

10 Environmental management measures

This chapter collates the environmental management measures for the project that were identified through the impact assessment process. All measures listed in Table 10-1 would be incorporated into the Construction Environmental Management Plan. These plans would provide a framework for establishing how these measures would -be implemented and who will be responsible for their implementation.

Table 10-1 Environmental management measures

Environmental aspect and objective	ID	Environmental management measures	Phase of project
Historic heritage			
Minimise visual impacts	HH1	During detailed design additional investigations will be undertaken that seek to further reduce the size and visual impact of the roundabout at Freemans Reach Road and Wilberforce Road.	Pre-construction
	HH2	Opportunities to relocate above-ground utilities underground will be investigated during detailed design.	Pre-construction
	HH3	Measures will be undertaken to ensure that the landscape scheme for the Thompson Square parkland area retains its informal character.	Pre-construction / post construction
Construction mitigation measures	HH4	Prior to construction dilapidation reports will be prepared as identified in Section 7.5.6 (generally receivers within 50 metres of piling, rock breaking and vibratory compaction activities). These will be undertaken in consultation with the relevant property owners.	Pre-construction
	HH5	Prior to commencing work on the project construction site all construction personnel will undergo a heritage induction which would contain information on heritage values and items in the area and on environmental management measures to minimise potential heritage impacts.	Pre-construction
	HH6	All heritage items within the study area will be clearly identified on construction plans to minimise the risk of inadvertent impacts.	Pre-construction
	HH7	Environmental management measures identified in Section 7.5.5 will be implemented to minimise vibration risks and impacts on heritage items.	Construction
	HH8	Heritage items at risk of vibration impacts will be inspected and monitored periodically during construction to identify any construction-related impacts. If impacts are detected, work in the area will cease and appropriate environmental management measures will be implemented such as using alternative low vibration construction techniques.	Construction

Environmental aspect and objective	ID	Environmental management measures	Phase of project
	HH9	Architectural noise environmental management measures for heritage listed buildings will be developed in agreement with property owners and installed by suitably qualified professionals.	Pre-construction
	HH10	An integrated archaeological project and research design will be developed in conjunction with heritage agency stakeholders. The research design will seek to investigate the project footprint and realise its archaeological potential. The archaeological project and research design will set out in detail the archaeological program, the research objectives and questions, and methods of analysis and dissemination of the results.	Pre-construction
Demolition of the existing bridge	HH11	The 1874 bridge will be dismantled in a manner that allows its construction methods and evolution to be appropriately documented as an archival record prior to, and during its demolition.	Demolition
Utility installation along Bridge Street	HH12	Further consultation with utility providers will be undertaken to confirm the feasibility of reducing the number of trenches required for the installation of utilities.	Pre-construction
Archival recording	HH13	Prior to commencing works and during works, an archival record of the project footprint and the immediate vicinity will be undertaken in accordance with Heritage Council guidelines for items of State significance.	Pre-construction / construction
	HH14	The Heritage Branch (on behalf of the Heritage Council), the Hawkesbury Museum and Hawkesbury City Council will be consulted on the level of appropriate archival recording. At a minimum archival recording will be undertaken in accordance with the Heritage Council guidelines for recording items of State significance prior to any further works.	Pre-construction / construction
	HH15	Archival recording prior to, during demolition and construction of the project and after completion of the project will be undertaken.	Pre-construction / construction
	HH16	A social record of Thompson Square and the building of the replacement bridge will be prepared to capture community views on the change to the environment.	Pre-construction
Post construction landscaping	HH17	Consultation with Hawkesbury City Council, relevant heritage agencies and the community on the urban design and landscape concept for Thompson Square will be undertaken during the detailed design phase of the project. The urban design landscaping principles and objectives will be used to further develop the detailed design of the project.	Pre-construction
	HH18	The concept of an informal landscape will be the basis of the final landscape plan for Thompson Square.	Pre-construction

Environmental aspect and objective	ID	Environmental management measures	Phase of project
	HH19	Post-construction landscaping will be prioritised where it would provide residences and businesses with a visual buffer to the completed project.	Pre-construction
Interpretation	HH20	An interpretation strategy within the archaeological project plan and research design, will be developed to identify opportunities for public understanding and engagement with the archaeological investigation process. This will assess and recommend strategies.	Pre-construction
	HH21	An interpretation plan will be prepared based upon all of the heritage assessments to provide a framework for making information about the site's significance publicly accessible. The interpretive plan will be informed by the landscape masterplan that is proposed for Thompson Square	Pre-construction
Re-use of existing bridge	HH22	Where possible, excess materials such as the iron piers on the existing Windsor bridge, would be re-used within the project. If re-use is not possible within the project, re-use opportunities off-site would be investigated. All components would be properly labelled with provenance.	Construction
Minimise impacts to maritime archaeology	MH1	An above and below water maritime archaeological salvage excavation will be undertaken within the area considered to have a high potential to contain archaeological remains associated with the c.1814 wharf where impacts from the project are anticipated. This includes the area immediately behind the southern bank of the river within footprint of the project. The salvage excavation will be conducted by a qualified maritime archaeologist in accordance with an appropriate research design. The research design would include, as a minimum, an excavation methodology, research questions and provisions for artefact analysis.	Pre-construction
	MH2	An archaeological excavation report will be prepared at the conclusion of the salvage excavation, and submitted to the Office of Environment and Heritage for their records.	Pre-construction
	MH3	The results of the excavation and artefact analysis will be used in on-site interpretation of the maritime history and heritage of the Windsor area.	Pre-construction
	MH4	Archaeological monitoring by a qualified archaeologist will be undertaken in conjunction with earthworks and landscaping on the northern side of the existing bridge in the general location of the c.1835 punt landing. Any archaeological remains or relics associated with the punt crossing will be recorded and/or salvaged.	Pre-construction
	MH5	An archaeological monitoring report will be prepared at the end of the monitoring works and submitted to the Office of Environment and Heritage for their records.	Pre-construction

Environmental aspect and objective	ID	Environmental management measures	Phase of project
Aboriginal heritage			
Minimise impacts to identified sites	AH1	A salvage excavation plan will be developed in consultation with NSW Office of Environment and Heritage which would include the following considerations: • In the upper portion of W-SP 45-5-3581, at the corner of George and Bridge Streets, the entire extent of the archaeologically significant deposit will be salvaged via open excavation. The area of excavation would be about 100 square metres or as otherwise agreed with OEH during detailed design. • In the lower portion of W-SP 45-5-3581, in the area between Bridge Street, Old Bridge Street and the wharf carpark, a representative sample of archaeological material will be taken to further investigate the relationship between the identified stone artefacts and shell lenses. The area of excavation would be about 25-50 square metres or as otherwise agreed with OEH during detailed design. • Field and analysis methods for the salvage excavations will be consistent with the Department of Planning and Infrastructure approved methodology set out in Volume 2 - working paper 3 and Department of Planning and Infrastructure will be consulted during the salvage process. • A suitably qualified and experienced archaeologist will be appointed to oversee the salvage activities.	Pre-construction
	AH2	• Aboriginal objects recovered during salvage activities would be transferred to the Australian Museum in accordance with legislative requirements, Australian Museum Archaeological Collection Deposition Policy v1.0 January 2012. • In the event the Australian Museum is unable to accept the objects, the objects will be transferred in accordance with a Care Agreement or similar agreement to an Aboriginal community. • In the event that neither the Australian Museum nor the Aboriginal community are able to accept the archaeological objects, the suitably qualified and experienced archaeologist appointed to oversee the salvage activities would seek a Care Agreement or similar agreement to curate the objects.	Pre-construction
	AH3	A written archaeological excavation report will be provided to RMS within a reasonable time following the completion of the archaeological program.	Pre-construction /construction

Environmental aspect and objective	ID	Environmental management measures	Phase of project
Minimise impacts to unidentified sites	AH4	In the areas where archaeological salvage is proposed, no construction or demolition activities (including preliminary and preparatory activities such as fencing, investigative drilling, minor clearing, establishing site compounds and adjustment of services and utilities) will occur until the salvage activities have been completed in that area.	Pre-construction /construction
	AH5	Prior to the commencement of preliminary and preparatory construction or demolition activities, a construction heritage site map identifying the known Aboriginal heritage sites and the areas to undergo salvage excavation will be prepared.	Pre-construction
	AH6	Registered Aboriginal stakeholders will be provided with the opportunity to assist with the salvage excavation.	Pre-construction
	AH7	Incident reporting procedures for the project will cover incidents involving Aboriginal heritage.	Construction
	AH8	Project environmental management plans will identify procedures for handling human remains, including an immediate stop to work in the vicinity of the find, and reporting to appropriate authorities.	Pre-construction

Environmental aspect and objective	ID	Environmental management measures	Phase of project
Traffic and transport			
Minimise impacts of construction work vehicles and haulage vehicles	T1	A Construction Traffic Management Plan will be prepared and implemented which would enable the safe management of traffic and minimise impacts on the local community. The plan will be structure to address the following issues: • Identification of public roads to be utilised by construction traffic. • Management measures so that construction traffic utilise the identified roads. • Identification of any public roads that may be partially or completely closed during the construction phase and the relevant expected timings and duration of closures. • Identification of sources of major construction materials and routes for their delivery to site. • Temporary access and traffic arrangements to be implemented during construction. • Access arrangements to construction sites and compounds and measures to prevent construction traffic from obstructing traffic flow inadvertently. • Parking for construction workers. • A response plan for any construction traffic incident. • Monitoring, review and amendment mechanisms.	Pre-construction / construction
	T2	Traffic Control Plans will be developed and implemented for specific areas and/or phases of construction. These will be prepared in accordance with relevant guidelines and by appropriately qualified personnel.	Pre-construction / construction
	T3	Traffic control schemes will be inspected regularly and modified if required.	Pre-construction / construction
	T4	Drivers and construction workers will be inducted in the requirements of the traffic management plan.	Construction
	T5	Deliveries and other major construction traffic movements will be timed to occur outside peak traffic periods, where possible.	Construction
	T6	Queuing on public roads will be avoided by the use of two-way radios to call up haulage trucks from layover areas on a 'just in time' basis.	Construction
	T7	Dilapidation surveys of roads around the project site will be undertaken prior to their use for construction as well as after construction is complete. Any damage to roads will be repaired.	Pre-construction / post construction

Environmental aspect and objective	ID	Environmental management measures	Phase of project
	T8	Consultation will be undertaken with the emergency services, bus operators, local business and other major stakeholders to inform them on changes in traffic management during construction.	
	T9	Construction related parking in local areas will be in accordance with the relevant parking restrictions. Opportunities to limit the impact this may have on the community will be investigated in consultation with the Hawkesbury City Council.	Construction
Minimise impacts to river users	T10	Environmental management measures may include introducing a temporary navigational speed limit (4 knots or below) within the construction zone and/or introducing a temporary no wash zone. Exclusion zones around marine construction sites will be required, however at all stages passage up and downstream would be provided to watercraft. Other RMS maritime requirements will be complied with.	Pre-construction / construction
	T11	Maritime operators will be undertaken so that impacts are minimised.	Pre-construction / construction
Operation	T12	Operational traffic levels and delays will be monitored. When delays due to traffic growth become unacceptable reconfiguration of the lanes on the bridge and approach roads from the initial two lane configuration to two southbound and one northbound lane will be undertaken.	Operation
Visual impact, urban design and landscaping			
Detailed design measures for the replacement bridge	V1	- Refinement of the bridge, its abutments and constituent parts and details to ensure a high quality outcome in response to its prominence within the Hawkesbury River's landscape setting and the township of Windsor. - Lighting design would be refined to integrate with the design and character of the bridge, approach roads and public domain, with consideration of minimising potential impacts associated with light spill and glare.	Pre-construction

Environmental aspect and objective	ID	Environmental management measures	Phase of project
Detailed design measures for Thompson Square	V2	• Further consultation would be undertaken with Hawkesbury City Council and other relevant stakeholders to develop an urban design, landscape and open space use plan for Thompson Square and adjacent areas on the southern foreshore. • The concept design of Thompson Square presented in this proposal would form the basis for ongoing consultation. • Retention and protection of as many trees as possible will be undertaken but in particular the most significant existing trees would be incorporated into the design wherever possible. • Review the potential benefits of locating the shared path on the eastern side of the proposed bridge to increase the area of green space in Thompson Square. • New tree planting would be consistent and complement the existing species that are to be retained. Planting locations would facilitate direct views to the river and screen the replacement bridge where possible. • Any new lighting would strike a balance between illumination for safety and the context of the parkland and its adjoining areas.	Pre-construction
Detailed design measures for The Terrace and river foreshore	V3	• Further consultation would be undertaken with Hawkesbury City Council to develop an urban design, landscape plan for the southern foreshore and adjacent areas. • Further design refinement of The Terrace and foreshore area to achieve high quality public access and amenity along the river's edge and to the river, including the appropriate provision of lighting where required. • Detailed design of the form, materials and finishes of the foreshore retaining wall would be undertaken to maximise the integration of the wall into the river setting. • Consideration would be given to the design of The Terrace roadway including materials and form and to integrate it into the surrounding parkland. • New tree, shrub and groundcover planting would be incorporated in the foreshore areas to enhance the parkland setting and views to the river.	Pre-construction

Environmental aspect and objective	ID	Environmental management measures	Phase of project
Detailed design measures for the northern intersection	V4	• Further consultation would be undertaken with Hawkesbury City Council to develop an urban design, landscape plan for the northern foreshore and adjacent areas. • Further design refinement would be undertaken to improve the integration of the northern intersection responding to its location and role as the northern arrival point to Windsor and Macquarie Park • Safe pedestrian and cycle connections throughout the project and links with existing path network within Macquarie Park would be further examined. • Appropriate provision for lighting would be considered and lighting infrastructure utilised only where required.	Pre-construction
Pedestrian and cycle access	V5	Further consultation would be undertaken with Hawkesbury City Council to develop a pedestrian and cycle access plan for the project and the surrounding area, in order to integrate the pedestrian and cycle connections into the surrounding network.	Pre-construction
Minimise visual impacts of construction	V6	Construction facilities will be contained within the construction works zone boundary and occupy the minimum area practicable.	Construction
	V7	Suitable barriers will be provided to screen views from adjacent areas	Construction
	V8	Temporary construction facilities and compound areas will be returned to their pre-construction state or better, either at the completion of the construction phase or progressively throughout the construction period where possible and practicable.	Construction
	V9	Pollution and dust will be kept to a minimum through the application of pollution management measures and monitoring.	Construction
	V10	Footpaths that will be affected by construction activities would be temporarily diverted to maintain suitable alternative access routes for pedestrians	Construction
	V11	Existing trees within construction area and compounds that do not need to be removed will be identified, protected and maintained throughout the construction period.	Construction
	V12	Temporary lighting will be screened or diverted to reduce unnecessary light spill.	Construction
	V13	Material used for temporary land reclamation will be removed once the works are complete.	Construction

Environmental aspect and objective	ID	Environmental management measures	Phase of project
Noise and vibration			
Minimise construction noise and vibration impacts	NV1	A Construction Noise and Vibration Management Plan (CNVMP) will be prepared and will include general controls such as: • Further detailed noise impact assessments will be undertaken of all construction works and works outside standard construction hours once detailed construction planning is complete as the location and type of construction works may change. These detailed noise impact assessments will be used to identify affected sensitive receivers and develop detailed mitigation measures. • The nearest noise sensitive receivers will be notified of future works and expected levels of noise well in advance of the works occurring. • Construction programming will be developed to minimise noise impacts - this may include time and duration restrictions and respite periods, and will be developed after consultation with affected receivers. • Where possible, works outside of standard construction hours will be planned so that noisier works are carried out in the earlier part of the evening or night time. • Where noisy works are required outside of standard construction hours, negotiated agreements will be sought with affected sensitive receivers. • Where possible, the use of noisy plant simultaneously and/or close together will be avoided. • Equipment and excavation work sites will be orientated away from sensitive receivers where possible to reduce noise emissions. • Equipment will be maintained in efficient working order. • Quieter construction methods will be used where feasible and reasonable. This may include grinding, rock splitting or terrain levelling instead of rock breaking where it is feasible and reasonable. • Where acceptable from a work health and safety perspective, quieter alternatives to reversing alarms (such as spotters, closed circuit television monitors and 'smart' reversing alarms) will be used particularly during out of hours activities. • All noise complaints will be investigated and appropriate mitigation measures implemented where practicable to minimise further impacts.	Pre-construction

Environmental aspect and objective	ID	Environmental management measures	Phase of project
Construction noise and vibration	NV1	• Truck movements will be restricted to identified haulage routes and the routes outlined in the Construction Traffic Management Plan • Noise monitoring will be undertaken to assess compliance with NMLs and assess the effectiveness of noise mitigation. The use of temporary noise shielding will be considered at locations along Bridge Street where substantial exceedances of noise criteria are predicted. In addition where work is undertaken in close proximity to Thompson Square or along Freemans Reach Road, temporary noise barriers will be considered • Buildings/structural conditions surveys will be undertaken prior to and following construction works at receivers within 50 metres of piling, rock breaking and vibratory compaction activities, including the heritage retaining wall at 4 Bridge Street. • No impact piling works will be undertaken within 20 metres of any heritage structure, unless additional assessment and monitoring confirm that vibration levels will be below project specific criteria. • Rock breaking/hammering will not be undertaken within seven metres of any heritage item or building unless additional assessment and monitoring confirm that vibration levels will be below project specific criteria. • Rock breaking/hammering will not be undertaken within five metres of any non heritage building unless additional assessment and monitoring confirm that vibration levels will be below project specific criteria. • Where rock breaking/hammering is planned within 10 metres of any occupied dwelling, the occupants will be notified of the works and the duration of the activity will be restricted, unless otherwise agreed with affected residents. • Where heavy plant is used within seven metres of a heritage structure, attended vibration monitoring will be undertaken to assess compliance with project specific vibration criteria. • Where an exceedance of project specific vibration criteria for structural damage is recorded during monitoring, work will cease immediately and alternative construction methods will be used.	Pre-construction/ Construction
Operational noise	NV2	Architectural treatments for noise mitigation would be identified by appropriate qualified professional and installed in consultation with property owners.	Pre-construction

Environmental aspect and objective	ID	Environmental management measures	Phase of project
Soil, sediment and water			
Minimise impacts to soil and water from construction	SW1	An erosion and sediment control plan will be developed during detailed design in accordance with Managing Urban Stormwater – Soils and Construction Volume 1 (Landcom, 2004) and Volume 2D (DECC, 2008). This plan will incorporate erosion control measure to limit the movement of soil from disturbed areas, and sediment control measures to remove any sediment from runoff prior to discharge into the river.	Pre-construction
	SW2	Appropriate measure will be implemented to contain any turbid water by applying best management practices such as silt curtains or similar.	Pre-construction
	SW3	A water quality monitoring program in compliance with RMS guidelines will be developed and implemented to assist in identifying water quality issues during construction and assessing the effectiveness of mitigation measures.	Detailed design
Minimise impacts to soil and water from operation	SW4	Water quality controls will be incorporated into the drainage design. This will include controls such as: • An end of pipe net type gross pollutant trap connected to the stormwater outlet will be provided. • A lockable shut-off valve will be provided at the stormwater pit immediately upstream of the outlet to mitigate the potential impact of spills of hazardous liquids. • The water quality basin on the northern bank will be fitted with an underflow baffle arrangement to provide accidental spill capture.	Construction / post construction
Minimise the impacts to soil and water from demolition	SW5	The existing bridge will demolished in a way to reduce the risk of debris falling into the river.	Demolition
	SW6	Debris and rubble will be prevented from entering the river.	Demolition
	SW7	Disturbance or turbidity will be contained by installing self-containment equipment such as silt curtains.	Demolition
	SW8	Water quality in the river will be monitored in accordance with the RMS Guideline for Construction Water Quality Monitoring to assess the effectiveness of water quality mitigation measures.	Demolition

Environmental aspect and objective	ID	Environmental management measures	Phase of project
	SW9	Demolition activities will be schedule to avoid or minimise works taking place during times of higher rainfall and river flows.	Demolition
Minimise the impacts of unknown contaminated material	SW10	During excavations, soil and fill material will be visually monitored to identify the potential contaminated material or soils.	Construction
	SW11	If potentially contaminated material or soils is suspected, works will cease in the area and additional investigations and monitoring will be undertaken.	Construction
	SW12	If it is confirmed that contaminated material or soils is present on site, an appropriate remediation plan will be developed and implemented.	Construction
	SW13	All fuels and chemicals will be stored and used in compliance with appropriate guidelines and standards. A spill management procedure will be developed and implemented if required.	Construction
Minimise the impacts of waste generation	SW14	Detailed waste management measures and procedures will be included in the CEMP for the project.	Pre-construction / Construction
	SW15	Waste management measures will be based upon the philosophy of reduce, reuse, recycle and appropriate disposal.	Pre-construction / Construction
	SW16	The project induction will cover waste management measures in the CEMP.	Pre-construction / Construction
	SW17	All waste material requiring off-site disposal will be classified using the Waste Classification Guidelines and disposed of at an appropriately licensed facility.	Pre-construction / Construction
	SW18	Procurement and waste management strategies will be based upon the philosophy of reduce, reuse, recycle and appropriate disposal.	Pre-construction / Construction
	SW19	Where applicable, waste that is to be re-used will comply with the conditions attached to EPA resource recovery exemptions for specific materials.	Pre-construction / Construction
Minimise the impacts of acid sulphate soils during demolition	SW20	Further acid sulfate soils investigations would be undertaken during detailed design of the project.	Pre-construction

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	SW21	If the presence of ASS is confirmed in the river sediment near the existing bridge, an ASS management plan will be developed and implemented. The plan will detail the management, handling, treatment and disposal of ASS and will be prepared in compliance with the Acid Sulfate Soils Assessment Guidelines (ASSMAC, 1998) and the Guidelines for Managing Acid Sulfate Soils (RTA, 2005).	Pre-construction
Minimise the impacts of construction on groundwater	SW22	Monitoring of groundwater at piezometers installed for the project and the adjacent groundwater bore will be undertaken to identify any impacts during construction. If any impacts on groundwater levels or quality are detected, the potential cause and environmental management measures will be identified and developed.	Pre-construction/ Construction
Minimise the impacts of hazardous materials during demolition	SW23	Demolition of bridge structures containing lead based paints will be undertaken in accordance with the following: • Australian Standard AS 436101 – 1995 Guide to lead paint management, Part 1: Industrial applications. • Australian Standard AS 4361.2 – 1998, Guide to lead paint management, Part 2: Residential and commercial buildings. • Australian Standard AS 2601 – 2001, The demolition of structures. The preferred option for management of lead based paints and the associated mitigation measures will be identified during the construction and demolition planning process. The demolition plan for the existing Windsor bridge would include the details on the reuse, recycling and/or disposal of the demolished components.	Demolition
Hydrology			
Minimise construction impacts	H1	The extent of obstructions within the river will be minimised as far as practicable at all times during construction and demolition.	Construction / demolition
	H2	The time between completion of construction of the replacement bridge and demolition of the existing bridge will be minimised as far as practicable.	Construction / demolition
	H3	Construction infrastructure and equipment will be removed from the river channel in the event of a forecast flood to minimise both the risk of damage to infrastructure/equipment and the risk of potential flood impacts on properties.	Construction

Environmental aspect and objective	ID	Environmental management measures	Phase of project
Minimise impacts to property	H4	Appropriate procedures to manage the effects of flooding during construction, and minimise any associated adverse environmental impacts to the greatest extent practicable, will be incorporated into a construction environmental management plan and emergency response plan (to be prepared and approved before the start of construction). The emergency response plan would include procedures to ensure adequate warning of floods is obtained and that appropriate emergency response procedures are implemented in a timely manner.	Pre-construction and construction
	H5	Flood impact mitigation requirements and options for buildings potentially impacted by increased flooding will be investigated during detailed design in consultation with the landholder. Appropriate measures would be identified, developed and implemented, as required, to minimise impacts on the building structure, building access and business opportunities.	Pre-construction
	H6	During the detailed design of the new bridge, detailed flood modelling will be undertaken on the final design of the project to identify any additional impacts. This will include collecting survey data at potentially impacted properties with buildings upstream of the bridge. Where impacts are identified, appropriate measures will be identified, developed and implemented, as required, to minimise impacts on the building structures, building accesses and business opportunities.	Pre-construction
Minimise scour impacts	H7	Suitable scour protection would be provided to protect the bridge abutments, piers and banks during construction and operation	Construction
Land use and socio-economic			
Minimise construction impacts to land use, the community and local business.	SE1	Early and ongoing consultation and communication with residents and local businesses will be undertaken to provide information on construction activities, including timing, duration and likely impacts.	Pre-construction/ Construction
	SE2	Affected local business owners will be consulted prior to construction to identify appropriate measures to manage potential impacts.	Pre-construction
	SE3	Operators of the Hawkesbury Paddle Wheeler will be consulted prior to construction to identify appropriate measures to manage the temporary access changes to Windsor wharf.	Construction
	SE4	Public access will be maintained to key areas of the Hawkesbury River during existing planned events.	Pre-construction/ Construction

Environmental aspect and objective	ID	Environmental management measures	Phase of project
	SE5	Appropriate compensation will be provided in accordance with the <i>Land Acquisition (Just Terms Compensation) Act 1991</i> for properties acquired as a result of the project.	Pre-construction/ Construction
	SE6	The town centre and businesses will be protected from the visual impacts of construction through careful placement of appropriate and visually sensitive screening wherever possible.	Pre-construction/ Construction
	SE7	Visitor access to key tourist areas and attractions will be assisted throughout the construction period though the placement of appropriate signage.	Pre-construction/ Construction
	SE8	Strategies for enhancing the local economic benefits of project construction, such as local employment strategies and sourcing materials from existing local industries, would be considered in the detailed design.	Post construction / operation
	SE9	Areas affected by construction would be reinstated and restored in accordance with the urban design and landscape concept for the project (see Section 7.4) as soon as practicable.	Post construction / operation
Flora and fauna			
Induction	FF1	The project induction will include relevant information, mitigation measures and procedures on protecting the biodiversity of the area during construction.	Pre-construction
Site planning	FF2	Temporary infrastructure (plant sites and offices etc) will be located in cleared areas away from vegetation. Clear boundaries will be applied for construction and exclusion zones for equipment, machinery and traffic to prevent unnecessary damage to native vegetation and fauna habitats.	Pre-construction
	FF3	Clearing limits will be accurately and clearly marked including trees/vegetation to be retained including riparian zones.	Pre-construction

Environmental aspect and objective	ID	Environmental management measures	Phase of project
Pre-clearing fauna survey	FF4	- Once construction areas have been surveyed and marked, a suitably qualified and experienced fauna ecologist will undertake a pre-clearing survey to identify any concerns to specific species. - A survey of the existing bridge structure will be undertaken by boat by an ecologist to confirm the bridge is not providing habitat for microchiropteran bats or other roosting bats. - Should the results of the bat survey and roost assessment indicate that the existing bridge occupied by microbats, a bat management plan will be prepared to mitigate the potential impacts on bats. The plan would include details of an appropriate work schedule, any further close inspections that may be required and exclusion and relocation of fauna away from the construction site. - WIRES will be made aware of the project and consulted if any injured fauna are encountered or if any fauna are injured as a result of the works. - An ecologist or WIRES representative will be present during the clearing of suspected vegetation that may support a habitat for fauna to manage and/or relocate any fauna present.	Construction
Erosion and sediment control	FF5	Management plans and measures will be developed and implemented to minimise water quality impacts from construction. A discussion on water quality mitigation measures has been provided in Section 7.6.6.	Pre-construction
	FF6	- Minimise the area of disturbance in riparian zones by clearly marking out work zones in riparian areas and protect areas with para-web fencing or similar material. - All works near riparian zones will have adequate sediment and erosion control.	Pre-construction
Weed control	FF7	- Establish a noxious weed management protocol. - All noxious weeds which are cleared as part of the project will be disposed of appropriately. - Inspection/maintenance procedures will be implemented to reduce the carriage of weed material on machinery.	Pre-construction/ Construction
Monitoring	FF8	- A monitoring program (including a weekly checklist) will be developed to check that all proposed impact mitigation measures have been effectively implemented. - In the event that impact mitigation measures do not perform effectively, the management program will be adjusted with further appropriate measures.	Pre-construction

Environmental aspect and objective	ID	Environmental management measures	Phase of project
Minimise habitat loss	FF9	- While no substantial trees with hollows were identified during the survey, if trees with hollows are found, their removal will be avoided where practicable. Where this is not possible, the tree will be maintained intact as far as possible and placed on the ground in adjoining vegetation. - Habitat trees will be inspected for fauna by ecologist or WIRES carer and habitat trees will be felled carefully to minimise impact.	Pre-construction
Minimise impacts to riparian and aquatic habitat	FF10	- In-stream and riparian disturbance will be minimised during construction through clearly delineated working areas. - Removal of instream woody snags (>3 m in length and >300 mm diameter) will be avoided where practicable. Any woody snags that require removal during construction will be relocated insitu.	Pre-construction /construction
	FF11	In-stream disturbance from dredging will be managed and mitigated as appropriate to minimise impacts. Appropriate measures will include insitu measures to limit the risk of sediment plumes and increased turbidity, such as silt curtains (or similar).	Pre-construction /construction
Rehabilitation	FF12	- Areas disturbed as a result of the project will be stabilised and rehabilitated through a progressive landscaping program that takes advantage of optimal growing conditions and is appropriate to the final land use. - Where possible riparian zone rehabilitation will include appropriate native species.	Pre-construction /construction

Environmental aspect and objective	ID	Environmental management measures	Phase of project
Air quality			
Minimise dust and vehicle emissions	AQ1	Dust control measures will be included in the Construction Environmental Management Plan to minimise the risk of impacts on sensitive receivers. Dust environmental management measures will include: • Covering of all materials transported to and from the construction site. • Covering of or spraying water on stockpiles of soil or other erodible materials, particularly during dry or windy conditions. • Suppressing dust on unsealed surfaces, temporary roadways, and other exposed areas using water trucks, hand held hoses, temporary vegetation or other appropriate practices. • Imposing work vehicle speed limits on unsealed surfaces. • Locating stockpiles as far away from residences as practically possible. • Minimising the extent of disturbed areas as far as practicable. • Rehabilitating disturbed areas as quickly as possible. • Modifying or stopping dust generating activities during very windy conditions. • Operating and maintaining vehicles and equipment in accordance with manufacturer's specifications. • Visual monitoring of air quality to verify the effectiveness of controls and enable early intervention. • Installing wheel wash facilities to reduce tracking of mud and soil off-site. • A procedure to receive, respond and monitor complaints about air quality and other environmental issues.	Construction

Environmental aspect and objective	ID	Environmental management measures	Phase of project
Manage hazardous substances	AQ2	Demolition of existing bridge structures containing lead based paints will be undertaken in accordance with the following: • Australian Standard AS 4361.1 – 1995 - Guide to lead paint management, Part 1: Industrial applications. • Australian Standard AS 4361.2 – 1998 - Guide to lead paint management, Part 2: Residential and commercial buildings. • Australian Standard AS 2601 – 2001 - The demolition of structures.	Demolition
	AQ3	The options for the management of lead based paints during the demolition of the existing bridge structure (based on the respective Australian standards) are as follows: • Containment – this option will involve the implementation of a high level of containment to prevent dust and debris spreading beyond the immediate works site during demolition. • Paint stabilisation – paint stabilisation will require the existing surfaces to be stabilised with another non-hazardous covering. During both stabilisation and structure removal, a moderate level of containment will be required. • Paint removal – paint removal will require the existing painted surfaces to be removed prior to demolition. During paint removal, a high level of containment will be required. Little to no containment will be required to manage the demolition of the structure following removal of the lead based paints.	Demolition
	AQ4	Regardless of the implementation of either of these options, the management of lead based paints will entail: • Containment of the work area and implementation of procedures and systems to prevent dust and debris spreading beyond the immediate work area. • Exclusion of the public from the work area • Regular clean-up and disposal of debris during the work period.	Demolition
	AQ5	In the unlikely event that asbestos is discovered, the subject works will be carried out in accordance with the Guide to the Control of Asbestos Hazards in Buildings and Structures (NOHSC, 1988) and Code of Practice for the Safe Removal of Asbestos (NOHSC, 2002). An employer must ensure that air monitoring is carried out if a risk assessment as described by the Occupational Health and Safety Regulation 2001 indicates the need for one.	Construction

Environmental aspect and objective	ID	Environmental management measures	Phase of project
Climate change			
Minimise the impact of increased inundation	CC1	The potential for increased scour of bridge piers, bridge abutments and increased frequency of inundation of flood affected properties will be considered in the detailed design process	Detailed design
Greenhouse gases			
Minimise greenhouse gas emissions during construction	GHG1	Construction material selection will include recycled material and local materials where possible including: - Concrete with a greater proportion of flyash. Higher flyash content would lower the carbon footprint of the mix. - Recycled steel as opposed to virgin steel. - Sourcing local materials.	Construction
	GHG2	Fuel efficient plant and equipment will be selected where practicable.	Construction
	GHG3	Biofuels will be used where practicable.	Construction
	GHG5	Where practicable, waste materials will be reused on site such as general fill, rock, aggregate and mulch from cleared vegetation.	Construction
Minimise greenhouse gas emissions during operation	GHG6	Use of LED or other energy efficient lighting will be investigated during detailed design. This has the potential to reduce electrical energy consumption. Appropriate energy efficient lighting would only be used where the standard of lighting can meet AS/NZS lighting design standards for major roads and pedestrians.	Operation

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