



Public Works
NSW Water Solutions



Wagga Wagga Levee Upgrade

Preliminary Environmental and Planning Overview

Final

Report Number DC10080

September 2010

Prepared for Wagga Wagga City Council

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Document Control

Issue / Revision	Author	Reviewer	Approved for Issue	
			Name	Date
Draft Version 1	Anastasia Assargiotis	Lara Hess	Lara Hess	03/08/10
Draft Version 2	Anastasia Assargiotis	Lara Hess	Lara Hess	07/09/10
Final Version	Anastasia Assargiotis	Lara Hess	Lara Hess	20/09/10

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Foreword

This Preliminary Environmental and Planning Overview (PEPO) has been prepared for Wagga Wagga City Council. The report identifies relevant planning provisions and presents a preliminary overview of environmental impacts for the construction and operation of the proposed Wagga Wagga levee upgrade works.

On the basis of the information presented in this PEPO it is recommended that a Review of Environmental Factors be undertaken under Part 5 of the *Environmental Planning and Assessment Act 1979* to assess the environmental impacts of the proposal.

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Foreword

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Executive Summary

Wagga Wagga City Council is proposing to upgrade the Main City Levee and the North Wagga Wagga Levee to provide an agreed level of flood protection plus a suitable freeboard, which was identified as a high priority recommendation in the Wagga Wagga City Council Floodplain Risk Management Plan (WMA Water, 2009b).

Following a review of applicable planning provisions for the proposal, it is recommended that a Review of Environmental Factors (REF) be prepared in accordance with Part 5 of the *Environmental Planning and Assessment Act 1979* to assess the environmental impacts of the proposal.

It is recommended that specialist flora and fauna and archaeological consultants be engaged to assess the clearing of any remnant vegetation and carrying out of earthworks in previously undisturbed areas, to avoid or reduce impacts to ecological and cultural heritage values. The specialist flora and fauna consultant should also examine the impacts of the proposal on ecological values of the Murrumbidgee River, including any associated wetlands and the Murrumbidgee River floodplain in the Wagga Wagga Local Government Area.

The feasibility study and design of the upgrade works should consider the impact of the increased levee height and length on river flow patterns during a flood, and whether any landowners would be impacted.

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Glossary

AAD	Annual Average Damages
AHIMS	Aboriginal Heritage Information Management System
ARI	Average Recurrence Interval
AS	Australian Standard
ASS	Acid Sulfate Soils
CBD	Central Business District
CEMP	Construction Environmental Management Plan
DCP	Development Control Plan
DECCW	Department of Environment, Climate Change And Water (Formerly DECCW)
DII	Department of Industry And Investment NSW
DSTA	Department of Services, Technology and Administration
EIS	Environmental Impact Statement
EPBC Act	<i>Environment Protection And Biodiversity Conservation 1999</i>
EPA	Environment Protection Authority, now part of DECCW
EP&A Act	<i>Environmental Planning And Assessment Act 1979</i>
EP&A Regulation	<i>Environmental Planning And Assessment Regulation 2000</i>
FM Act	<i>Fisheries Management Act 1994</i>
km	Kilometres
LEP	Local Environmental Plan
LGA	Local Government Area
m	Metres
ML	Megalitres
NOW	NSW Office of Water (Part Of DECCW)
NP&W Act	<i>National Parks And Wildlife Act 1974</i>
OH&S	Occupational Health and Safety
PEPO	Preliminary Environmental and Planning Overview
POEO Act	<i>Protection Of The Environment Operations Act 1997</i>
REF	Review of Environmental Factors
SEPP	State Environmental Planning Policy
SES	State Emergency Service
SWMP	Soil And Water Management Plan
TSC Act	<i>Threatened Species Conservation Act 1995</i>
TMP	Traffic Management Plan
WM Act	<i>Water Management Act 2000</i>
WSP	Water Sharing Plan

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1 Introduction

This section provides details on the background of the proposal, its objectives and the need for the proposal.

1.1 Background to the Proposal

The city of Wagga Wagga is located on the Murrumbidgee River, with a catchment area at the city of 26,400 km² (see Figure 1-1). It has a population of approximately 60,000 people and, on numerous occasions since the first flood recordings in the 1840s, has been threatened by major floods.

The city is protected from flooding by three levee systems with a total length of approximately 15 km (see Appendix A). The main levee protecting Wagga Wagga, south of the Murrumbidgee River, has previously been upgraded to a level 1 metre above the record 1974 flood, although this flood is now considered to be a 60 year ARI event. Temporary levees have also been constructed around North Wagga Wagga since 1936, with a levee subsequently constructed to provide flood security for a 1 in 20 year flood.

These flood levees are generally well maintained and their condition has been audited on at least two occasions in 1993 and 2007. Findings from these audits were:

- The levee may need to be raised in some areas to provide the required level of flood security;
- Some areas of river banks, which support the town levees, may need to be stabilised;
- Trees and shrubs, which are growing on the levee, should be removed; and
- There are areas of the levee where minor erosion is evident.

Investigation of the feasibility of raising the Main City Levee and the North Wagga Wagga Levee to provide an agreed level of flood protection plus a suitable freeboard was identified as a high priority recommendation in the Wagga Wagga City Council Floodplain Risk Management Plan (WMA Water, 2009b).

1.2 Existing Infrastructure

Following the 1956 floods Council decided to construct the Main City Levee to protect the development located on the southern floodplain. The levee was upgraded in the late 1970's following the August 1974 flood and again more recently in 1983. Temporary levees have been constructed around the village of North Wagga Wagga since at least the mid-1930's. These levees were formalised as more permanent structures in 1990 so as to provide protection from the 1 in 20 year flood plus 0.3m freeboard. There are several other low lying banks located on the floodplain, including the levee constructed in 1992 which protects the Gumly Gumly area. This levee provides protection to approximately a 10 year ARI event (WMA Water, 2009a).

The Main City Levee is 8.9km long and is comprised of earthfill embankment levees and reinforced concrete retaining wall levees. The North Wagga Wagga Levee is 4.6 km long and consists of an earthfill embankment levee. The Bank Two Levee, which surrounds the eastern end of the North Wagga Wagga Levee, consists of an earthfill embankment levee 1.4 km long and is separated from the North Wagga Wagga Levee by a flood passage. The total length of these existing levees is approximately 14.9km.



Figure 1-1 Wagga Wagga Aerial Map

Source: Wagga Wagga City Council

1.3 Existing Condition and Performance

The following information is summarised from the Floodplain Risk Management Study completed in 2009 by WMA Water for Wagga Wagga City Council.

The Main City Levee provides protection from inundation up to and including the August 1974 event with approximately 1.0 m freeboard (this is assuming that the sandbagging at Copland Street and Hammond Avenue is effective). The levee is first overtopped in approximately the 70 year ARI flood event. In the 100 year ARI event the levee is overtopped in a number of locations, including at Copland Street and Hammond Avenue as well as downstream of Hampden Bridge and just downstream of Narrung Street.

The North Wagga Wagga area is protected by the North Wagga Wagga Levee, which protects the area up to approximately the 20 year ARI level with 0.3 m freeboard, assuming minor sand bagging of some of the lower areas is undertaken. Whilst a detailed assessment of the freeboard requirements has not been undertaken a review of contributing factors suggests that the current 0.3 m allowance is unlikely to provide the 20 year ARI level of protection. The north western corner of the levee adjacent to Hopkirk and Gardiner Streets is exceeded during a 20 year ARI event.

An audit of the Wagga Wagga Main City Levee and the North Wagga Wagga levee was undertaken in 1993. Both levees were found to be constructed of grey/brown to black clays which have high shrinkage potential. Fill density tests found adequate compaction in the upper levels and marginally adequate compaction at the lower levels. Stability factors were a concern at a number of locations, including south of Hampden Bridge to Sturt Street, south of Morrow Street, at the railway line, and at Flowerdale Lagoon, with these areas warranting further investigation. The audit recommended that the Main City Levee be repaired and upgraded to the August 1974 level plus 1 m, and that the North Wagga Wagga Levee should maintain the level of protection to which it had been designed, that is, the 1 in 20 year ARI.

Since the completion of the 1993 levee audit some remedial works have been undertaken, including in the area surrounding Wagga Beach, a section near Flowerdale Lagoon, and some sections of the North Wagga Wagga levee which have had additional fill placed.

A visual audit of the levee was then undertaken in 2007, which identified a number of areas along the Main City Levee where erosion was evident. A number of areas were also highlighted due to minimal vegetation cover and their potential for erosion, and vertical cracks were documented in the concrete sections of the levee. The audit also identified evidence of cracking and holes in a section adjacent to Flowerdale Lagoon. The audit identified a number of sections along the North Wagga Wagga levee which were also displaying evidence of erosion, with minimal vegetation cover and the existence of trees within the bank a possible contributor to this erosion. Overall, the audit found that the levees are generally maintained and are in a satisfactory condition although maintenance requirements have not been documented, and, based on a visual inspection, there do not appear to be any areas of concerns although a number of areas warrant further attention.

Failure of the levee system in the event of a large flood event would result in extensive (property and infrastructure) damage to the Wagga Wagga CBD and North Wagga Wagga, and presents a potential safety risk to the inhabitants (See Section 4.15).

1.4 Option Evaluation

The Wagga Wagga City Council Floodplain Risk Management Study (WMA Water, 2009a) identified and assessed possible risk management measures to mitigate flooding impacts and reduce flood damages in Wagga Wagga. These were assessed against the legal, structural, environmental, social and economic conditions or constraints of the local area, with potential floodplain risk management measures separated into three broad categories, including flood, property and response modification measures. Measures assessed are listed below:

- Flood Modification Measures:
 - Levees; and
 - Flood refuge mounds and evacuation locations.

- Property Modification Measures:
 - Zoning;
 - Voluntary purchase;
 - House raising;
 - Flood proofing; and
 - Flood access.
- Response Modification Measures:
 - Flood warning;
 - Flood awareness and preparedness;
 - Evacuation planning.

One of the flood modification measures recommended as part of this study comprised raising of the Main City Levee to a 100 year ARI level of protection, with an additional combination of 0.5 m and 1.0 m allowance for freeboard, depending on the construction type. This would provide increased protection to the leveed areas with minimum adverse impacts across the floodplain. Raising the Main City Levee to the 100 year ARI level of protection with an allowance for freeboard would also reduce the Annual Average Damages (AAD) for the leveed area by up to 55% of the current estimate of approximately \$2.1 million. In addition to the required level of freeboard, other issues required to be taken into consideration with regard to upgrading the levee, including cost and localised impacts. The final amount of freeboard provided would include a design parameter based on a range of considerations, including the type of levee construction and material used. Consideration should also be given to providing a controlled failure point for the case where the 100 year ARI level of protection is not achieved due to practical constraints, with appropriate controls for properties behind the levee will be required.

The possibility of raising the North Wagga Wagga Levee level of protection was considered during the Floodplain Risk Management Study. However, it was agreed that it was not appropriate to raise the level of protection of this levee due to the economic costs and social implications such as reduced flood awareness. As such, it was recommended that the existing levee be maintained to a 20 year ARI level of protection with an appropriate allowance for freeboard, and consideration to be given to the North Wagga Wagga Levee during the Main City Levee upgrade design assessment, the sensitivity of design flood levels to any floodplain vegetation management plans and the incorporation of a controlled failure point such as a spillway.

The upgrade of the Main City Levee was recommended as a high priority in the Wagga Wagga City Council Floodplain Risk Management Plan (WMA Water, 2009b).

1.4.1 Borrow Area Options

Three sites have been investigated as potential borrow areas to source the necessary excavated material to undertake the works. The proposed borrow sites are located within rural and industrial areas, with two of these sites subject to existing borrow activities (North Wagga Wagga and Copland Street borrow areas) and one subject to previous disturbance in the form of clearing (Tasman Road borrow area).

Geotechnical investigations were carried out at the three proposed borrow sites by Aitken Rowe Testing Laboratories in December 2009 (Tasman Road and Coplan Street borrow areas) and January 2008 (North Wagga Wagga borrow area). Laboratory tests and visual inspection on the recovered samples from the boreholes indicated that each site contained suitable material for levee construction, as follows:

Tasman Road Borrow Area

The silty clay material encountered in all boreholes across the borrow pit area drilled was considered 'suitable' for levee construction provided strict compaction control is maintained during the placement as the clay material is considered to have tendency to be moderately to highly dispersive.

Copland Street Borrow Area

The silty clay and silty sandy clay material encountered in all boreholes across the borrow pit area drilled were considered 'suitable' for levee construction provided strict compaction control is maintained during the placement as the clay material is considered to have tendency to be moderately to highly dispersive. However, care would need to be exercised to ensure exclusion of low plasticity sandy/clayey silt & silty clay in the levee construction.

North Wagga Wagga Borrow Area

The silty clay and sandy clay material encountered at the proposed borrow sites was considered suitable for levee bank construction provided strict compaction control measures are adopted. However, it was recommended that clayey sand and clayey sandy gravel material, which was encountered at some locations below 4.5m from existing ground level, not be used in construction of levee banks or any other water retention structures.

At this stage a preferred borrow area(s) has not been selected. The sites are shown in Figure 1-2 below and have all been considered as part of this preliminary environmental assessment.

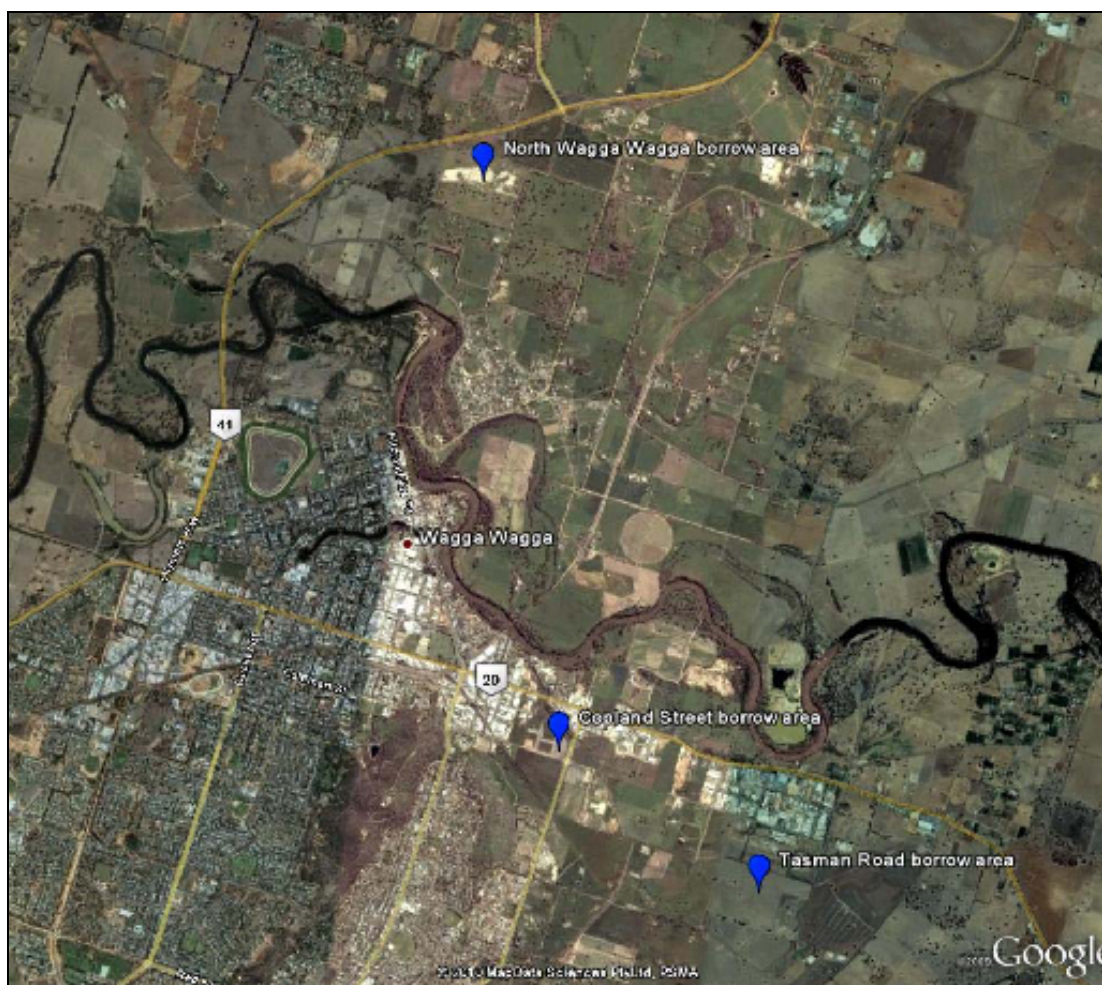


Figure 1-2 Proposed Borrow Areas

Source: Google Earth 2010

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2 Scope of Works

2.1 Description of the Proposed Works

The proposed works would comprise raising the Main City Levee and the North Wagga Wagga Levee to provide an appropriate level of flood protection (likely 100 year ARI level for the Main City Levee and 20 year ARI for North Wagga Wagga Levee) plus a suitable freeboard.

The Main City Levee is 8.9km long and is comprised of earthfill embankment levees and reinforced concrete retaining wall levees. The North Wagga Wagga Levee is 4.6 km long and consists of an earthfill embankment levee. The Bank Two Levee, which surrounds the eastern end of the North Wagga Wagga Levee, consists of an earthfill embankment levee 1.4 km long.

A levee upgrade options/feasibility study would develop appropriate options, taking into consideration the following factors:

- Type of levee (including no levee where an extension may be required);
- Height of raising required;
- Flood parameters (e.g. depth of water, velocity);
- Condition of levee (e.g. geotechnical);
- Space available for upgrade works;
- Other requirements (e.g. community, landscaping etc); and
- Site conditions (e.g. close to river bank, road crossings, foundations etc).

Upgrade options which would be investigated in the feasibility/options study include:

- Raised embankments, using augmentation and raising on either embankment face or direct “centreline” raising methods;
- Raised embankment using supporting walls e.g. crib walls, reinforced concrete walls, sheet piling, rockfill gabions etc;
- Sheet pile extensions to existing earthfill levees. Such arrangements have been used at Deniliquin where space was very limited. The sheet piles are capped with concrete to improve appearance;
- Reinforced concrete cantilever walls;
- New earthfill levees; and
- Replacement of levee where the existing levee is in poor condition (or unknown condition) and where a new levee would be more economical than upgrade of an existing levee.

2.2 Construction Issues

The construction activities would require the removal of vegetation, groundcover and topsoil from the existing levee and the proposed levee extension areas. Topsoil would be temporarily stockpiled and replaced once the levee is augmented. Rehabilitation and revegetation (where appropriate) of all disturbed areas would be undertaken post construction. A preliminary

assessment of the environmental impacts resulting from the proposal is discussed in Section 4.0 of this PEPO.

Upgrade of the existing levees using earthfill methods would require sourcing, transporting, placing and management of excavated material, with the exact volume of imported/excavated material required to be determined following the feasibility study. Three potential borrow sites have been identified, with two of these subject to existing excavation activities. Geotechnical investigations have confirmed the suitability of these sites as borrow areas, although at this stage a preferred site(s) has not been selected.

In addition to earthworks, the upgrade works may require sourcing, transporting, placing and management of sheet piling and rocks (in the event that sheet piling and rockfill gabions are used) and on site concrete works for options requiring concrete structures.

Construction Environmental Management Plan

A project specific Construction Environmental Management Plan (CEMP) would be prepared by the contractor prior to the commencement of the construction works. The CEMP would be prepared in accordance with DECCW's Environmental Management Guidelines (DIPNR 2004). The guidelines provide the minimum requirements for matters to be included in the construction contractors CEMP.

2.2.1 Construction Timeframe

The construction works would be staged, and are predicted to take place over several years.

2.3 Operational Issues

Council would need to update the existing operational management regime/manual (or develop one if none currently exist) for maintenance of the upgraded levee system. The management of the levee system would need to consider:

- The level of public access to the levee, which would reflect the level of maintenance required (i.e. vehicle access and the need to undertake pot hole repairs and grading);
- Batter maintenance:
 - Batter slumping;
 - Vegetation maintenance – dependent on the steepness of the batter slopes and vegetation selected, i.e. requirements for mowing;
 - Tree removal to protect against cracking caused by tree roots;
- Procedures to reduce erosion and scouring from rainfall and maintenance of soil moisture content, i.e. vegetation selection;
- Annual inspections of the levee for rabbit burrows, bank scouring, weed growth;
- Inspections following flood events.

3 Statutory Considerations

The following section presents an overview of all environmental planning instruments and legislation applicable to the development.

3.1 Environmental Planning Instruments

3.1.1 Wagga Wagga Local Environmental Plan 2010

The environmental planning instrument applicable to the Wagga Wagga LGA is the Wagga Wagga Local Environmental Plan 2010.

Under this LEP, the levee bank traverses a number of land use zones, including rural, residential, business, industrial, special uses and open space zones. The majority of the levee bank is subject to the zoning of the land through which it passes, except for part of the north-eastern section of the levee bank (approximately between Narung Street in the north and the railway line in the south) which is zoned SP2 Flood Mitigation Work. The proposed southern extension of the levee bank would be located on land zoned SP1 Special Activities (Cemetery). Flood mitigation works are permitted with consent in all of the above zones, with the exception of SP1 Special Activities (Cemetery), where they are prohibited.

The proposed borrow areas are zoned RU1 Primary Production (North Wagga Wagga borrow area) IN1 General Industrial (Copland Street borrow area) and RE1 Public Recreation/IN2 Light Industrial (Tasman Road borrow area). Extractive industries are permitted with consent in all of these zones except RE1 Public Recreation, where they are prohibited.

However, Section 5.12 of this LEP states that this plan does not restrict or prohibit, or enable the restriction or prohibition of, the carrying out of any development, by or on behalf of a public authority, that is permitted to be carried out with or without consent, or that is exempt development, under the State Environmental Planning Policy (Infrastructure) 2007 (See Section 3.1.3 below).

The Natural Resources Sensitivity Maps which form part of the Wagga Wagga LEP 2010 identify sensitive areas with the Wagga Wagga LGA for land, biodiversity and water. Various parts of the existing levee bank are subject to these sensitivity classifications. In accordance with Clauses 7.3 – 7.6 of the LEP, a consent authority is required to consider a number of matters prior to granting development consent to development on land identified as a sensitive area.

3.1.2 Wagga Wagga Development Control Plan 2010

The Wagga Wagga Development Control Plan 2010 specifies that development on land subject to the biodiversity, land, waterways or groundwater overlays of the LEP is to be consistent with any Conservation Management Plan.

3.1.3 Wagga Wagga Riverside Strategic Master Plan Final Draft

The Wagga Wagga Riverside Strategic Master Plan (currently in draft form) is to be considered as a strategic document that sets out a vision for Riverside Wagga Wagga, with the aim of the Master Plan to provide a long term vision that guides the future development and interface of Wagga Wagga with the Riverside. The Riverside Wagga Wagga project aims to reinforce the relationship between the iconic Murrumbidgee River and the city of Wagga Wagga by bringing an array of recreational, cultural, commercial and residential development underpinned by sustainable principles to fully showcase its potential and enhance the quality of living for its residents and visitors.

The Master Plan includes a Strategic Master Plan that integrates planning, design and economic feasibility and is supported by principles, guidelines and themes, and Precinct Master Plans which outline the precinct principles and guidelines for the Wiradjuri and Wilks Reserves, Hampden Terraces and The Bends Precincts.

Modification of the existing levee as part of the Riverside Wagga Wagga project is proposed within the three Precinct Master Plans, so as to improve connectivity/interaction of the levee and adjacent built form, improve the relationship between city and riverside, reduce the emphasis on the levee as a built barrier, integrate the levee with the built form to visually interrupt its continuity, and meander the alignment of the levee to create a softer appearance.

The Strategic Master Plan also incorporates a series of design themes that underpinned the Strategic Framework. Themes relevant to the levee bank include, but are not limited to, the Green Fingers theme, which aims to reinforce the riverside presence into the urban zones and compliment the environmental objectives, and the Integrated Levee theme, which focuses on reshaping the levee to visually blend it with the natural and built setting. The need to improve visual and physical connectivity between the city and the river is a first priority for Riverside, without jeopardising flooding for the city. With these objectives in mind, a solution to improve integration of the levee with the topography and the new urban built form of riverside elements has been proposed within the Wagga Wagga Riverside Strategic Master Plan, and is described briefly as follows:

The North Bend Levee Form

Sandwiched between the Retirement Village and the existing carpark, the current levee forms an abrupt, disconnected edge to the city interface. The proposal brings the landform towards the river, to form a more cohesive, natural shape that complies with flooding constraints. The levee shape also provides opportunity for new development that is an essential component of Riverside, creates a generous upper level public river terrace that overlooks the rejuvenated park space below, and provides sufficient space for an effective planted buffer against the retirement village. This planting will form a necessary strong, green defining edge to the riverside from the Beach area.

The South Bend Levee Form

This section of levee is contained on the south by the existing granite landform, and to the north in front of Watermark, it is to the top of the existing retaining wall. The levee realignment proposal better integrates these two elements and creates a more natural, sinuous shape that relates to the nature of the river, and also provides opportunity for an upper plaza with some developable areas that would generate activity and increase use in this area.

Civic Precinct Levee Form

The levee through this area forms a distinctive visual blockage to the river corridor. It follows a constant curve and the slopes between the levee and the river are very steep. These slopes in the long term should be gentler to enable adequate management and to avoid undercutting from erosion. The proposal moves the levee back towards the city in a more sinuous alignment that assists flood mitigation, creates gentler accessible slopes to the river edge, and allows more direct access to the river corridor. Views to the river from the city and along the edge of the river corridor are also enhanced and opened up. In the central area the levee becomes part of the built form, thereby reducing visual delineation of the linear barrier it currently creates.

Levee Openings

A series of levee openings are proposed between Hampden Bridge and the Beach to enhance visual and urban permeability. The openings are proposed at key locations where vistas along the existing city structure are reinforced towards the river such as at Kincaid Street and at Sturt Street. Connectivity is improved through the proposed major public car park facility at Johnston and Church Street, servicing the beach and associated parkland.

In conjunction with the levee openings, levee infill panels are proposed in those areas where the levee is required to be raised from its existing levels, such as between Sturt Street and Crampton Street. The infill panels would be approximately 700 to 800mm high and would greatly contribute to visual permeability towards the river.

The design of the proposed levee upgrade works would be required to be consistent where possible with both the Riverside Wagga Wagga Strategic Master Plan and the Riverside Wagga Wagga Plan of Management, while maintaining the appropriate level of flood protection for the City of Wagga Wagga.

3.1.4 State Environmental Planning Policy (Infrastructure) 2007

The objective of State Environmental Planning Policy (Infrastructure) 2007 (Infrastructure SEPP) is to assist in the effective delivery of public infrastructure throughout the State by achieving a number of aims. This includes clearly defining the environmental assessment and approval process for public infrastructure and services facilities.

According to Clause 50, Division 7 of the Infrastructure SEPP, development for the purpose of flood mitigation work may be carried out by or on behalf of a public authority without consent on any land. This includes development for any of the following purposes if the development is in connection with flood mitigation work:

- (a) *construction works,*
- (b) *routine maintenance works, and*
- (c) *environmental management works.*

According to Clause 5 of SEPP (Infrastructure) 2007, if development for a particular purpose that may be carried out without consent includes construction works, the following works or activities are (subject to and without limiting that provision) taken to be construction works if they are carried out for that purpose:

- (a) *accessways,*
- (b) *temporary construction yards,*
- (c) *temporary lay-down areas for materials or equipment,*
- (d) *temporary structures,*
- (e) *conduct of investigations,*
- (f) *clearing of vegetation (including any necessary cutting, lopping, ringbarking or removal of trees) and associated rectification and landscaping,*
- (g) *demolition,*
- (h) *relocation or removal of infrastructure, and*
- (i) *extraction of extractive materials at the construction site solely for the purpose of the construction.*

As such, the proposed extraction of extractive material (borrow activities) for the levee upgrades works are permitted without consent as part of the works.

3.2 Legislation

3.2.1 Environmental Planning and Assessment Act 1979

Environmental assessment under the *Environmental Planning and Assessment Act 1979* (EP&A Act) are prepared under three different Parts of the Act:

- Part 3A
- Part 4
- Part 5

The applicable part depends on the application of relevant environmental legislation and environmental planning instruments.

Part 3A

Part 3A of the EP&A Act applies to developments declared to be a major project through a State Environmental Planning Policy (SEPP) or by the Minister for Planning. SEPP (Major Projects) 2005 lists those developments deemed to be major projects under Part 3A of the EP&A Act. The proposed upgrade of the Wagga Wagga levee system is not considered to fall within the definition of a major project.

In addition, Section 75B(2) of the EP&A Act states that Part 3A applies to major infrastructure or other development that is an activity for which the proponent is also the determining authority (within the meaning of Part 5 of the Act) and that, in the opinion of the proponent, would (but for Part 3A) require an environmental impact statement to be obtained under Part 5 (that is, if the project is likely to significantly affect the environment). The guidelines generally indicate that this provision is mainly applicable to State government authorities and not local government authorities.

Part 4

Part 4 applies to development requiring development consent. However, as the works are permitted without development consent in accordance with Clause 50 of SEPP (Infrastructure) 2007, the provisions of Part 4 of the EP&A Act do not apply, including designated development provisions.

Part 5

Part 5 applies to projects which do not require development consent due to the provisions of an environmental planning instrument such as an LEP or SEPP. Clause 50 of SEPP (Infrastructure) 2007 excludes the levee upgrade works from requiring development consent.

Under Part 5 of the EP&A Act, an EIS would be required if the development was considered to be significant. The use of Table 3 from '*Is an EIS Required?*' (DUAP 1996) has been used to assist in determining whether an EIS would be (refer to Appendix B). The decision as to whether a REF or EIS is prepared would need to be considered by the determining authorities. Should the proposed development require an EIS, it may be subject to Section 75B(2) of the EP&A Act and become a major project under Part 3A.

Due to the existence of the levee bank, it is not anticipated that the altered flood impacts due to its upgrade would result in a significant environmental impact. The trigger for significance could arise from the clearing of native vegetation on the river bank due to levee widening, and accumulative effect of the earthworks, such as dust, traffic and noise and the impact of these factors on the local community. In addition, a specialist flora and fauna study would be required to assess the impacts on any threatened species, populations and endangered ecological communities as a result of clearing and any altered flooding patterns.

Summary

Following a review of applicable planning provisions for the proposal, it is considered that the works would not have a significant impact on the environment and it is recommended that a Review of Environmental Factors (REF) be prepared in accordance with Part 5 of the EP&A Act to assess the environmental impacts of the proposal.

3.2.2 Crown Lands Act 1989

The *Crown Lands Act 1989* is the current legislation for the administration of State lands in NSW. The objects of this Act are to ensure that Crown land is managed for the benefit of the people of New South Wales and in particular to provide for:

- a) *a proper assessment of Crown land,*
- b) *the management of Crown land having regard to the principles of Crown land management contained in this Act,*
- c) *the proper development and conservation of Crown land having regard to those principles,*
- d) *the regulation of the conditions under which Crown land is permitted to be occupied, used, sold, leased, licensed or otherwise dealt with,*
- e) *the reservation or dedication of Crown land for public purposes and the management and use of the reserved or dedicated land, and*
- f) *the collection, recording and dissemination of information in relation to Crown land.*

Section 155 (1) of the *Crown Lands Act 1989* states that a person shall not, without lawful authority, erect a structure on, clear, dig up or cultivate public land. As such, any levee upgrade works within Crown land which are not located within an existing easement (including extension and/or widening of the levee bank) may require approval from the NSW Land and Property Management Authority.

3.2.3 Roads Act 1993

The objectives of this Act are:

- a) *To set out the rights of members of the public to pass along public roads, and*
- b) *To set out the rights of persons who own land adjoining a public road to have access to the public road, and*
- c) *To establish the procedures for the opening and closing of a public road, and*
- d) *To provide for the classification of roads, and*
- e) *To provide for the declaration of the RTA and other public authorities as roads authorities for both classified and unclassified roads, and*
- f) *To confer certain functions (in particular, the function of carrying out road work) on the RTA and on other roads authorities, and*
- g) *To provide for the distribution of the functions conferred by this Act between the RTA and other roads authorities, and*
- h) *To regulate the carrying out of various activities on public roads.*

Under Section 138 of the *Roads Act 1993* a person must not: "erect a structure or carry out a work in, on or over a public road, or dig up or disturb the surface of a public road" otherwise than with the consent of the appropriate roads authority. In the event that the proposed levee

upgrade works are likely to impact on any public roads in accordance with Section 138 of this Act, the requirement for consent under this Act should be reviewed.

3.2.4 Water Act 1912

Part 8 of the *Water Act 1912* deals with flood control works. The Act specifies that approval is needed to undertake a “controlled work” which is defined under the Act as:

- (a) *an earthwork, embankment or levee that is situated, or proposed to be constructed, on land that:*
 - (i) *is, or forms part of, the bank of a river or lake, or*
 - (ii) *is within a floodplain, or*
- (b) *any work that is situated, or proposed to be constructed, on land that:*
 - (i) *is, or forms part of, the bank of a river or lake, or*
 - (ii) *is within a floodplain,*

and that is declared by order of the Ministerial Corporation published in the Gazette to be a controlled work, or
- (c) *an earthwork, embankment or levee, wherever situated or proposed to be constructed, that:*
 - (i) *affects or is reasonably likely to affect the flow of water to or from a river or lake, and*
 - (ii) *is used or is to be used for, or has the effect or likely effect of, preventing land from being flooded by water, or*
- (d) *any work, wherever situated or proposed to be constructed, that:*
 - (i) *affects or is reasonably likely to affect the flow of water to or from a river or lake, and*
 - (ii) *is used or is to be used for, or has the effect or likely effect of, preventing land from being flooded by water, and*
 - (iii) *is declared by order of the Ministerial Corporation published in the Gazette to be a controlled work.*

Wagga Wagga City Council would need to apply to the NSW Office of Water for approval to undertake the works.

In response to consultation undertaken as part of this PEPO, NSW Office of Water have advised that it is probable that a replacement approval will be required, given that the proposed upgrade is basically on the current alignment but with some extension. It is suggested that the two existing approvals could be rolled into one replacement approval.

3.2.5 Water Management Act 2000

The object of the *Water Management Act 2000* (WM Act) is the sustainable and integrated management of the State's water for the benefit of both present and future generations.

The WM Act has repealed the provisions under *Rivers and Foreshores Improvement Act 1948* relating to works within the vicinity of waterways. Section 344 (1) states that a person must not carry out a controlled activity in, on or under waterfront land otherwise than in accordance with a controlled activity approval. Waterfront land is defined as land within 40m of a waterway (including estuary or lake). A controlled activity is defined under the WM Act as:

- *the erection of a building or the carrying out of a work (within the meaning of the Environmental Planning and Assessment Act 1979), or*
- *the removal of material (whether or not extractive material) or vegetation from land, whether by way of excavation or otherwise, or*
- *the deposition of material (whether or not extractive material) on land, whether by way of landfill operations or otherwise, or*
- *the carrying out of any other activity that affects the quantity or flow of water in a water source.*

Although the proposed levee upgrade works would meet the definition of a controlled activity under the WM Act, Clause 39A of the *Water Management (General) Regulation 2004* states that public authorities and local Councils are exempt from section 344 (1) (a) of the Act in relation to all controlled activities that they carry out in, on or under waterfront land. As the works are being undertaken by a local Council, a controlled activity approval is therefore not required from DECCW.

Water Sharing Plan for the Murrumbidgee Regulated River Water Source 2003

Water sharing plans under the *Water Management Act 2000* govern the sharing of water in a particular water source between water users and the environment and rules for the trading of water in a particular water source. The Murrumbidgee River is subject to the Water Sharing Plan for the Murrumbidgee Regulated River Water Source (WSP). The WSP applies to the regulated reaches of the NSW Murrumbidgee River and administers the allocation and sharing of the Murrumbidgee River water resources. It is not considered that the proposal would affect the objectives or operation of the WSP.

3.2.6 Protection of the Environmental Operations Act 1997

The Department of Environment, Climate Change and Water (DECCW) is responsible for the administration of the *Protection of the Environment and Operations Act 1997* (POEO Act) which regulates air, noise, land and water pollution.

The Protection of the Environment Operations Act 1997 (POEO Act) defines an extractive industry as an activity:

- 1) *that obtain extractive materials by methods including excavating, dredging, blasting, tunnelling or quarrying or that store, stockpile or process extractive materials, and*
- 2) *that obtain, process or store for sale or re-use an intended quantity of more than 30,000 cubic metres per year of extractive material.*

Extractive industry is listed as a scheduled activity under the POEO Act. Should the volume of excavated material required for the upgrade works exceed the 30,000m³ per year threshold, an Environment Protection Licence from the Department of Environment, Climate Change and Water (DECCW) may be required to establish the borrow areas for the proposed works. However, it should be noted that, in response to consultation undertaken as part of this PEPO, DECCW have advised that the proposed works do not require an environment protection licence. This would be confirmed in the environmental assessment for the works.

3.2.7 Fisheries Management Act 1994

Degradation of native riparian vegetation along New South Wales watercourses, and installation and operation of in-stream structures and other mechanisms that alter natural flow regimes of rivers and streams, are declared to be key threatening process under Schedule 6 of the *Fisheries Management Act 1994* (FM Act).

No other provisions of the FM Act are relevant to the proposal.

3.2.8 Native Vegetation Act 2003

Under the Native Vegetation Act (2003) clearing of native vegetation in the Wagga Wagga local government area requires assessment and approval by the Murrumbidgee Catchment Management Authority. The exception to this requirement is where the clearing is part of a Routine Agricultural Management Activity (RAMA) or part of Local Government Infrastructure activities as defined by the Local Government Infrastructure RAMA. The Murrumbidgee has approved Clearing Property Vegetation Plans (PVP) for local Government including Wagga Wagga City Council.

However, the *Native Vegetation Act 2003* is not applicable to any clearing that is, or is part of, an activity carried out in accordance with an approval of a determining authority within the meaning of Part 5 of the *Environmental Planning & Assessment Act 1979* if the determining authority has complied with that Part. As such, any clearing undertaken as part of the proposed levee upgrade works would not be subject to the provisions of this Act.

3.2.9 National Parks and Wildlife Act 1974

An archaeology assessment of the proposed works is recommended to determine whether any consent under the *National Parks and Wildlife Act 1974* (NP&W Act) would be necessary (refer to Section 4.12).

If any artefacts were required to be disturbed for the works, an application would need to be made to the Director General of the Department of Environment, Climate Change and Water (DECCW) for a Section 90 Consent to Destroy under the NP&W Act.

3.2.10 Threatened Species Conservation Act 1995

A number of threatened species, populations and communities have been identified in the Wagga Wagga LGA. A flora and fauna assessment would be undertaken to ensure no impacts to threatened species, populations and communities listed under the *Threatened Species Conservation Act 1995* occur.

The clearing of native vegetation and loss of hollow bearing trees are declared to be key threatening process under Schedule 3 of the *Threatened Species Conservation Act 1995*.

3.2.11 Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) provides for Commonwealth involvement in development assessment and approval in circumstances where there exist 'matters of national environmental significance'. Matters of national environmental significance include:

- World Heritage properties;
- National Heritage places;
- Ramsar Wetlands;
- Nationally threatened species and ecological communities;
- Migratory species;
- Commonwealth marine areas; and
- Nuclear actions (including uranium mining).

The proposed development is unlikely to impact on any issues of national environmental significance as listed under the EPBC Act.

3.3 Summary of Approvals

The following table lists the necessary approvals under current legislation which would be required should the proposal proceed.

Table 3-1: Summary of Necessary Approvals

Organisation	Consent / Licence /Approval
Wagga Wagga City Council	Determination under Part 5 of the EP&A Act
NSW Office of Water (Department of Environment, Climate Change and Water)	Approval under Part 8 of the Water Act 1912
Land and Property Management Authority	Should the levee upgrade require works within Crown land (i.e. extension/widening of the levee) outside an existing easement, the appropriate approval/authority would be required from LPMA under the Crown Lands Act 1989.

3.4 Consultation

A limited level of consultation was undertaken with relevant government stakeholders as part of this PEPO. The organisations consulted and a summary of their responses is presented in Table 3-2 below. Many of the issues raised would be addressed in the environmental assessment for the preferred levee upgrade option. Copies of the full responses are provided in Appendix C.

Table 3-2: Summary of Consultation

Organisation	Comment	Where Addressed
Industry and Investment NSW (I&I NSW)	<p>Issues Related to Fisheries</p> <p>The Department has an interest in any potential impacts to aquatic species and habitats as a result of the proposed works.</p> <p>Threatened Fish Species</p> <p>The Murrumbidgee River supports major components of the aquatic Endangered Ecological Community in the natural drainage system of the lower Murray River catchment which is listed as threatened under the <i>Fisheries Management Act 1994</i>, as well as several fish species and populations which are listed as threatened in their own right (including Trout Cod and Silver Perch). It is imperative that any works to be undertaken as part of this rehabilitation proposal include robust conditions relating to the protection of this ecological community. An assessment of impacts the proposal may have (both construction and operational) on any aquatic threatened species at the site will need to form part of the proposal.</p> <p>Fish Habitat</p> <p>Measures should be taken to ensure that fish habitat is not damaged or destroyed. Any Key Threatening Processes that are going to be undertaken as part of or as a result of the works should be outlined in the proposal. Information should also be presented outlining any mitigation measures that are to be undertaken as part of the proposal (i.e. revegetation). Where, despite mitigation, a significant environmental impact is unavoidable, environmental compensation should be provided as per NSW I&I policies and guidelines.</p> <p>Specifically, I&I NSW seek information regarding any impact the proposed works will have on any riparian vegetation or snags. This includes the location of any impacted vegetation and snags and how these will be managed so as not to have an impact on the aquatic ecosystem, along with how these impacts will be compensated for.</p> <p>Legislative Requirements</p> <p>Under Sections 198-203 of the <i>Fisheries Management Act 1994</i>, a person is required to obtain a permit from I&I NSW to conduct dredging and reclamation work within NSW waters. Any works within the banks of waterways is deemed as dredging and reclamation work. Blockage to fish passage (temporary or permanent) will also require a permit under Part 7 of the FM Act, and removal or movement of snags, freshwater aquatic vegetation or boulders also now constitutes dredging under the <i>Fisheries Management Act 1994</i>.</p> <p>Environmental Planning & Assessment</p> <p>Any environmental planning and assessment documents should include the following information as an absolute minimum to allow staff from I&I NSW to make an informed decision about the potential impacts that any proposed works may have on aquatic species and their habitats:</p>	<p>Section 4.11.1</p> <p>Section 4.11.1</p> <p>Section 3.2.7</p> <p>This would be included in the Review of</p>

	<ul style="list-style-type: none"> ▪ Location of works (including topographic map); ▪ Name of adjacent watercourse(s); ▪ Description of works to be undertaken, including method(s) of construction, timing and duration of works; ▪ Obstruction to fish passage (temporary and permanent) identified; ▪ Aquatic habitat conditions at the site – particularly riparian and aquatic vegetation, water depth, permanence of water flow and snags in the vicinity of the proposed works; ▪ Potential impacts upon aquatic and riparian habitats (both temporary and permanent); ▪ Proposals to mitigate impacts upon riparian and aquatic vegetation and aquatic habitats; ▪ Potential impacts upon water quality of the proposed works; ▪ Proposals to mitigate impacts upon water quality; ▪ An assessment of the potential impact that proposed works may have on aquatic threatened species, populations and ecological communities. 	<p>Environmental Factors prepared for the proposed works.</p>
<p>Department of Environment, Climate Change and Water (DECCW)</p>	<p>Based on the information submitted the proposed activity is not scheduled under the <i>Protection of the Environment Operations Act 1997</i> and the proposed works do not require an environment protection licence. However, the proponent should be aware that they are legally obliged to ensure that all necessary steps (e.g. erosion and sediment control) are taken to ensure that pollution of the Murrumbidgee River or other nearby watercourses do not occur during these works.</p> <p>The specific issues DECCW considers to be important in the environmental assessment include biodiversity, Aboriginal cultural heritage, noise and air quality (dust).</p> <p>It is also understood that the Wagga Wagga levee upgrade feasibility study is being undertaken for Council under the State Assisted Floodplain Management Program. DECCW's Urban and Coastal Water Programs (Inland) Group is assisting Council in compiling the work brief for the feasibility study for the levee design being undertaken by NSW Public Works. Given this high level of co-operation and input to the recommendations of the Floodplain Risk Management Study, DECCW anticipates that the study would have addressed all the relevant flooding issues.</p>	<p>Section 3.2.6</p> <p>Section 4.4, 4.6, 4.11 and 4.13</p>
<p>NSW Officer of Water (part of DECCW)</p>	<p>The existing levees at Wagga Wagga are authorised via approvals issued under Part 8 of the <i>Water Act 1912</i>.</p> <p>Given that the proposed upgrade is basically on the current alignment but with some extension, especially with the North Wagga Wagga Levee, it is probable that a replacement approval will be required. It is suggested that the two existing approvals could be rolled into one replacement approval.</p> <p>Assessment of the replacement approval would be in accordance with the requirements of the <i>Water Act 1912</i> and / or IDAS (Integrated Development Application System).</p>	<p>Section 3.2.4</p> <p>It should be noted that the North Wagga Wagga Levee is not anticipated to require significant extension and therefore is not</p>

		considered to require a replacement approval.
Murrumbidgee Catchment Management Authority	<p>Under the Native Vegetation Act (2003) clearing of native vegetation in the Wagga Wagga local government area requires assessment and approval by the Murrumbidgee Catchment Management Authority. The exception to this requirement is where the clearing is part of a Routine Agricultural Management Activity (RAMA) or part of Local Government Infrastructure activities as defined by the Local Government Infrastructure RAMA. The Murrumbidgee has approved Clearing Property Vegetation Plans (PVP) for local Government including Wagga Wagga City Council.</p> <p>Wagga Wagga City Council should ensure that clearing is limited to the minimum extent necessary, and that use is made of local planning control instruments including the Local Environmental Plan (Draft 2008), the supporting Local Environment Study and other reports and mapping that Council has undertaken in relation to native vegetation, biodiversity and habitat. The recent biodiversity certification for the Wagga Wagga LGA should provide necessary background information.</p> <p>It should be noted that floods are a natural and necessary process of good river health, and the Murrumbidgee River is a vital part of the greater Murray-Darling Basin. The Murray Darling Basin Authority is developing a Basin Plan for the greater Murray Darling Basin, and Council should consider the ecological function of the Murrumbidgee River floodplain in that greater context. The need to protect the infrastructure of the Wagga Wagga urban area must be balanced with the need to allow for floodplain watering of the wetlands and billabongs in the Wagga Wagga City Council LGA that require periodic and prolonged inundation. The Murrumbidgee CMA would expect the review and upgrading of the Wagga Wagga levee to include current best knowledge about the placement of flood control structures in the context of the health of the Murrumbidgee River, and the greater Murray Darling Basin.</p> <p>Various permits and environmental assessments may also be required as the Wagga Wagga Local Government Area is part of the listed Endangered Ecological Community of the Lower Murray River aquatic ecological community.</p> <p>Note that the only approval required to be sought from the CMA relates to the clearing of native vegetation. However, other matters will impact on the targets and objectives of the Murrumbidgee Catchment Action Plan 2006 and as such, any contribution to the realisation of these targets should be considered.</p>	<p>Section 3.2.8</p> <p>Noted</p> <p>Section 4.10 and 4.11.1</p> <p>Section 4.11.1</p> <p>Clearing undertaken as part of the proposed levee upgrade works would not require consent as the Native Vegetation Act 2003 does not apply to development permitted without consent under Part 5 of the EP&A Act.</p>

3.5 Land Ownership

The existing levee bank is generally located within Council reserves, Crown land and easements through privately owned land.

Should the proposed upgrade works require the levee to be extended (i.e. widened) outside the existing easement on private property or Crown land, Council will need to formulate a policy with respect to adjustment of easements and compensation of landowners. This would include the proposed southern extension of the levee bank. Similarly, the NSW Land and Property Management Authority would need to be consulted in regards to any works proposed on Crown Land.

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4 Preliminary Environmental Overview

This section briefly describes study area and identifies preliminary environmental issues associated with the proposal.

4.1 Location and Land Use

The City of Wagga Wagga is the largest inland city in NSW and is the regional centre of the Riverina district. The City is the regional focus for major commercial, retail and business centre activities, with many secondary and service industries supporting primary industry (WMA Water, 2009a).

The majority of the Murrumbidgee River floodplain in the Wagga Wagga local government area is used for agricultural purposes and contains numerous rural homesteads. Rural villages and the surrounding rural areas of the Wagga Wagga LGA contain only about 9% of the total population, however they occupy a vast expanse of the total area. Much of the original native vegetation was cleared for farming and grazing, particularly west of the City. The current level of clearing is low, however many of the patches of bush that remain are highly degraded (WMA Water, 2009a).

There are small pockets of industrial and urban development in Central and North Wagga Wagga. Industrial development has also occurred on the southern floodplain spreading east from Wagga Wagga along the Sturt Highway towards the township of Forest Hill and the airport. Council's residential development strategy for Wagga Wagga allows no new residential subdivisions within the floodplain (100 year ARI flood extent). Future growth zones have been identified north of the floodplain near Charles Sturt University and south of Wagga Wagga (WMA Water, 2009a).

Future development of the riverside precinct, which comprises an area extending from Wiradjuri Reserve in the north through Wilks Park down to Thompson Street in the south, is subject to the Wagga Wagga Riverside Strategic Master Plan and Wagga Wagga Riverside Plan of Management (currently in draft form). The Master Plan includes a Strategic Master Plan that integrates planning, design and economic feasibility and is supported by principles, guidelines and themes, and Precinct Master Plans which outline the precinct principles and guidelines for the Wiradjuri and Wilks Reserves, Hampden Terraces and The Bends Precincts. Both the Strategic Master Plan and the Precinct Master Plans include modification of the existing levee to achieve the aims of the Wagga Wagga Riverside project.

The existing levee banks are located on the fringe of the Wagga Wagga and North Wagga Wagga urban areas. They traverse a number of different land use zones, including rural, residential, business, industrial, special uses and open space zones. With the exception of Wagga Wagga Beach area and the associated caravan park, the open spaces zones are generally available for passive recreation only. The proposed southern extension of the levee bank would be located within a parcel of land which includes an existing cemetery (Wagga Wagga General Cemetery), as shown in the Levee Corridor Map in Appendix B. Parts of the existing levee bank are also in close proximity to the Wiradjuri Walking Track, which follows a route of about 30 kilometres along the banks of the Murrumbidgee River.

The proposed borrow sites are located within rural and industrial areas, with two of these sites subject to existing borrow activities (North Wagga Wagga and Copland Street borrow areas) and one subject to previous disturbance in the form of clearing (Tasman Road borrow area). The Tasman Road borrow pit site is located at the western side of Tasman Road, Wagga Wagga, to the south of the Wagga Gun Club. The Koorngal Road borrow pit is located to the southwest corner of Koorngal Road and Copland Street, Wagga Wagga. An existing levee bank is located to the eastern side of the borrow pit. North Wagga borrow pit site is located approximately 1.2km from the junction of Rowan & Marah Streets in North Wagga Wagga, with a power line running north-south direction to the east of the site and a small dam and

existing borrow pit separating two proposed borrow pit areas. These borrow areas are shown in Figure 1-2.

4.2 Visual Impacts

The earthworks, ground disturbances and construction traffic/equipment associated with the project would have a short term adverse visual impact on the local environment. The borrow area with the greatest visual impact would be the Copland Street borrow area due to its location in an existing industrial area, with the North Wagga Wagga and Tasman Road borrow areas located in rural areas.

It is envisaged that construction of the levee would be undertaken in sections. The temporary nature of the construction activities and the relatively short duration of works in any one location due to staging would assist to minimise the impact.

The final height of the levee bank would not be known until the feasibility study has been completed. However, the levee would be higher than existing, and a number of trees in close proximity to the levee may also need to be removed. Although revegetation and rehabilitation post construction would assist in minimising the impacts (refer to Section 4.11), it is likely that maintenance requirements would limit vegetation on the levee to groundcover species, which may result in a minor change to the existing landscape.

Borrow areas would need to be rehabilitated following completion of borrow activities.

Mitigation

During construction, the works areas should be kept to the minimal required to undertake the works, to reduce the construction footprint.

The main mitigation measure to minimise visual impacts post construction would be implementation of a rehabilitation management plan to establish and maintain suitable vegetation on the levee embankments and on the areas adjacent to the levee (refer to Section 4.11).

If practicable, access to the levee should be restricted, at least initially to promote the establishment of vegetation.

4.3 Topography, Geology and Soils

The eastern half of Wagga Wagga lies within the "Wagga Metamorphic Belt", a major geological formation consisting mostly of Ordovician metasedimentary rocks with numerous granitic intrusives. Much of the western half of Wagga Wagga is occupied by flat to gently undulating terrain, predominantly of Quaternary alluvium (Priday. S. and Mulvaney M., 2005).

Wagga Wagga is affected by a substantial problem of urban salinity, brought on primarily by the major changes in land use that are part of the urbanisation process (Wagga Wagga City Council, 2009).

A Murrumbidgee River Levee Bank Assessment was carried out by Aitken Rowe Testing Laboratories in August 2007. This assessment identified that levee banks along the Murrumbidgee River range in height from 1.5m to 4.5m, with batters ranging generally from about 30° to 55° and steeper batters at levee bank located to the north of Sturt Highway near the Marshall Creek. Some sink holes and collapse on the existing levee bank were evident in places, particularly around Marshall Creek. Rainwater seepages were noted seeping through the batters, creating tunnelling inside the batters in places. This has resulted sedimentation adjacent to the bank. The banks' crest and batters were generally covered with vegetation. There was no sign of instability on the levee bank at the time of the investigation; however it was noted that further collapse and sinking of bank material may destabilise the entire bank.

Geotechnical investigations were carried out at the three proposed borrow sites by Aitken Rowe Testing Laboratories in December 2009 (Tasman Road and Coplan Street borrow areas) and January 2008 (North Wagga Wagga borrow area). All three borrow sites were generally flat and covered with vegetation at the time of the investigations. Soil properties were identified to be as follows:

Tasman Road Borrow Pit

The laboratory tests and visual inspection on the recovered samples from the boreholes indicated most of the materials to be medium to high plasticity silty clays in accordance with 'AS1726 – 1993 – Geotechnical Site Investigation'.

Coplan Street Borrow Pit

The laboratory tests and visual inspection on the recovered samples from the boreholes indicated most of the materials to be medium to high plasticity silty clays and some medium plasticity silty sandy clay in accordance with 'AS1726 – 1993 – Geotechnical Site Investigation'.

North Wagga Wagga Borrow Pit

The laboratory tests and visual inspection on the recovered samples from the boreholes indicated most of the materials to be low to medium plasticity silty clay in the upper profile where encountered and medium to high plasticity silty clays. However, low to medium plasticity sandy clay, fine to medium grained clayey sand and clayey sand gravel material noted in certain boreholes at depths ranging from 3.8m to 4.5m below the existing ground surface.

Impacts

Once the remedial works are completed the stability of the levee will be greatly enhanced and able to withstand the predicted 1 in 100 year ARI event (Main City Levee) and the 1 in 20 year ARI event (North Wagga Wagga Levee).

Mitigation

Borrow areas would need to be rehabilitated following completion of borrow activities.

4.4 Noise and Vibration

Most offensive noise affecting the Wagga Wagga community is generated through single incidents. In 2008-2009, Wagga Wagga City Council received 314 noise complaints, of which the majority related to barking dogs. Other main sources of domestic noise complaints were for amplified music, air conditioners and power tools (Wagga Wagga City Council, 2009). These are anticipated to be the greatest source of noise emissions in urban areas of Wagga Wagga.

The levee banks are located on the fringe of the Wagga Wagga and North Wagga Wagga urban areas, in close proximity to a number of sensitive noise receivers in adjoining residential, commercial and rural areas. As a result, the background noise levels in these areas are likely to be lower than the main city centre.

Impacts

The works are expected to generate an elevated volume of traffic during construction, which would contribute to traffic noise. Construction machinery while in use on site would also generate noise. Predicted construction equipment is likely to include scrapers, bulldozers, rollers and construction vehicles such as trucks.

As discussed above the works would be undertaken in close proximity to a number of sensitive receivers. In a number of areas, the levee bank directly adjoins the rear boundary of

residential properties. Construction management levels for noise at residences are listed in Chapter 4 (Table 2) of DECCW's *Interim Construction Noise Guideline* (2009), which states that construction works with a duration of more than 3 weeks should be subject to a quantitative assessment of noise impacts. Construction noise criteria for projects where the construction duration is greater than three weeks is the rating background noise plus 10dB(A).

It is unlikely that this construction noise criteria objective would be met at some sensitive noise receivers, namely the residential properties closest to the levee. It is expected that noise resulting from the construction activities may cause nuisance to some residents in the town, especially those located in the less developed areas of Wagga Wagga. The movement of construction traffic would also result in impacts to residents, however the impacts would largely be dependent on the location of the borrow areas and the selected traffic routes to deliver spoil.

The use of rollers during levee works may also result in vibration impacts on adjoining properties.

The North Wagga Wagga and Tasman Road borrow areas are located in rural areas, while the Copland Street borrow area is located in an existing industrial area.

Once the construction methodology is determined, including predicted traffic movements, a more thorough assessment of noise impacts would be required to be included in the REF. The construction staging timeframe would be confirmed in the REF, with the works anticipated to be staged over several years.

No operational noise impacts are expected.

Mitigation

Once the construction methodology is determined and predicted traffic movements are known, a more thorough assessment of noise impacts would be required as part of the environmental assessment, including consideration of the DECCW's *Interim Construction Noise Guideline* (2009). This would include predicting noise levels, based on the construction methodology and equipment proposed, at nearest residences using the *AS 2436-1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites* (Standards Australia 1981),

Given that noise impacts would only result during the construction period, it is not considered that a specialist noise assessment (such as undertaking background noise monitoring and modelling) would be required.

The following general mitigation measures would be implemented;

- Limiting working hours to:
 - Monday to Friday – 7.00 am to 6.00 pm; and
 - Should it be necessary to undertake construction activities on Saturdays this would be limited to 7.00 am to 1.00 pm if inaudible at the adjacent residential premise, otherwise 8.00am to 1.00 pm.
- Community consultation in regards to the works.
- Ensuring construction equipment is maintained as per the specifications.
- Dilapidation surveys/reporting for nearby structures would be undertaken when rollers are used, due to potential vibration impacts.

If construction noise is predicted to have a significant impact on adjoining residents, additional mitigation methods including acoustic enclosures and mufflers may be necessary.

4.5 Traffic and Access

Wagga Wagga is located central to two important regional road networks – the Sturt Highway and the Olympic Way – which are used extensively for freight transport and distribution (Wagga Wagga City Council, 2009). Consequently, there is a high volume of large truck traffic through the City of Wagga Wagga, particularly via the east-west route along the Sturt Highway. It is also approximately 50km from the Hume Highway. The Sydney – Melbourne rail corridor intersects the levee corridor in East Wagga Wagga, with both freight and passenger services operating on this route.

Traffic levels in the vicinity of the levee, that is, on the fringe of the urban area and in rural areas, are considered to be low to moderate. The levee is accessible from several roads around the town. In some sections, the top of the levee bank is used regularly for vehicular access and therefore consists of a compacted dirt track devoid of grass. Roads cross the levee at numerous locations.

The borrow sites are all accessible via road or unsealed access tracks.

Construction Impacts

The construction works would result in a substantial increase in traffic numbers, due mainly to the need to import excavated material from the borrow areas. An estimation of traffic numbers is currently unavailable and would be determined once design details are known.

Traffic impacts would be influenced by the location of the selected borrow area(s), the delivery route from borrow area to construction areas, the number of vehicles, the duration of construction, and vehicle sizes.

The main traffic associated impacts would include:

- Noise and dust from traffic movements;
- Increased congestion of local roads;
- Potential for partial road closures/changed traffic conditions, especially in areas where the levee is located close to local roads and residential properties or in areas where roads cross the levee;
- Impacts on traffic/access as a result of vibration from the use of rollers;
- Temporary restriction of access to cycle and pedestrian tracks adjoining the levee;
- Potential pedestrian safety issues;
- Road dilapidation; and
- Need for adequate parking.

It is possible that some roads would require upgrading prior to the commencement of construction. Further assessment would be required once the construction details are confirmed.

Borrow areas are located within reasonable distance from the levee embankment (refer to Figure 1-2 and Appendix B). To minimise traffic movements and therefore traffic associated impacts, it is recommended that at least two borrow areas in two separate locations are selected (such as North Wagga Wagga borrow area and either Copland Street or Tasman Road borrow areas).

Operational Impacts

Council would need to establish the level of public access along the crest of the levee following construction. The design of the levee would need to consider allocated access and

egress ramps to facilitate access for maintenance. Access across the levee (i.e. cross roads) would be maintained.

There may be impacts to the community if pedestrian access to the upgraded levee is not permitted, with current level of access allowing pedestrian traffic to the majority, if not all, of the levee bank.

Mitigation

The preparation of a traffic management plan would be required to address traffic related impacts arising from the construction works. The traffic management plan would need to detail the following:

- Predicted traffic movements;
- Road closures, changed road conditions, alternative local traffic routes;
- Measures to minimise impacts to other road users;
- Specify traffic routes from borrow areas to construction work sites;
- Identify any “no go” areas for construction traffic;
- Specify areas designated for parking, stockpiling of topsoil and excavated levee material, deliveries and work compounds;
- Measures to restrict public access to the levee during construction;

The following general mitigation measures would be applicable to the project:

- The local community would be advised of the truck movement times prior to construction commencing;
- Restriction of working hours to those specified in Section 4.4;
- Traffic would comply with applicable traffic laws and regulations; and
- All road surfaces would be restored to a condition equivalent to the original surface post construction.

Post Construction

Mitigation measures would need to reflect the level of access to the levee. Structures such as gates and cross fencing would need to be installed if it is decided to restrict vehicle access along the top of the levee bank.

4.6 Air Quality

Air quality in the Wagga Wagga LGA is one of the poorest in the NSW. This is due to a range of factors, most of which are unable to be fully controlled, including:

- Natural events (dust, pollen, smoke from wildfire);
- General domestic pollution (wood heaters, illegal burning);
- Motor vehicle use (range of air pollutants from emitted by general urban traffic and high truck traffic from regional roads in the City);
- Industrial activity (range of air pollutants);
- Agricultural activity (smoke from stubble burning, dust from ploughed paddocks); and

- Bushfire management (hazard reduction burning) (Wagga Wagga City Council, 2009).

Impacts

The main construction phase impacts on air quality are expected to arise from the generation of airborne dust associated with vegetation clearing, earthworks at the levee site and borrow areas, and from vehicles transporting excavated materials to the site.

Heavy vehicles travelling to and from the borrow areas may result in increased exhaust fumes and air quality impacts.

Mitigation

Potential dust impacts would be minimised by limiting the area of bare ground exposed at any one time and the use of water carts to suppress dust.

All construction vehicles and equipment would have been suitably serviced within the six-month period prior to commencement of construction activities.

Vehicle movements would be kept to the minimum required.

4.7 Waste Management

Impacts

The potential sources of waste which may result from the construction works would depend on the preferred levee option, and may include, but not be limited to, the following:

- Spoil loss through the transportation of excavated material;
- Vegetation waste (exact amount is currently unknown and would depend the location of the borrow areas and the height/width of upgraded levee);
- Excess building materials such as sheet piling, concrete and rocks;
- Construction personnel waste.

Mitigation

The contractor would be required to provide details on suitable waste management procedures and to assume the responsibility for the appropriate disposal and recycling of waste generated.

4.8 Water Quality/Sediment and Erosion Control

Wagga Wagga is a major urban centre located in the mid-catchment of the Murrumbidgee catchment. The Murrumbidgee River, the main stream within the Murrumbidgee catchment, starts in the Kosciuszko National Park on the Long Plain and flows 1,600 kilometres westward to its confluence with the Murray River near Balranald. It has average annual flows of around 4.4 million megalitres and is the third largest river in the Murray–Darling Basin. The Murrumbidgee River is a regulated system and has 14 dams and 8 large weirs (Murrumbidgee CMA, 2008).

The Murrumbidgee River is under constant pressure from point source and diffuse pollution from a huge number of activities in the catchment, as well as being subjected to huge quantities of extraction. Water quality testing is carried out by Wagga Wagga City Council from a site upstream and downstream of Wagga Wagga, with these results compared to measure the influence of Wagga Wagga on the water quality of the Murrumbidgee River. Monitoring results for 2008-2009 suggest the health of the river is fair to good (Wagga Wagga City Council, 2009).

The riverbank adjacent to the levee is generally well vegetated.

Construction Impacts

The main water quality impact identified due to the proposed upgrade of 14.9km of existing levee banks is the potential for sediment to enter the Murrumbidgee River. Aspects of the proposal identified as potentially impacting on water quality includes:

- Stripping of the existing levee;
- Stockpiling of stripped material;
- Compaction of the levee;
- Excavation, transportation and placement of excavated material;
- Movement of construction equipment around the works area; and
- Other construction waste entering the river or drainage lines.

These impacts would be exacerbated in wet or windy conditions.

The potential impacts due to sediment entering the Murrumbidgee River would be increased turbidity and nutrients from the soils. High levels of particulate matter in the water column has the potential to reduce light penetration and visibility, which in turn limits plant growth, fish movements and the ability of predatory fish and birds to see their prey. When sediments from turbid water settle, there is a risk that organisms living on the bottoms of waterways could be smothered.

The risk of water quality impacts would be greatest along the stretch of levee bank running adjacent to the Murrumbidgee River. The location of the borrow areas would also influence on the potential water quality impacts due to the transportation of spoil. However, the relatively flat topography of the borrow areas would assist in reducing the likelihood of soil entering drainage lines or the Murrumbidgee River.

Construction Mitigation

The main mitigation measures to protect against water quality impacts would be the installation and maintenance of effective sediment and erosion control measures to ensure sediment stays on site and does not enter waterways. Sediment and erosion control measures would be documented in a Soil and Water Management Plan (SWMP) developed by the contractor as part of the CEMP. The SWMP would need to be approved by Council prior to implementation.

The SWMP would need to be site specific and reflect the construction methodology. As a minimum the plan would need to address the following;

- Design and construction of batter slope gradients to reduce sediment and erosion issues.
- Specify areas for stockpiling of material and the installation of sediment fences or similar to prevent offsite spoil movement.
- Sediment fences or similar around the levee during construction.
- Regular cleaning of roads to remove soil and debris.
- Implementation of the vegetation management plan (refer to Section 4.11).

Operational Impacts

The operational impacts likely to arise following the levee construction would be sedimentation and erosion issues associated with inappropriately stabilised or vegetated levee banks. Water quality impacts would be similar to those described above.

There is the potential that the altered levee would impact upon water velocities and subsequently scouring during a flood event. This would be taken into consideration during the feasibility study and design of the upgrade works, in accordance with the results of recent flood studies.

Flooding and drainage related impacts are discussed in Section 4.10 below.

Operational Mitigation

Implementation of the vegetation management plan (refer to Section 4.11) including ongoing maintenance.

Maintenance of sediment and erosion control measures until the area is stabilised and vegetation has established.

4.9 Groundwater

Geotechnical investigations were carried out at the three proposed borrow sites by Aitken Rowe Testing Laboratories in December 2009 (Tasman Road and Coplan Street borrow areas) and January 2008 (North Wagga Wagga borrow area). No groundwater was encountered to depths of 3.5m, 4.5m and 5m at the Tasman Road, Copland Street and North Wagga Wagga borrow areas, respectively.

Impacts

Extraction works at the borrow pits are not anticipated to intercept groundwater, based on the results of the geotechnical investigation. However, should borrow activities be undertaken to depths below the limit of these investigations, groundwater levels would be confirmed prior to the excavation works.

Mitigation

Excavation at the borrow areas would take into consideration likely groundwater levels, so as to avoid groundwater. Specific mitigation measures would be developed in the event that groundwater is encountered during excavation works.

4.10 Flooding and Drainage

The City of Wagga Wagga is situated on the south bank of the Murrumbidgee River with the village of North Wagga Wagga, the first settlement, on the north. North Wagga Wagga is on land enclosed between the Northern flood plain and the river, on land slightly higher than the surrounding flood plain.

Since early European settlement in the 1840's, the city of Wagga Wagga has experienced flooding on numerous occasions. These events have caused considerable damage, inconvenience and loss of life. The sheer magnitude of the volume of floodwaters generated by the catchment means that it is impossible to significantly reduce the peak flood flows, even with the construction of major dams such as Burrinjuck, Blowering and Tantangara in the Snowy Mountains. The main means of protecting the city from inundation has been the construction of Council and private levee banks together with Council controls imposed on new development (WMA Water, 2009a).

The velocities and depth across the Murrumbidgee River floodplain cause Wagga Wagga CBD and North Wagga Wagga areas to fall into the high hazard floodway category, with high

hazard defined as areas where there is a possible danger to personal safety; the movement of trucks and hence evacuation is difficult; able bodied adults would have difficulty wading to safety and there is potential for significant structural damage to buildings (WMA Water, 2009a).

Operational Impacts

The feasibility study and design of the upgrade works would need to consider the results of recent flood studies and modelling in relation to water distribution during a flood.

An assessment would need to be made should any existing drainage arrangements for the levee system be altered from the current arrangement.

4.11 Flora and Fauna

A search of the NSW Parks and Wildlife Group *Atlas of NSW Wildlife* found that the following five threatened flora species and 37 threatened fauna species have been recorded in the Wagga Wagga LGA. The local population of the Squirrel Glider within the Wagga Wagga Local Government Area is also listed as an Endangered Population.

Table 4-1: Threatened Species of Flora Recorded within Wagga Wagga LGA

Scientific Name	Common Name	Status*
<i>Ammobium craspedioides</i>	Yass Daisy	V
<i>Brachyscome muelleroides</i>	Claypan Daisy	V
<i>Senecio garlandii</i>	Woolly Ragwort	V
<i>Pultenaea humilis</i>	Dwarf Bush-pea	V
<i>Swainsona recta</i>	Mountain Swainson-pea	E1

*E1 = Endangered Species, V = Vulnerable

Table 4-2: Threatened Species of Fauna Recorded within Wagga Wagga LGA

Scientific Name	Common Name	Status*
Amphibians		
<i>Litoria booroolongensis</i>	Booroolong Frog	E1
<i>Litoria raniformis</i>	Southern Bell Frog	E1
<i>Crinia sloanei</i>	Sloane's Froglet	V
Birds		
<i>Pyrrholaemus saggitatus</i>	Speckled Warbler	V
<i>Circus assimilis</i>	Spotted Harrier	V
<i>Hieraaetus morphnoides</i>	Little Eagle	V
<i>Stictonetta naevosa</i>	Freckled Duck	V
<i>Burhinus grallarius</i>	Bush Stone-curlew	E1
<i>Cacatua leadbeateri</i>	Major Mitchell's Cockatoo	V
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V
<i>Climacteris picumnus</i>	Brown Treecreeper	V
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V

Scientific Name	Common Name	Status*
<i>Stagonopleura guttata</i>	Diamond Firetail	V
<i>Grus rubicunda</i>	Brolga	V
<i>Epthianura albifrons</i>	White-fronted Chat	V
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	V
<i>Xanthomyza phrygia</i>	Regent Honeyeater	E1
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V
<i>Pachycephala inornata</i>	Gilbert's Whistler	V
<i>Melanodryas cucullata</i>	Hooded Robin	V
<i>Petroica boodang</i>	Scarlet Robin	V
<i>Petroica phoenicea</i>	Flame Robin	V
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V
<i>Glossopsitta pusilla</i>	Little Lorikeet	V
<i>Lathamus discolor</i>	Swift Parrot	E1
<i>Neophema pulchella</i>	Turquoise Parrot	V
<i>Polytelis swainsonii</i>	Superb Parrot	V
<i>Ninox connivens</i>	Barking Owl	V
Mammals		
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V
<i>Petaurus norfolcensis</i>	Squirrel Glider	V
<i>Petaurus norfolcensis</i>	Squirrel Glider in the Wagga Wagga Local Government Area	E2
<i>Phascolarctos cinereus</i>	Koala	V
<i>Macrotis lagotis</i>	Bilby	E4
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V
<i>Myotis macropus</i>	Southern Myotis	V
<i>Vespadelus baverstocki</i>	Inland Forest Bat	V
Reptiles		
<i>Delma impar</i>	Striped Legless Lizard	V

*E1 = Endangered Species, E2 = Endangered Population, E4 = Presumed Extinct, V = Vulnerable

In addition, the following five Endangered Ecological Communities (EECs) are found in the Wagga Wagga LGA:

- Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray- Darling Depression, Riverina and NSW South Western Slopes bioregions;
- Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions;
- White Box Yellow Box Blakely's Red Gum Woodland;
- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions; and

- Aquatic Ecological Community in the Natural Drainage System of the Lower Murray River Catchment (Wagga Wagga State of the Environment Report 2008-2009).

Predicted pre-1750 distribution mapping of vegetation communities in the Wagga Wagga LGA indicates that the Yellow Box Woodland was likely to be present in the proposed borrow areas as well as the area traversed by the existing levee bank prior to clearing (Friday, S. and Mulvaney M., 2005). Variants of the Yellow Box Woodland community identified in this report include Yellow Box-Grey Box Woodland, Yellow Box-Grey Box-White Box Woodland and Yellow Box-White Cypress Pine Woodland. Very few of the remnants identified are in a condition considered to closely represent the 'pre-1750' state of this type. Most remnants in fair condition are usually dominated by grass species such as *Bothriochloa macra*, *Austrostipa bigeniculata*, *A. scabra*, *Austrodanthonia auriculata* and *Elymus scaber*. Several of the more commonly occurring forbs such as *Convolvulus erubescens*, *Sida corrugata*, *Goodenia pinnatifida* and *Calotis cuneata* typically occur. The majority of remnants are dominated by an exotic sward containing species such as *Hordeum spp.*, *Lolium spp.*, *Paspalum dilatatum* and many weeds of pastures and native vegetation. This community is included within the definition of White Box-Yellow Box-Blakely's Red Gum Woodland, with much of this vegetation type cleared for cultivation or subjected to prolonged grazing.

The existing levee banks are generally grassed and predominantly clear of substantive vegetation. In some sections, the top of the levee bank is used regularly for vehicular access and therefore consists of a compacted dirt track devoid of grass. In areas where the levee bank is in close proximity to the Murrumbidgee River, vegetation between the levee and river banks comprises native vegetation, predominantly remnant and planted trees. An ongoing Willow Removal Project being undertaken by Wagga Wagga City Council (with funding from the Murrumbidgee CMA) has resulted in the removal of a number of Willows from the banks of the Murrumbidgee River and revegetation of the cleared areas.

All of the proposed borrow sites have been subject to disturbance as a result of existing borrow activities (North Wagga Wagga and Copland Street borrow areas) or previous clearing (Tasman Road borrow area). As such, vegetation in these areas is generally limited to cleared grasses.

4.11.1 Aquatic Ecology

There are a number of wetlands of national and international ecological significance within the Murrumbidgee Catchment. These are listed in Table 4-3 below.

Table 4-3: Significant Wetlands within Wagga Wagga LGA

Wetland	Significance	Source*
Fivebough Swamp	International, national	JAMBA/CAMBA agreements (Listed under Ramsar Convention) ⁸
Tuckerbil Swamp	International, national	JAMBA/CAMBA agreements (Listed under Ramsar Convention)
Lowbidgee Floodplain	International, national	JAMBA/CAMBA agreements and Directory of Important Wetlands in Australia ¹
Mid-Murrumbidgee Wetlands - from Wagga Wagga to Carrathool	National	Directory of Important Wetlands in Australia ¹
Bethungra Dam Reserve	National	Directory of Important Wetlands in Australia ¹
Big Badja Swamp	National	Directory of Important Wetlands in Australia ¹
Black Swamp and Coopers Swamp	National	Directory of Important Wetlands in Australia ¹
Coopers Swamp (NSW 064)	National	Directory of Important Wetlands in Australia ¹
Coree Flats	National	Directory of Important Wetlands in Australia ¹
Doodle Comer Swamp	National	Directory of Important Wetlands in Australia ¹

Wetland	Significance	Source*
Lake George	National	Directory of Important Wetlands in Australia 1
Lower Mirrool Creek Floodplain	National	Directory of Important Wetlands in Australia 1
Micalong Swamp	National	Directory of Important Wetlands in Australia 1
Monaro Lakes	National	Directory of Important Wetlands in Australia 1
Towneys Plain	National	Directory of Important Wetlands in Australia 1
Yaouk Swamp	National	Directory of Important Wetlands in Australia 1
Regulated Murrumbidgee River	National	Endangered Ecological Communities under the <i>Fisheries Management Act 1994</i>
Wetlands in the Murrumbidgee Catchment inhabited by threatened species	State	<i>NSW Threatened Species Conservation Act 1995</i>
Tarcutta Swamp	Regional	Murrumbidgee Unregulated Streams Management Committee

*CAMBA = China-Australia Migratory Bird Agreement, JAMBA = Japan-Australia Migratory Bird Agreement

A number of threatened species, populations and endangered ecological communities listed under the *Fisheries Management Act 1994* also occur in the Wagga Wagga Local Government Area, including:

- Trout Cod (*Maccullochella macquariensis*);
- Macquarie Perch (*Macquaria australasica*);
- Silver Perch (*Bidyanus bidyanus*);
- Murray-Darling population of the Eel-tailed Catfish; and
- Aquatic Ecological Community in the Natural Drainage System of the Lower Murray River Catchment.

Construction Impacts

The proposal would require a considerable level of clearing (mostly groundcover) as the existing levee would be required to be raised. As well as removal of existing groundcover on and surrounding the levee, this may also comprise removal of trees in some areas where they are located close to the existing levee, particularly near the Murrumbidgee River. At the southern end of the existing Main City Levee, the levee would be required to be extended (less than 1km) through a cleared grassed area in a south-westerly direction. However, as noted above, vegetation density and structure varies across the levee and borrow area sites. It is anticipated that minimal mature vegetation would require clearing.

The majority of threatened fauna species recorded in the Wagga Wagga LGA are birds or tree residing mammals, such as bats and gliders, or smaller mammals dependent on groundcover vegetation. There is the potential that the vegetation surrounding the levee or vegetation at the borrow areas could provide habitat for threatened species, particularly in areas adjacent to the Murrumbidgee River. It is therefore recommended that a specialist flora and fauna assessment be undertaken to assess the impacts of the proposal on ecological values of the area.

It is not expected that construction activities would impact upon any aquatic habitats or the threatened species and populations within the Murrumbidgee River. An assessment of impacts to aquatic habitats during construction works would be undertaken once the construction techniques are confirmed.

Operational Impacts

Inappropriate vegetation choice or inefficient rehabilitation could result in operational issues such as cracking (from tree roots), scouring and erosion. The impacts associated with sedimentation and erosions are discussed in Section 4.8. To avoid operational issues associated with cracking and erosion, it is recommended that a specialist rehabilitation/vegetation management plan be prepared to detail appropriate measures to ensure the long term stabilisation of the levee such as species and location recommendations, (i.e. recommendations for the batters and the toe of the levee), planting rates and on going maintenance requirements.

Any impacts to the aquatic environment due to the alteration of flood flows would need to be considered in the REF.

Mitigation

It is recommended that a flora and fauna study be undertaken to assess the impacts of the proposal on ecological values of the Murrumbidgee River, including any associated wetlands and the Murrumbidgee River floodplain in the Wagga Wagga LGA. The study would need to include an assessment of floodplain vegetation and any impacts as a result of the proposed works.

A construction vegetation management plan would be developed to ensure that areas to be retained are fenced off so that they are not impacted adversely during construction.

It is recommended that a rehabilitation/vegetation management plan be prepared to detail appropriate vegetation and maintenance requirements to ensure the successful stabilisation of the levee. In addition a rehabilitation plan for the borrow area(s) would be required.

4.12 Aboriginal Heritage

Wagga Wagga Local Government area lies within the heart of southern Wiradjuri Country/Ngurambang. The Wiradjuri Heritage Study (Go Green Services, 2002) examined archaeological surveys, studies and reports within or near Wagga Wagga LGA carried out between 1980 and 2002, with the following broad conclusions drawn:

- Quartz is the main artefact type with occasional pieces of chert, silcrete and quartzite.
- Artefact scatters are likely to be located in well-drained areas near water sources such as sand hills and creek levees.
- Hearth stones and artefacts are likely to be exposed by erosion at the base of sand dunes or drifts.
- Mussel shell deposits are often with ashy grey material with some charcoal.
- Burials are usually only detected after disturbance of material or erosion but are usually in naturally elevated sand dunes or alluvial sites.
- Modified (scarred) trees are likely to occur near water but can occur anywhere. They are often difficult to conclusively identify due to similarities to other naturally scarred trees.
- These studies indicate a seemingly high level of traditional Wiradjuri activity. The people didn't always live in transient camps but often concentrated around camp sites and mounds for continual and repeated occupation.

From a total of 131 site features either on the Aboriginal Heritage Information Management System (AHIMS) register or recorded in the Wiradjuri Heritage Study, 75 (or 57%) were found to be scarred trees. Most commonly recorded scar trees during the Wiradjuri Heritage Study were Grey Box (*Eucalyptus microcarpa*), with some Yellow Box (*Eucalyptus melliodora*), and

White Box (*Eucalyptus albens*). The bark of Grey Box, being thin and hard and difficult to break, makes it ideal for a range of traditional uses. Although few scars on River Red Gum (*Eucalyptus camaldulensis*) were found, historically they are known to have been used to obtain bark for canoes. Bark was known to come off Cypress Pine smoother and last longer than other tree types. It should be noted that the dominance of scarred (modified) trees on the register is due to their relatively high visibility and fixed position and size and ease of identification when compared to other sites. Scars may also have been caused by natural occurrences (limb fall, fire, stock, natural decay) or by European settlers (Survey markers, bark removal, tree pruning) (Go Green Services, 2002).

A number of earth mounds/shell middens in close proximity to billabongs indicate use of fresh water mussels as a major food source. Hearths (the remains of ground surface fires) and larger earth cooking/domestic use mounds, particularly in the Old Man Creek and Bullenbong flood plain area, which were major wetlands teeming with bird and animal life, indicate a considerable Wiradjuri community living there in at least a semi-sedentary way of life (Go Green Services, 2002).

A search of DECCW's Aboriginal Heritage Information Management Systems database revealed that 69 Aboriginal objects and Aboriginal places have been recorded within a 10km radius of the existing levee bank. None of these sites are located within 1 km of the levee bank or the proposed borrow areas.

Impacts

As no sites have previously been recorded in the vicinity of the levee bank, and two of the three potential borrow areas are subject to existing borrow activities, it is considered that there is a low likelihood of undiscovered Aboriginal sites being disturbed as a result of the works.

However, impacts may result from disturbance or destruction of any unidentified sites, including the use of earthmoving construction equipment or clearing of any remnant trees which have the potential to contain scars. It is noted that it is an offence under the *National Parks and Wildlife Act 1974* to knowingly destroy, deface or damage an Aboriginal object or place without obtaining a licence.

Mitigation

Due to the proximity of the levee bank to the Murrumbidgee River, and the frequency of modified (scarred) trees in the Wagga Wagga LGA, it is recommended that a specialist Aboriginal archaeological consultant be engaged to assess the Aboriginal heritage impact of the removal of any remnant trees which have the potential for Aboriginal heritage significance (i.e. have the potential to be modified/scarred trees). In addition, earthworks which result in the disturbance of previously undisturbed ground should also be subject to Aboriginal heritage assessment in accordance with DECCW guidelines. This would include a survey of the works area footprint and an assessment of the potential impacts resulting from the proposal. The Aboriginal archaeological assessment would detail mitigation measures to safeguard any unidentified sites likely to occur in the area.

4.13 European Heritage

A number of heritage items listed in the Wagga Wagga Local Environmental Plan 2010 are located near the existing levee bank within North Wagga Wagga and on Fitzmaurice Street and Church Street within the Wagga Wagga CBD. The Wagga Wagga General Cemetery, located near the proposed southern extension of the levee bank, is also heritage listed. The City of Wagga Wagga Conservation Area, which is generally confined to the older inner sections of the City surrounding and including part of the Central Business District, is bounded to the east by the Murrumbidgee River and therefore encompasses part of the existing levee bank. There are no current or proposed heritage items in the vicinity of the proposed borrow areas.

A search of the NSW Heritage Branch database identified four items within the Wagga Wagga LGA which are listed on the State Heritage Register, including the Mobile Cook's Galley (in the Museum of the Riverina) and Wagga Wagga Railway Station and yard group within the suburb of Wagga Wagga. None of these items are located in close proximity to the existing levee bank.

It should be noted that heritage listed items within the Wagga Wagga LGA may also be subject to non-statutory heritage listings on the Royal Australian Institute of Architects' Register of Significant Twentieth Century Architecture, the National Trust of Australia Heritage Register and the Institute of Engineers Australia Historic Engineering Structures Register, such as the Hampden Bridge.

Impacts

No impacts to known heritage items are predicted as a result of borrow activities. However, raising (and the associated widening) of the existing levee bank has the potential to impact on the City of Wagga Wagga Conservation Area and/or any nearby heritage items, depending on the proximity of the works to such items. The proposed southern extension of the levee bank has the potential to impact on the Wagga Wagga General Cemetery, although this can be relocated to the Koorngal Road road reserve if required to prevent impacts to the cemetery.

Mitigation

It is recommended that a specialist heritage impact assessment be undertaken at the completion of the feasibility study, once the potential impacts of the proposed upgrade works on the heritage conservation area and nearby heritage items can be better defined.

4.14 Socio-economic

A comprehensive community consultation program was carried out as part of the Wagga Wagga City Council Floodplain Risk Management Study (WMA Water, 2009a) and included:

- A public presentation at Water Week;
- Community newsletters;
- Floodplain management committee meetings and workshops;
- Public meetings;
- Open shop days and public exhibition of draft study; and
- Establishment of a website.

The potential to raise the North Wagga Wagga Levee, and associated consequences and issues associated with the Main City Levee upgrade and the potential cost, were among a number of issues raised by the community as part of this community consultation process.

Failure of the Main City Levee would have significant immediate impacts on properties in the CBD itself, as well as possible longer term impacts over a significantly wider area. In the event of levee failure those properties affected will experience relatively short warning time of the failure resulting in high early velocities and high inundation depths in a relatively short time period. The loss of key infrastructure and basic public services, such as clean water, sewage disposal and electricity will impact on a large area extending beyond the vicinity of the inundated areas. The economic impact of the long recovery time will be significant to the commercial businesses in the main CBD area. The economic cost of levee failure will also affect the residential properties protected by the Main City Levee, in terms of loss of possessions and potential loss of actual dwelling. A large number of houses are not constructed to withstand hydrostatic pressure which would be present following failure of the levee and ponding of floodwater. The financial cost is exacerbated by the relatively limited availability of home and contents insurance against river flooding (WMA Water, 2009a).

Consequences of the North Wagga Wagga overtopping include the requirement for evacuation of the entire suburb, requiring the removal of approximately 600 people. In addition, road access is lost between North Wagga and Wagga Wagga prior to levee overtopping. This isolation requires all evacuation to occur before the gauge height at Hampden Bridge reaches 9.0 metres. The State Emergency Service (SES) has a comprehensive flood warning and door-knocking procedure and the residents of North Wagga have a high level of flood awareness. The evacuation of the suburb is a large task requiring significant SES resources and the length of inundation time in the suburb will cause major disruption to the lives of the residents (WMA Water, 2009a).

Impacts

The upgraded levee will offer an enhanced level of protection to the people, property and infrastructure of Wagga Wagga, as the existing levees only offer protection against to estimated 60 year ARI for the Wagga Wagga CBD and less than 20 year ARI for North Wagga Wagga. Failings and deficiencies as identified in previous levee audits would be addressed and the Main City Levee and North Wagga Wagga levees upgraded to withstand the 100 year and 20 year ARI flood events, respectively.

As discussed above, failure and/or overtopping of levees would result in significant immediate impacts as well as potentially longer term impacts and economic costs for Wagga Wagga. Investigation of the feasibility of raising the Main City Levee and the North Wagga Wagga Levee was identified as a high priority recommendation in the Wagga Wagga City Council Floodplain Risk Management Plan.

Following the upgrade works, the levee would function as per its original intent and would continue to represent those features identified as being of importance to the community. However there is the potential that recreational access to the levee may be restricted to protect against degradation. Further assessment would be required once a decision is made regarding the level of public access permitted to the upgraded levee banks.

The existing levee bank is generally located within Council reserves, Crown land and easements through privately owned land. Should the proposed works need to be undertaken on private land, it would be necessary to establish a written agreement with each individual landowner prior to construction. The feasibility study and design of the upgrade works would need to consider the results of recent flood studies and modelling in relation to water distribution during a flood and any impacts on properties outside of the upgraded levee bank.

Mitigation

The proposal should include continued community consultation or information regarding the project and construction timeframe.

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5 Conclusions and Recommendations

5.1 Proposed Works

The proposed works would comprise raising of the existing Main City Levee and the North Wagga Wagga Levee to provide an appropriate level of flood protection (likely 100 year ARI level for the Main City Levee and 20 year ARI for North Wagga Wagga Levee) plus a suitable freeboard. The Main City Levee would also be extended by less than 1km at its southern end.

5.2 Project Justification

An audit of the existing flood levees identified that:

- The levee may need to be raised in some areas to provide the required level of flood security;
- Some areas of river banks, which support the town levees, may need to be stabilised (not part of the scope of works of this PEPO);
- Trees and shrubs, which are growing on the levee, should be removed; and
- There are areas of the levee where minor erosion is evident.

The upgraded levee will offer an enhanced level of protection to the people, property and infrastructure of Wagga Wagga, as the existing levees only offer protection against an estimated 60 year ARI flood event for the Wagga Wagga CBD and less than 20 year ARI for North Wagga Wagga. Failings and deficiencies as identified in previous levee audits would be addressed and the Main City Levee and North Wagga Wagga levees upgraded to withstand the 100 year and 20 year ARI flood events, respectively.

Failure and/or overtopping of levees would result in significant immediate impacts as well as potentially longer term impacts and economic costs for Wagga Wagga.

5.3 Conclusion and Recommendations

It is recommended that an REF be prepared in accordance with Part 5 of the EP&A Act to comply with the applicable planning legislation. The REF would need to address the impacts raised in this report in further detail to reflect the final design and the construction methodology.

It is recommended that the following specialist studies be undertaken to support the environmental assessment:

- Flora and fauna assessment;
- Aboriginal archaeological assessment;
- European heritage assessment.

Table 5-1: Evaluation of the Likely Significance of Potential Impacts on the Environment

Impacts	Potential significance considering the extent of impacts	Potential significance considering the level of adverse impacts on environmentally sensitive areas	Potential significance considering the nature of the impacts
PHYSICAL & POLLUTION			
a) air impacts	Low	Low	Low
b) water impacts	Med	Low	Low
c) soil impacts	Med	Low	Low
d) noise and vibration impacts	Low	Low	Low
BIOLOGICAL			
a) fauna	Low (Subject to flora and fauna assessment)	Low (Subject to flora and fauna assessment)	Low (Subject to flora and fauna assessment)
b) flora	Low (Subject to flora and fauna assessment)	Low (Subject to flora and fauna assessment)	Low (Subject to flora and fauna assessment)
c) ecological	Low (Subject to flora and fauna assessment)	Low (Subject to flora and fauna assessment)	Low (Subject to flora and fauna assessment)
RESOURCE USE			
a) community resources	Low	Low	Low
b) natural resources	Low	Low	Low
COMMUNITY			
a) social impacts	Medium (positive)	Medium (positive)	Medium (positive)
b) economic impacts	Low	Low	Low
c) heritage, aesthetic, cultural impacts	Low (Subject to heritage assessment)	Low (Subject to heritage assessment)	Low (Subject to heritage assessment)
d) land use impacts	Low	Low	Low
e) transportation impacts	Low	Low	Low
Activity as a Whole	Low to medium	Low	Low

Based on the information available, the activity is **not likely** to significantly affect the environment, and therefore an REF is likely to be required. This would be confirmed through the specialist sub-consultant engagements which would be part of the environmental assessment of the works, including the flora and fauna and heritage assessments.

6 References

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Aitken Rowe Testing Laboratories (2008): Borrow Pit Investigation for Levee Bank Construction

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