.	General	All environmental safeguards must be incorporated within the following documents: <ul style="list-style-type: none"> • Project environmental management plan. • Detailed design stage. • Contract specifications for the proposal. • Construction environmental management plan. 	RMS project manager	Pre-construction
2.	General	A risk assessment must be carried out on the proposal in accordance with the Roads and Maritime Services Audit Pack and OSD risk assessment procedures to identify an audit and inspection program for the works. The recommendations of the risk assessment are to be implemented. A review of the risk assessment must be undertaken after the initial audit or inspection to evaluate if the level of risk chosen for the project is appropriate. Any works resulting from the proposal and as covered by the REF may be subject to environmental audit(s) and/or inspection(s) at any time during their duration.	RMS project manager and regional environmental staff	Pre-construction After first audit
3.	General	The environmental contract specification must be forwarded to the RMS regional environmental officer for review at least 10 working days prior to the tender stage. A contractual hold point must be maintained until the CEMP is reviewed by the RMS regional environmental officer.	RMS project manager	Pre-construction
4.	General	The Roads and Maritime Services Project Manager must notify the RMS regional environmental officer, Sydney Region at least five days prior to work commencing.	RMS project manager	Pre-construction
5.	General	All businesses and residences likely to be affected	RMS project manager	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		by the proposal must be notified at least five working days prior to the commencement of the proposed activities.		
6.	General	Environmental awareness training must be provided, by the contractor, to all field personnel and subcontractors.	Contractor	Pre-construction and construction
7.	Traffic and access	<p>A detailed construction traffic management plan (CTMP) would be prepared during the detailed design phase. The CTMP would be prepared in accordance with the RMSs <i>Guide to Traffic Control at Work Sites</i> and would include guidelines, general requirements and procedures to be used when activities or areas of work have a potential impact on existing traffic arrangements. The CTMP would be submitted in stages to reflect the progress of work and would:</p> <ul style="list-style-type: none"> • Identify the traffic management requirements during construction. • Describe the general approach and procedures to be adopted when producing specific traffic control plans. • Provide for the continuous, safe and efficient movement of traffic for both the public and construction workers. • Maintain the capacity of local roads. • Identify temporary speed restrictions to ensure safe driving environment around work zones. • Minimise impacts on The Northern Road and local traffic. • Provide access to local roads and properties, including the use of temporary turn-around bays. • Provide temporary works and traffic signals. 	Construction contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> Identify the number and width of traffic lanes in operation. Identify traffic barrier requirements and placement. Include methods for implementing the traffic management plan. Include methods for minimising road user delays. Provide appropriate warning and advisory signposting. Consider other developments such as the South West Growth Centre precincts that may also be under construction, to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic. Provide designated pedestrian and cyclist access through and/or around the construction site to maximise connectivity, maintain access and allow safe movements. Make provision for consultation with relevant local government authority, as appropriate. 		
8.	Traffic and access	Traffic control plans (TCPs) would be prepared and implemented for the appropriate stage of works by suitably qualified personnel. Implementation of TCPs would be inspected as required for the duration of the construction phase in accordance with the <i>RMS Traffic Control at Worksites Manual</i> .	Construction contractor	Pre-construction & construction
9.	Flora and fauna	Minimise the removal of vegetation within areas that are 'non-certified' would be considered in the detailed design.	RMS project manager	Detailed design
10.	Flora and fauna	Safeguards as described in the Biodiversity Guidelines (RTA 2011a) would be applied, including	RMS project manager	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
		riparian revegetation post-scour protection.		
11.	Flora and fauna	The design of creek and waterway crossings would be in line with guidelines to maintain adequate fish passage according to fish habitat (Fairfull and Witheridge 2003).	RMS project manager	Detailed design
12.	Flora and fauna	A rehabilitation plan including the selection of suitable native plant species would be developed during detailed design.	RMS project manager	Detailed design
13.	Flora and fauna	Should blockage of culverts be required, a permit to temporarily block fish passage would be obtained.	RMS project manager	Pre-construction
14.	Flora and fauna	<p>A flora and fauna management plan would be prepared as part of the CEMP. The plan would include but not be limited to the following:</p> <ul style="list-style-type: none"> • Clearly defined vegetation clearing boundaries including a map representing areas that would need to be protected (including exclusion zone fencing requirements). • Pre-clearance surveys and management measures. • Provision for the education of all construction personnel with regards to the importance of clearing limits and remnants/individual trees of significant value. • A procedure for clearing hollow bearing trees in line with the then RMS Biodiversity Guidelines. • A weed management plan. • Safeguards to minimise unavoidable impacts to biodiversity according to the Biodiversity Guidelines (RTA 2011a). 	Construction contractor	Pre-construction
15.	Flora and fauna	Pre-clearance surveys would be undertaken by a suitably qualified ecologist prior to any clearing	Construction contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		works to clearly demarcate and map vegetation protection areas. These surveys would include a survey of the existing bridge structures to confirm that the bridges do not continue provide habitat for microchiropteran bats. The management measures identified as a result of the pre-clearing survey would be incorporated into the Flora and Fauna Management Plan of the CEMP.		
16.	Flora and fauna	An offset plan would be developed for the 0.1 hectares of ENV to be removed from non-certified areas. This plan would be developed in consultation with OEH. Offsets would be in accordance with relevant biodiversity measure 11 of the Biodiversity Certification. Offsets would be developed in consultation with both DP&I and OEH.	RMS project manager	Pre-construction
17.	Flora and fauna	Temporary infrastructure would be sited and the sites managed to avoid potential impacts to areas of significant biodiversity, such as areas of native vegetation and the locations of records of the Cumberland Plain Land Snail.	Construction contractor	Construction
18.	Flora and fauna	Regular inspections would be undertaken to ensure all retained vegetation and fauna habitat are clearly marked and exclusion zones and fencing are maintained.	Construction contractor	Construction
19.	Flora and fauna	An ecologist would be present during the clearing of habitat trees to handle and relocate any injured fauna. WIRES would be consulted if any injured fauna are encountered.	Construction contractor	Construction
20.	Flora and fauna	Vegetation representative of River-flat Eucalypt Forest would be replanted in cleared areas adjacent to Thompsons Creek.	Construction contractor	Post Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
21.	Aboriginal cultural heritage	<p>An Aboriginal cultural heritage management plan would be prepared and incorporated into the CEMP. The plan would include, but not be limited to the following:</p> <ul style="list-style-type: none"> • Identification of Aboriginal cultural heritage areas using diagrams. • Identification of Aboriginal items that are not impacted by the proposal. • Measures to protect Aboriginal item such as fencing. • Induction requirements. • Mitigation measures to avoid risk of harm. • Process to communicate risk and responsibilities through environmental awareness training. • Include any requirements for AHIPs or approvals. 	Construction contractor	Pre-construction
22.	Aboriginal cultural heritage	<p>An area based Section 90 Aboriginal heritage impact permit (AHIP) would be sought for impacts on all Aboriginal sites within the proposal that cannot be conserved, and for any required salvage excavations or surface collections. This includes the following items IFI (Harrington Park), O-IF-2/TNRU2, NR4, NR5, BRP-IF-16/TNRU14, TNRU1, TNR2, TNRU3, TNRU4, TNRU5, TNRU6, TNRU7, TNRU9 and TNRU10.</p>	RMS project manager	Pre-construction
23.	Aboriginal cultural heritage	<p>A number of Aboriginal sites are currently listed on existing AHIPs (O-IF-3, BRP-S-01, BRP-S-04 and BRP-S-08). Before an AHIP application is submitted by RMS, the permit holder and OEH would be consulted as to the current status of the Aboriginal sites.</p>	RMS project manager	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
24.	Aboriginal cultural heritage	Salvage excavation of a representative area of the sites with moderate archaeological significance would be undertaken to identify appropriate mitigation measures for these sites. This would include the following sites O-IF-2/TNRU2, BRP-IF-16/TNRU14, TNRU4 and TNRU6, TRNU10. A section 90 AHIP would be obtained to conduct this testing.	RMS project manager	Pre-construction
25.	Aboriginal cultural heritage	Hand collection of site TNRU7 would be undertaken by the Aboriginal stakeholder group.	RMS project manager	Pre-construction
26.	Aboriginal cultural heritage	The scarred tree NRST1 would continue to be conserved by the design. Prior to and during construction an exclusion zone would be in place around the tree so that impacts would be avoided during construction.	Construction contractor	Pre-construction and construction
27.	Aboriginal cultural heritage	Site cards for the newly recorded sites would be submitted to AHIMS and site update cards for those sites found to have errors in their co-ordinates would also be submitted.	RMS project manager	Pre-construction
28.	Aboriginal cultural heritage	An exclusion zone would be created for O-IF-3, Northern Road PAD2, NR6, BRP-S-01, BRP-S-02, BRP-S-08, TRNU8 and TRNU13 during construction.	RMS project manager	Construction
29.	Aboriginal cultural heritage	Should Aboriginal cultural heritage items be uncovered during construction, RMS's unexpected finds procedure would be followed. All work in the vicinity of the find would cease and the RMS Aboriginal Cultural Heritage Advisor and the regional environmental officer would be contacted immediately. Works in the vicinity of the find would not re-commence until clearance is been received from those RMS officers and the OEH.	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
30.	Non-Aboriginal cultural heritage	Where possible, heritage items and archaeological deposits would be avoided by the proposal.	RMS project manager	Detailed design
31.	Non-Aboriginal cultural heritage	Consultation with the Heritage Council regarding the State heritage register listed item and items of archaeological potential would be undertaken. Consultation would also be undertaken with Camden and Liverpool City councils regarding potential impacts to locally listed heritage items.	RMS project manager	Detailed design
32.	Non-Aboriginal cultural heritage	Consideration would be given to veering the Derwent link road near Farmstead complex (Lots 141 & 142, DP 625519) to the west to avoid impacts to the farm buildings. If the route of the road is not altered then archival recording would be conducted prior to any works being carried out.	RMS project manager	Detailed design
33.	Non-Aboriginal cultural heritage	Consideration would be given to moving the proposed link road at Mersey Road to avoid demolition of the house (Lot 1, DP 234403) and any associated archaeological deposits.	RMS project manager	Detailed design
34.	Non-Aboriginal cultural heritage	<p>A non-Aboriginal cultural heritage management plan would be prepared and incorporated into the CEMP. The plan would include, but not be limited to the following:</p> <ul style="list-style-type: none"> • Identification of non-Aboriginal cultural heritage items using diagrams. • Identification of non-Aboriginal items that are not impacted by the proposal. • Measures to protect non-Aboriginal item such as fencing. • Induction requirements. • Mitigation measures to avoid risk of harm. • Process to communicate risk and responsibilities through environmental 	Construction contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<p>awareness training.</p> <ul style="list-style-type: none"> Requirements for applications and approvals. 		
35.	Non-Aboriginal cultural heritage	An exemption would be sought from the NSW Heritage Branch for Orierton before any impacts occur to the site, including impacts on archaeological deposits associated with the millers cottage. A research design would be completed as part of this application and a suitably qualified excavation director would be nominated to ensure consistency of archaeological monitoring during the construction of the Hillside Drive link road.	RMS project manager	Pre-construction
36.	Non-Aboriginal cultural heritage	Archival and photographic recording of the Orierton homestead, driveway and its surroundings would be undertaken in order to document the character of the estate before construction.	RMS project manager	Pre-construction
	Non-Aboriginal cultural heritage	Archival recording would be undertaken for Lots 141 & 142, DP 625519 prior to any works being carried out.	Construction contractor	Pre-construction
37.	Non-Aboriginal cultural heritage	If the route remains unchanged for House at Lot 1, DP 234403 archival and photographic recording, the creation of site plans and archaeological monitoring would be required. A section 140 permit would be required to undertake monitoring and archaeological excavations if required at the site. As part of the application for the permit a research design would be developed and a suitably qualified excavation director nominated.	Construction contractor	Pre-construction
38.	Non-Aboriginal cultural heritage	An exception would be obtained under section 139 of the Heritage Act before works begin within the Narellan Army Camp area.	Construction contractor	Pre-construction
39.	Non-Aboriginal cultural heritage -	A heritage induction would be provided before construction begins to inform workers of the location	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
	general	of known heritage items. This induction would include the process to follow if unanticipated heritage items or deposits are located during works, in accordance with the RMS Unexpected Archaeological Finds Procedure (November 2011).		
40.	Non-Aboriginal cultural heritage	The Orielton fence that would be removed as part of the road widening would be replaced with a suitable rural-style fence.	Construction contractor	Construction
41.	Non-Aboriginal cultural heritage	A suitable entrance gate to Orielton would be constructed on the new link road stub. The link road stub would be constructed with suitable road treatments in order to reduce noise impacts at to Orielton.	Construction contractor	Construction
42.	Non-Aboriginal cultural heritage	Archaeological monitoring would be conducted during the construction of the Hillside Drive link road where deposits associated with the miller's cottage may be located. A section 60 Permit would be required for archaeological monitoring.	Construction contractor	Construction
43.	Non-Aboriginal cultural heritage	An exclusion zone would be created for the northern and southern gateposts, gatehouse at the entrance to Maryland, Prince of Wales Inn, Bringelly Church, Structures at Lot 3 DP 590913.	Construction contractor	Construction
44.	Non-Aboriginal cultural heritage	Screening vegetation would be planted along the road boundary of The Northern Road in order to alleviate any impacts on views from Maryland homestead and Cottage at 1186 The Northern Road.	Construction contractor	Construction
45.	Noise and vibration	Further investigation of all feasible and reasonable noise control options would be considered for the affected receivers (as identified in tables 6-44 and 6-45, and listed in Appendix K as part of the proposal to reduce traffic noise levels to within the applicable noise limits. As a part of this investigation affected	RMS project manager	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
		landowners would be consulted regarding their individual needs.		
46.	Noise and vibration	<p>A Construction Noise and Vibration Management Plan (CNVMP) would be developed during finalisation of the construction methodology and the detailed design phase. This plan would include but not be limited to:</p> <ul style="list-style-type: none"> • A noise assessment in accordance with the Interim Construction Noise guideline (DECC2009). • Identification of potentially affected properties and residences. • A risk assessment to identify potential risk for discrete work elements/activities likely to affect residents. This would guide the development of the construction timetable and the identification of feasible and reasonable mitigation measures. • A map indicating the locations of likely potential impacts potentially impacted receivers. • Mitigation measures to control and minimise the impacts of construction noise and vibration with consideration of the requirements of section 5 of ENMM. • Noise monitoring program during construction. • A process for assessing the performance of the implemented mitigation measures. 	Construction contractor	Pre-construction
47.	Noise and vibration	<ul style="list-style-type: none"> • Construction timetabling would be organised to minimise noise impacts. Timetabling considerations may include time and duration restrictions and respite periods. • The nearest noise receptors would be notified 	Communications manager	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<p>of the construction work schedule and expected noise levels prior to construction.</p> <ul style="list-style-type: none"> Where rock breaking/ hammering is required within 10 metres of any occupied dwelling, occupants would be notified of the works and the duration of activity. Activity would be restricted to no more than two hours in any working day. 		
48.	Noise and vibration	Where feasible and reasonable, measures identified to manage and mitigation operational noise and vibration impacts would be implemented as early and possible during construction to provide additional construction phase mitigation as well.	Construction contractor	Construction
49.	Noise and vibration	Where residents are highly noise affected (above 75 dB(A)) additional safeguards including respite periods would be considered in consultation with the affected community.	Construction contractor	Construction
50.	Noise and vibration	Works would be carried out during standard working hours (that is 7am-6pm Monday to Friday, 8am-1pm Saturdays). Any work that is performed outside normal work hours or on a Sunday or public holiday is to minimise noise impacts in accordance with the Environmental Noise Management Manual, "Practice Note vii – Roadworks Outside of Normal Working Hours and the Interim Construction Noise Guidelines (OEH 2010). This would include notifying the local community of any works planned to be undertaken outside standard construction hours.	Construction contractor	Construction
51.	Noise and vibration	A community liaison phone number and site contact would be provided so that noise and vibration-related complaints can be received and addressed in a timely manner.	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
52.	Soils, landscape and water quality	Detailed design would consider the following: <ul style="list-style-type: none"> • Separation of off site and on site water. • Sedimentation basin locations and sizes. • Management of runoff during construction, including the application of appropriate erosion and sediment control measures. 	Design contractor	Detailed design
53.	Soils, landscape and water quality	During detailed design the design of the grass swales would include review of their location, length, size and design for operational water quality treatment.	Design contractor	Detailed design
54.	Soils, landscape and water quality	A soil and water management plan (SWMP) would be prepared as part of the construction environmental management plan (CEMP) for the proposal before construction. The SWMP would address the RMS Code of Practice for Water Management, the RMS Erosion and Sediment Procedure and incorporate specifications outlined in the NSW Soils and Construction – Managing Urban Stormwater Volume 1 “the Blue Book” (Landcom, 2004) and Volume 2 (DECC, 2008). The SWMP would include but not be limited to: <ul style="list-style-type: none"> • Minimisation of the area of disturbance, including designated exclusion zones for construction plant and equipment storage and use. • Delineation of traffic areas and restriction of entry and exit points to construction sites. • Appropriate storage of chemicals and fuels. • Description of works and activities and a list of equipment and machinery. • Identify areas of risk (eg steep areas or high erosivity soils) and areas requiring management controls. 	Construction contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> A maintenance schedule for the ongoing maintenance of temporary erosion and sediment controls. Emergency procedures for chemical spills and other potential emergency incidents. <p>This plan would be reviewed by the RMS regional environmental officer, Sydney Region before construction.</p>		
55.	Soils, landscape and water quality	An Environmental Work Method Statement (EWMS) would be prepared for the proposal. With regards to soils, landscape and water quality, it would include the identification of areas requiring management controls (such as high risk areas including Narellan Creek, Thompsons Creek and Lowes Creek).	Construction contractor	Pre-construction
56.	Soils, landscape and water quality	Progressive erosion and sediment control plans would be implemented.	Construction contractor	Construction
57.	Soils, landscape and water quality	Water quality monitoring and construction works would be undertaken in line with the RMS Guideline for Construction Water Quality Monitoring (RTA undated) and EPL conditions.	Construction contractor	Construction
58.	Soils, landscape and water quality	An incident emergency spill plan would be developed and incorporated into the CEMP. The plan would include measures to avoid spillages of fuels, chemicals, and fluids onto any surfaces or into any adjacent/nearby waterways and emergency response plan.	Construction contractor	Construction
59.	Soils, landscape and water quality	An emergency spill kit would be kept on site at all times. All staff would be inducted into the incident emergency procedures and made aware of the location of emergency spill kits.	Construction contractor	Construction
60.	Soils, landscape and water quality	Should a spill occur during construction, the incident emergency spill plan would be implemented, and the RMS regional environmental officer, Sydney Region	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		would be contacted.		
61.	Soils, landscape and water quality	Stockpiles would be managed in accordance with the <i>Stockpile Site Management Guideline</i> (RTA 2011).	RMS project manager	Construction
62.	Soils, landscape and water quality	<p>A site stabilisation plan would be prepared as part of the CEMP. The plan would include but not be limited to the following:</p> <ul style="list-style-type: none"> • Identification and mapping of areas along the length of the proposal requiring stabilisation. • A risk assessment for disturbed areas and stockpiles. • Detailed methods for stabilisation. • A monitoring program for the stabilised areas. • A process for determining the success of stabilised areas or methods. • A process for identifying additional stabilisation methods in: <ul style="list-style-type: none"> – All high risk areas would be stabilised within two weeks. – All medium risk areas would be stabilised within one month. – In anticipation of rain events. 	RMS project manager	Construction
63.	Soils, landscape and water quality	Topsoil would be stockpiled separately for possible reuse in landscaping and rehabilitation works.	RMS project manager	Construction
64.	Soils, landscape and water quality	Controls would be implemented at entry and exit points to minimise the tracking of soils and particulates onto pavement surfaces.	Construction contractor	Construction
65.	Soils, landscape and water quality	Any material transported onto pavement surfaces would be swept and removed at the end of each working day.	Construction contractor	Construction
66.	Soils, landscape and water quality	Soil sampling would be undertaken prior to works commencing where high risk of salinity occurs, to	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		identify the level of salinity in the soils.		
67.	Soils, landscape and water quality	Where high saline soils are identified, salinity management options would be considered and incorporated into the detailed design for structure protection (eg concrete cover requirements).	Construction contractor	Construction
68.	Soils, landscape and water quality	In the event that indication of contamination is encountered (such as odorous or visually contaminated materials), work in the area would cease until an environmental consultant can advise on the need for remediation or other action, as deemed appropriate.	Construction contractor	Construction
69.	Soils, landscape and water quality	A fuel truck would be used during construction to refuel vehicles. This truck would be appropriately bunded and carry spill kit material. Should fuels, chemicals and liquids be stored within the proposal they would be: <ul style="list-style-type: none"> • Stored at least 50 metres away from any waterways or drainage lines. • Stored in an impervious surface or undertaken off-site. 	Construction contractor	Construction
70.	Soils, landscape and water quality	Vehicle wash downs and/or concrete truck washouts would be undertaken within a designated bunded area of an impervious surface or undertaken off-site.	Construction contractor	Construction
71.	Soils, landscape and water quality	The proposal would be undertaken in line with the Code of Practice for Water Management (RTA 1999) and RMS's Water Policy.	Construction contractor	Construction
72.	Soils, landscape and water quality	Machinery would be checked daily to ensure that no oil, fuel or other liquids are leaking from the machinery.	Construction contractor	Construction
73.	Soils, landscape and water quality	Should the groundwater table be encountered a management plan would be prepared.	Construction contractor	Construction
74.	Hydrology	The proposal would be undertaken in line with the	RMS	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
		Code of Practice for Water Management (RTA 1999) and RMS's Water Policy.		
75.	Hydrology	Works to maintain bridge waterway area at Thompsons Creek bridge so that the potential increase in the 100 year ARI upstream flood levels and increase in flood risk to existing properties is alleviated.	RMS	Detailed design
76.	Hydrology	Detailed flood modelling would be undertaken during detailed design. RMS would consult with any affected landowners identified regarding the potential drainage and flooding impacts on private properties, in order to formulate appropriate mitigation measures.	RMS	Detailed design
77.	Hydrology	RMS would consult with Council during detailed design to confirm that future development upstream of proposal would not increase peak flows arriving at the proposed road corridor boundary.	RMS	Detailed design
78.	Hydrology	Drainage systems would be checked at regular intervals and maintained to ensure they are operating at full capacity (eg clearance of debris from drainage lines).	RMS	Operation
79.	Land use	Consultation would be undertaken with property owners partially or wholly impacted by the proposal.	RMS	Detailed design
80.	Land use	Property acquisition would be managed in accordance with the provisions of the Road and Maritime Services' <i>Land Acquisition Policy</i> and the <i>Land Acquisition (Just Terms Compensation) Act 1991</i> .	RMS project manager	Detailed design
81.	Socio-economic	Property acquisition would be managed in accordance with the provisions of the Road and Maritime Services' <i>Land Acquisition Policy</i> and the <i>Land Acquisition (Just Terms Compensation) Act 1991</i> .	RMS Property Officer	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
82.	Socio-economic	Detailed design of each construction stage would provide U-turn facilities, including for B-double trucks, to provide a detour length no great than five kilometres to access property.	RMS project manager	Detailed design
83.	Socio-economic	Local residents would be notified prior to works commencing and would be kept regularly informed of construction activities during the construction process.	RMS project manager and construction contractor	Pre-construction and construction
84.	Socio-economic	A complaints-handling procedure and register would be included in the CEMP.	Construction contractor	Pre-construction
85.	Socio-economic	Ongoing consultation with Bringelly Public School to maintain access and safety for students. This may include education and awareness programs for school students about road safety in the vicinity of construction works	RMS project manager and construction contractor	Construction
86.	Socio-economic	Road users, pedestrians and cyclists would be informed of changed conditions including likely disruptions to access.	Construction contractor	Construction
87.	Socio-economic	Property access would be maintained wherever possible. Prior to any unavoidable disruption to access, consultation would be undertaken with the affected property owner.	Construction contractor	Construction
88.	Socio-economic	Early and ongoing consultation and communication with local businesses would be required to identify potential impacts on local businesses and appropriate management strategies to avoid or minimise these impacts. This may include measures such as additional signage, provision of alternative access including for delivery vehicles, and communication with local communities about changes to business access.	RMS project manager and construction contractor	Construction
89.	Socio-economic	Access would be maintained for emergency vehicles in the vicinity of construction works. Ongoing	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		consultation would be undertaken with emergency services during construction to ensure that potential impacts are identified and appropriately managed.		
90.	Socio-economic	Prior to construction, residents in the vicinity of the construction compound sites and work areas would be notified.	Construction contractor	Construction
91.	Socio-economic	Prior to construction, RMS would also notify residents that may be in the vicinity of the construction compound sites and work areas.	Construction contractor	Construction
92.	Landscape character and visual impact	Detailed design would be undertaken according to the urban design vision, objectives and principles which underpin the concept design and incorporate the urban and landscape design masterplan requirements from section 8 of the landscape character and visual impact assessment.	RMS	Detailed design
93.	Landscape character and visual impact	Existing trees would be retained in the road corridor where feasible. This would be undertaken by identifying 'no go areas' to restrict access around trees not affected by the proposal and making minor adjustments to the horizontal and vertical carriageways to move them clear of root zones.	Construction contractor	Construction
94.	Landscape character and visual impact	Landscaping would be undertaken in accordance with the masterplan and include: <ul style="list-style-type: none"> • Screening trees and shrubs. • Visually valuable exotic trees in existing residential and commercial areas. • Scattered trees to maintain open views across rural areas. • Planting in verges, medians and traffic islands to soften and break up large areas of pavement. • Maintenance, restoration and enhancement of riparian areas. 	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> Maintenance of landmark regional views to the Blue Mountains and Razorback Mountains. 		
95.	Air quality	Stockpiles and general areas with the capacity to cause dust would have site-specific safeguards implemented such as water spraying, wheel washes, compaction or progressive revegetation or stabilisation with cover crops to suppress dust emissions.	Construction contractor	Construction
96.	Air quality	Stockpiles would be managed in accordance with the <i>Stockpile Site Management Guidelines</i> (RTA 2011).	Construction contractor	Construction
97.	Air quality	Should wind reach a level where dust cannot be controlled, then the dust generating activity would be stopped.	Construction contractor	Construction
98.	Air quality	Stabilisation and rehabilitation of disturbed surfaces would be undertaken progressively.	Construction contractor	Construction
99.	Air quality	Construction equipment and vehicles would be properly maintained to ensure exhaust emissions comply with the POEO Act.	Construction contractor	Construction
100.	Waste management and resource and water use	Water captured in construction sediment basins would be reused for dust suppression, watering of landscaped areas and any other suitable construction activity where feasible.	Construction contractor	Pre-construction
101.	Waste management and resource and water use	Procurement would endeavour to use materials and products with a recycled content and low carbon footprint where that material or product is cost and performance effective.	RMS project manager	Pre-construction and construction
102.	Waste management and resource and water use	Excavated material would be reused on-site for fill or other RMS projects where feasible.	Construction contractor	Construction
103.	Waste management and	Roadside materials (guideposts and signs) would be reused or recycled where feasible.	RMS project manager	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
	resource and water use			
104.	Waste management and resource and water use	The contractor would classify any excavated spoil in accordance with the <i>Protection of the Environment Operations Act 1997</i> .	Construction contractor	Construction
105.	Waste management and resource and water use	Resource management hierarchy principles are to be followed: <ul style="list-style-type: none"> • Avoid unnecessary resource consumption as a priority • Avoidance is followed by resource recovery (including reuse of materials, reprocessing, and recycling and energy recovery). • Disposal is undertaken as a last resort (in accordance with the <i>Waste Avoidance and Resource Recovery Act 2001</i>). 	Construction contractor	Construction
106.	Waste management and resource and water use	Recyclable wastes would be separated and transported to a suitable recycler.	Construction contractor	Construction
107.	Waste management and resource and water use	All construction waste material would be removed from site once the works have been completed.	Construction contractor	Construction
108.	Waste management and resource and water use	Working areas would be maintained, kept free of rubbish and cleaned up at the end of each working day.	Construction contractor	Construction
109.	Waste management and resource and water use	Any offsite disposal of spoil would be accompanied by a Section 143 permit under the POEO Act.	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
110.	Waste and litter impacts during operation	Standard road maintenance works would be undertaken during operation. This would include litter removal and response to accidental spills and collisions. The maintenance requirements would be managed by RMS and/or Council, as per their standard operating procedures.	RMS	Operation
111.	Greenhouse gas and energy use	Further investigations into opportunities for reducing greenhouse emissions during construction and operation of the proposal would be undertaken during the detailed design phase.	RMS project manager	Detailed design
112.	Greenhouse gas and energy use	Equipment would be selected with the consideration of fuel efficiency.	Construction contractor	Construction
113.	Greenhouse gas and energy use	Material would be sourced from the local region, where possible, to reduce transport-related energy consumption.	Construction contractor	Construction
114.	Greenhouse gas and energy use	Surplus fill and waste material would be re-used on site, where possible	Construction contractor	Construction
115.	Greenhouse gas and energy use	Machinery would be turned off, when not in use.	Construction contractor	Construction
116.	Greenhouse gas and energy use	The use of recycled steel in pavement/ concrete reinforcement would be investigated and used, where possible.	Construction contractor	Construction
117.	Greenhouse gas and energy use	Energy-efficient lighting would be used, where possible.	Construction contractor	Construction
118.	Greenhouse gas and energy use	Delivery of materials with full loads would be collected from local suppliers where possible to minimise the number of trips required and maximise fuel consumption.	Construction contractor	Construction
119.	Greenhouse gas and energy use	Appropriately sized construction equipment, plant and vehicles would be used.	Construction contractor	Construction
120.	Greenhouse gas and energy use	Servicing of equipment would be undertaken to ensure optimal performance and minimise down-time (which can reduce time disturbance and access	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		areas).		
121.	Greenhouse gas and energy use	Laydown of the vehicles and buildings would be undertaken in a way to minimise movement and clearing	Construction contractor	Construction
122.	Greenhouse gas and energy use	Intelligent vehicle use, such as not leaving the engine idling when not in use, would be undertaken	Construction contractor	Construction
123.	Greenhouse gas and energy use	Investigation of alternative fuels and power sources to be used would be undertaken and implemented, where appropriate.	Construction contractor	Construction
124.	Greenhouse gas and energy use	Recycling of waste would be undertaken where possible.	Construction contractor	Construction
125.	Greenhouse gas and energy use	Material and waste supply and departure scheduling would be undertaken to optimise full loads and minimise required vehicle trips.	Construction contractor	Construction
126.	Greenhouse gas and energy use	Energy-efficient lighting would be used where appropriate.	RMS	Operation
127.	Greenhouse gas and energy use	Investigation of alternative power sources to be used where appropriate (eg solar power).	RMS	Operation
128.	Climate change	Drainage requirements would take into consideration the effect of increased rainfall projections as a result of climate change on the proposal.	RMS project manager	Detailed design
129.	Climate change	Conservation of vegetation and planting of street trees providing shade to the road surfaces would be considered during detailed design	RMS project manager	Detailed design
130.	Climate change	Hydrology assessment for detailed design to review potential climate change flood levels from both overtopping of local water course and increases sea level.	RMS project manager	Detailed design
131.	Climate change	Flora selected for revegetation to take account of long-terms climate projections for the region.	RMS project manager	Detailed design
132.	Climate change	Review tolerances for bridge structures to ensure	RMS project manager	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
		suitability for projected climate extremes		
133.	Climate change	Review tolerances for asphalt taking into account projected climate change temperature ranges.	RMS project manager	Detailed design
134.	Climate change	Consider projections for increased concrete structure deterioration in the specification and detailed design of concrete structures.	RMS project manager	Detailed design
135.	Climate change	Regular inspections of pavement and structures along the road corridor would be undertaken and maintenance carried out as necessary.	RMS project manager	Operation

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