



Part E – General Controls – Environmental Controls

Chapter E23: Riparian Land Management

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1 INTRODUCTION

1. This Chapter provides Council's requirements for the development of land within or adjacent to any riparian corridor land (watercourse, lake or estuary system). The requirements reflect the principles contained in the NSW Department of Infrastructure, Planning and Natural Resources' *Riparian Corridor Management Study* dated March 2004, prepared on behalf of Council.
2. This chapter does not apply to the following types of development:
 - (a) The erection of a dwelling-house or dual occupancy building, or
 - (b) Alterations and additions to an existing dwelling-house or dual occupancy building, or
 - (c) Ancillary buildings or facilities associated with an existing dwelling-house or dual occupancy development (which are either activities requiring development consent, exempt development or complying development) adjacent to any river, lake or estuary, but excluding any facility proposed to be carried out in, on or directly over the bed of any river, lake or estuary.
3. This chapter should be read in conjunction with section 91 of the Environmental Planning and Assessment Act 1979, the Water Management Act 2000, Water Management (General) Regulation 2004. This chapter should also be read in conjunction with clause 6.4 of Wollongong Local Environmental Plan (WLEP) 2009 which includes provisions regarding development proposals upon riparian land identified on the Riparian Land Map contained in WLEP 2009.
4. As shown on the Riparian Land Map, all watercourses within the Wollongong Local Government Area have been classified into one or more of the following three (3) categories, depending upon the nature and function of each watercourse:
 - **Category 1 – Environmental Corridor** – This category aims to provide extensive habitats for terrestrial and aquatic fauna and to maintain and restore the viability of riparian vegetation as well as protect water quality and provide bank stability.
 - **Category 2 – Terrestrial and Aquatic Habitat** – This category aims to maintain or restore the natural functions of a stream in order to maintain the viability of riparian vegetation and provide suitable habitat for terrestrial and aquatic fauna as well as improve water quality and provide bank stability.
 - **Category 3 – Bank Stability and Water Quality** – This category aims to minimise sedimentation and nutrient transfer to provide bank stability, improve water quality and protect native vegetation.

Note: Category 3 often applies to open channels with limited engineering and very little remnant vegetation. In areas where natural values are limited, a riparian corridor consisting of flood appropriate vegetation is important to ensure a flood hazard free overland flow path.

2 OBJECTIVES

1. The main objectives of this Chapter of the DCP are to:
 - (a) Protect urban creeks and riparian corridors from further degradation and improve their environmental function.
 - (b) Conserve, enhance and protect existing native riparian vegetation and associated habitat.

- (c) Protect and enhance viability of endangered ecological communities and threatened species populations listed under the Threatened Species Conservation Act 1995.
- (d) Restore and rehabilitate degraded, fragmented and modified riparian corridors where possible.
- (e) Maintain and enhance the stability of the bed and bank of a watercourse and protect assets from accelerated rates of erosion.
- (f) Enhance the aesthetic qualities and educational values of the local creek landscape.
- (g) Ensure riparian management is compatible with, and does not adversely affect, floodplain risk management objectives in urban areas.
- (h) Protect water quality.
- (i) Protect and enhance any cultural heritage values of the riparian corridors.

3 DEFINITIONS

‘Riparian corridor’ refers to any land (and its associated vegetation) that adjoins, directly influences, or is influenced by a watercourse. Its outer limit is measured from the top of a watercourse bank away from the watercourse centreline. It includes a core riparian zone (CRZ) and a vegetated buffer.

‘Riparian vegetation’ is vegetation that grows on water surfaces, below water surfaces, on waterway banks, and along the edges of waterways.

‘Top of bank’ or “highest bank’ is where the channel changes to the floodplain.

‘Watercourse’ means any river, creek, stream or chain of ponds, whether artificially modified or not, in which water usually flows, either continuously or intermittently, in a defined bed or channel, but does not include a waterbody (artificial).

‘Core riparian zone (CRZ)’ A *Riparian Corridor* refers to any land (and its associated vegetation) that adjoins, directly influences, or is influenced by a watercourse.

‘Vegetated buffer’ A *Vegetated Buffer* extends an additional 10m from the CRZ and applies to category 1 and 2 watercourses. The *Vegetated Buffer* serves to protect the CRZ from edge effects such as weed invasion, micro-climate changes, litter, trampling and pollution.

4 INTEGRATED DEVELOPMENT

1. Certain development upon riparian lands (i.e. in, on or adjacent to any watercourse, lake or estuary) may require the lodgement of an Integrated Development Application with Council pursuant to Section 91 of the *Environmental Planning and Assessment Act 1979* where the formal concurrence is required from any one or more government departments / statutory authorities:
 - (a) NSW Department of Water and Energy pursuant to Section 91(2) of the *Water Management Act 2000*;
 - (b) NSW Department of Primary Industries pursuant to sections 19(b), 201 and 219 of the *Fisheries Management Act 1994*; and
 - (c) NSW Department of Environment and Climate Change pursuant to section 90 of the *National Parks and Wildlife Act 1974*.

4.1 Water Management Act 2000

4.1.1 General

1. Development within 40 metres from the top of bank of any watercourse, lake or estuary requires the lodgement of an Integrated Development Application with Council in accordance with Section 91 of the *Environmental Planning and Assessment Act 1979* since the formal concurrence (i.e. general terms of a Controlled Activity Approval) is required from the NSW Department of Environment, Climate Change and Water, pursuant to Section 91(2) of the *Water Management Act 2000* (WMA).
2. A Controlled Activity Approval (CAA) under the WMA is required for controlled activities carried out in, on or under waterfront land.
3. Under the WMA, a “Controlled Activity” includes:
 - (a) “The erection of a building or the carrying out of a work (within the meaning of the *Environmental Planning and Assessment Act 1979*), or
 - (b) The removal of material (whether or not extractive material) or vegetation from land, whether by way of excavation or otherwise, or
 - (c) The deposition of material (whether or not extractive material) on land, whether by way of landfill operations or otherwise, or
 - (d) The carrying out of any other activity that affects the quantity or flow of water in a water source.”

4.1.2 Exempt Development not requiring a Controlled Activity Application or lodgement of an Integrated Development

1. Under clause 39A of the *Water Management (General) Regulation 2004*, the following types of development are exempt from requiring a Controlled Activity Application under section 91(2) of the WMA and hence, the lodgement of an Integrated Development Application is not required:
 - (a) The erection of a dwelling-house or dual occupancy building, or
 - (b) Alterations and additions to an existing dwelling-house or dual occupancy building, or
 - (c) Ancillary buildings / facilities for an existing dwelling-house or dual occupancy building (which are either activities requiring development consent, exempt development or complying development) adjacent to any river, lake or estuary, but excluding any facility proposed to be carried out in, on or directly over the bed of any river, lake or estuary.
2. The following types of activities are also exempt from requiring a Controlled Activity Application under section 91(2) of the WMA:
 - (a) Any removal of vegetation which is lawfully permitted, under other legislation.
 - (b) Public authorities and / or Council in relation to controlled activities carried out by those organisations in, on or under waterfront land.
 - (c) Any activities carried out in accordance with any lease, license permit or other right under the Mining Act 1992, Crown Lands Act 1989 or the Crown Lands (Continued Tenures) Act 1989;
 - (d) Any activity carried out under section 52 of the Water Management Act 2000 (domestic and stock water rights).
 - (e) Any activity carried out in accordance with a harvestable rights order, in connection with the construction or use of a dam on land within the harvestable rights area constituted by the order.

- (f) Any activity carried out in connection with the construction or use of any licensed work to which Part 2 of the Water Act 1912 applies.
 - (g) Any activity carried out in connection with the construction or use of a controlled work under Part 8 of the Water Act 1912.
3. The above exemptions are on the proviso that the Minister may still give the person carrying out any of the above activities a specific direction to protect the waterfront land on which the activity is carried out or any river, lake or estuary to which that land has frontage.

4.2 Fisheries Management Act 1994

1. The lodgement of an Integrated Development Application under Section 91 of the *Environmental Planning and Assessment Act 1979* is necessary if the formal concurrence from the NSW Department of Primary Industries is required pursuant to the *Fisheries Management Act 1994* for any of the following activities / works:
 - (a) The carrying out of dredging or reclamation works (s.201);
 - (b) Permit to cut, remove, damage or destroy marine vegetation on public water land or an aquaculture lease, or on the foreshore of any such land or lease (s205); and
 - (c) The construction or alteration of a dam, floodgate, causeway or weir across or within a river or creek (s.219(c)).

4.3 National Parks and Wildlife Act 1974

1. The lodgement of an Integrated Development Application under Section 91 of the *Environmental Planning and Assessment Act 1979* may be required for any proposed development in, upon or adjacent to any watercourse, lake or estuary where a development may potentially destroy or deface a site containing Aboriginal artefacts or may adversely affect a site of Aboriginal cultural heritage significance and hence, the formal concurrence from the NSW Department of Environment and Climate Change is required pursuant to Section 90 of the *National Parks and Wildlife Act 1974*.
2. In such cases, the preparation of the Integrated Development Application must be carried out in accordance with the requirements as per the Chapter E10: Aboriginal Heritage contained in Part E of the DCP.

5 OTHER RELEVANT LEGISLATION

5.1 Native Vegetation Act 2003

1. Land to which the Native Vegetation Act 2003 applies
2. The *Native Vegetation Act 2003* applies to certain land within the Wollongong LGA, except for the following:
 - (a) Land zoned residential (but not rural residential), industrial or business under *Wollongong Local Environmental Plan 2009*,
 - (b) Land that is reserved under the *National Parks and Wildlife Act 1974*,
 - (c) Land that is acquired under section 145 of the *National Parks and Wildlife Act 1974* for the purpose of obtaining land for reservation under that Act or for the purpose of preserving, protecting and preventing damage to Aboriginal objects or Aboriginal places,
 - (d) Land that is subject to an interim protection order made under Part 6A of the *National Parks and Wildlife Act 1974*,

- (e) Land to which an interim heritage order or listing on the State Heritage Register under the *Heritage Act 1977* applies,
 - (f) Land that is critical habitat, being habitat declared under Part 3 of the *Threatened Species Conservation Act 1995* or under Division 3 of Part 7A of the *Fisheries Management Act 1994*,
 - (g) Land that is a State forest, flora reserve or timber reserve under the *Forestry Act 1916*,
 - (h) Land that is acquired under section 15 of the *Forestry Act 1916* for the purposes of a State forest (not being any such land that is acquired for the purpose of a timber plantation).
3. Under Section 12 of the *Native Vegetation Act 2003*, the clearing of native vegetation is not permitted except where prior development consent has been granted under this Act or where the Minister has approved a property management plan which permits the clearing of such native vegetation.
4. The clearing, removal or pruning of trees and other vegetation upon land to which Act applies requires consent to be obtained from the relevant Catchment Management Authority:
- For lands north of Stanwell Park in Wollongong LGA (i.e. Otford, Helensburgh, Maddens Plain), consent is required from Sydney Metropolitan Catchment Management Authority; and
 - For lands south of Stanwell Park in Wollongong LGA, consent is required from Southern Rivers Catchment Management Authority.

5.1.1 Exempt Activities

1. The following activities are exempt from requiring approval under the *Native Vegetation Act 2003*:
- (a) Clearing for routine agricultural management activities but does not authorise any clearing of native vegetation:
 - (i) If it exceeds the minimum extent necessary for carrying out the activity, or
 - (ii) If it is done for a work, building or structure before the grant of any statutory approval or other authority required for the work, building or structure.
 - (b) The continuation of existing cultivation, grazing or rotational farming practices provided it does not involve the clearing of remnant native vegetation; and
 - (c) Sustainable grazing that is not likely to result in the substantial long-term decline in the structure and composition of native vegetation.
2. Other Clearing Activities in which the Native Vegetation Act 2003 does not apply
3. This Act does not apply to the following types of clearing of native vegetation:
- (a) Any clearing authorised under the *State Emergency and Rescue Management Act 1989* in relation to an emergency within the meaning of that Act,
 - (b) Any clearing authorised under the *Rural Fires Act 1997* in relation to any emergency fire fighting act within the meaning of that Act,
 - (c) Any clearing carried out in accordance with a bush fire management plan under the *Rural Fires Act 1997*,
 - (d) Any clearing carried out in accordance with a property management plan approved by the Director-General of the Department of Environment and Conservation for the purposes of the *Threatened Species Conservation Act 1995*,

- (e) Any clearing authorised under a licence issued under Division 1 of Part 6 of the *Threatened Species Conservation Act 1995*,
 - (f) Any clearing that is, or that is part of, designated development within the meaning of the *Environmental Planning and Assessment Act 1979* and for which development consent has been granted under that Act,
 - (g) Any clearing that is, or is part of, an activity carried out by a determining authority within the meaning of Part 5 of the *Environmental Planning and Assessment Act 1979* if the determining authority has complied with that Part,
 - (h) 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 and Assessment Act 1979* if the determining authority has complied with that Part, Any clearing authorised to be carried out under Division 3 or 4 of Part 7 of the *Fisheries Management Act 1994*,
 - (i) Any clearing authorised under a licence issued under Division 6 of Part 7A of the *Fisheries Management Act 1994*,
 - (j) Any clearing carried out in accordance with a licence issued under section 131 of the *National Parks and Wildlife Act 1974*,
 - (k) Any clearing authorised under the *Mining Act 1992*,
 - (l) Any clearing authorised under the *Petroleum (Onshore) Act 1991*,
 - (m) Any clearing that consists of plantation operations within the meaning of the *Plantations and Reafforestation Act 1999* on an authorised plantation in accordance with any conditions of the authorisation and with the Plantations and Reafforestation Code under that Act,
 - (n) Any clearing that involves the removal or lopping of any tree or other vegetation in accordance with section 88 of the *Roads Act 1993*,
 - (o) Any clearing carried out in accordance with a consent issued under Division 3 of Part 9 of the *Roads Act 1993*,
 - (p) Any clearing for the purpose of a survey under the *Surveying Act 2002* that is undertaken by or under the direction of a surveyor,
 - (q) Any clearing carried out in accordance with a licence, permit, authority or approval under the *Water Act 1912* or the *Water Management Act 2000*.
4. The *Native Vegetation Act 2003* does not remove the requirement for development consent to be obtained for the clearing of native vegetation as per *Wollongong Local Environmental Plan 2009* or the Tree Preservation Order contained in this DCP.

5.1.2 Lake Illawarra Authority Act 1987

6. The *Lake Illawarra Authority Act 1987* applies to Lake Illawarra as defined by the mean high water mark (MHWM) of Lake Illawarra and bounded at the entrance of that Lake:
- (a) By a straight line (bearing generally easterly) from the easternmost point of that MHWM in Pur Pur Bay to the westernmost point of Windang Island, and
 - (b) From that westernmost point, by a straight line (bearing generally north-westerly) to the nearest point of that MHWM directly west of the southernmost extremity of the surf club situated on Berrwarra Point, including, all named bays, all islands (other than those reserved or dedicated under any Act) and all structures situated in that Lake, but excluding creeks, rivulets and inlets, the bridge and roadway between Windang and Warilla (including the causeway and supporting structures) and land vested in Pacific Power as at the commencement of this Act.

Under Section 14 of the *Lake Illawarra Authority Act 1987*, formal consent is required from the Lake Illawarra Authority, prior to the commencement of any work or erection of any structure upon land to which the Act applies. The Lake Illawarra Authority requires that any

other relevant consent or approval required by or under any other Act be obtained first, prior to the lodgement of any application with the Authority.

6 DEVELOPMENT IN RIPARIAN CORRIDORS

6.1 Riparian Corridor Objectives

6.1.1 General

1. The category for each watercourse in the Wollongong City LGA is determined by the relevant Riparian Land Map contained in *Wollongong Local Environmental Plan 2009*.
2. Any new development upon riparian land shall be designed to meet the specific riparian corridor objectives for the relevant watercourse category as contained in Table 1 below.

Table 1 Riparian Corridor Objectives

Watercourse Category	Riparian Corridor Objectives
Category 1 – Environmental Corridor	<ul style="list-style-type: none"> • Maximise the protection of terrestrial and aquatic habitat; • Maintain a continuous riparian corridor to provide linkages between stands of remnant vegetation for the movement of terrestrial and aquatic fauna; • Maintain the viability of native riparian vegetation; • Minimise ‘edge effects’ at the riparian corridor / urban interface by the provision of a suitable riparian corridor width; • Maintain adequate riparian corridor width, based on geomorphological and environmental considerations and to maintain or improve bank stability; • Protect water quality of the watercourse through an adequate riparian corridor width; • Restore the vegetation, geomorphic structure, hydrology and water quality of the riparian corridor to its original (pre-European) state, where practicable; • Locate infrastructure or utility services (i.e. electricity, water, sewerage etc) outside the riparian corridor, wherever practicable; • Maintain the riparian connectivity by the use of piered crossings in preference to pipes or culverts; • Minimise the impact of walkways, cycle ways and general access points by using ecologically informed design principles; • Restrict the encroachment of flood compatible development (e.g. playing fields) to the edge of the riparian corridor; • Treat stormwater run-off outside the riparian corridor before discharge into the watercourse.

Category 2 – Terrestrial and Aquatic Habitat

- Maintain/restore the natural functions of watercourses.
- Maintain the viability of native riparian vegetation;
- Minimise 'edge effects' at the riparian corridor / urban interface by the provision of a suitable riparian corridor width;
- Maintain adequate riparian corridor width, based on geomorphological and environmental considerations and to maintain or improve bank stability;
- Protect water quality of the watercourse through an adequate riparian corridor width;
- Restore the vegetation, geomorphic structure, hydrology and water quality of the riparian corridor to its original (pre-European) state, where practicable;
- Minimise the number of road crossings and such crossings are designed to maintain riparian connectivity;
- Restrict the encroachment of flood compatible development (e.g. playing fields) to the edge of the riparian corridor rather than within the core riparian zone;
- Locate infrastructure or utility services (i.e. electricity, water, sewerage etc) outside the riparian corridor, wherever practicable;
- Treat stormwater run-off outside the riparian corridor before discharge into the watercourse.

Category 3 – Bank Stability and Water Quality

- Minimise sedimentation and nutrient transfer;
- Provide bank stability;
- Protect water quality;
- Protect riparian vegetation, wherever possible;
- Emulate a naturally functioning stream with a suitable riparian corridor width;
- Provide suitable vegetated habitat refuges for terrestrial and aquatic fauna, wherever possible;
- Treat stormwater run-off outside the riparian corridor before discharge into the riparian zone, wherever possible.

6.2 Riparian Corridor Width Requirements

1. Any development (excluding new dwelling-houses, new dual occupancy developments or alterations and additions to existing dwelling-houses or dual occupancies) in, upon or adjacent to riparian land must be designed to achieve the minimum riparian corridor width requirement for the specific watercourse category as contained in Table 2 below. The riparian corridor width is measured from the top of a watercourse bank away from the watercourse centreline.

Table 2: Riparian Corridor Width Requirements

Creek Category	CRZ Recommended Width (m)	Vegetated Buffer(m)	
Creek Category	CRZ Recommended Width (m)	Vegetated Buffer (m)	Total Width Requirement for each side of the watercourse (m)
Category 1	40*	10*	50*
Category 2	20*	10*	30*
Category 3	10	-	10

- Council may consider a variation to the minimum riparian corridor width for proposals involving alterations or additions to an existing building which is already located within the prescribed riparian corridor width or in other exceptional circumstances where, in the opinion of Council, the variation will not result in any adverse impact upon the functions of the riparian corridor or any adverse flood hazard risk or other hazard risk. However, the absolute minimum riparian corridor width shall be 10 metres from the top of bank. This is generally consistent with the general 10 metre 'high flood risk precinct' as defined in the Floodplain Management Chapter in Part E of this DCP.

*Note: Any proposed variation to the minimum riparian corridor width requirements between the bed of any river, watercourse, lake or estuary and 40 metres inland from the river, lake or estuary will require appropriate negotiations to occur directly with the NSW Department of Environment, Climate Change and Water, prior to the lodgement of any Integrated Development Application under section 91 of the Environmental Planning and Assessment Act 1979. Should the Department agree to a variation to the minimum riparian corridor width requirements, appropriate documentary evidence must be provided in support of the application at the time of lodgement, otherwise Council will assume no such agreement has been reached with the Department and hence, the riparian corridor width requirements as per Table 2 will be required to be met.

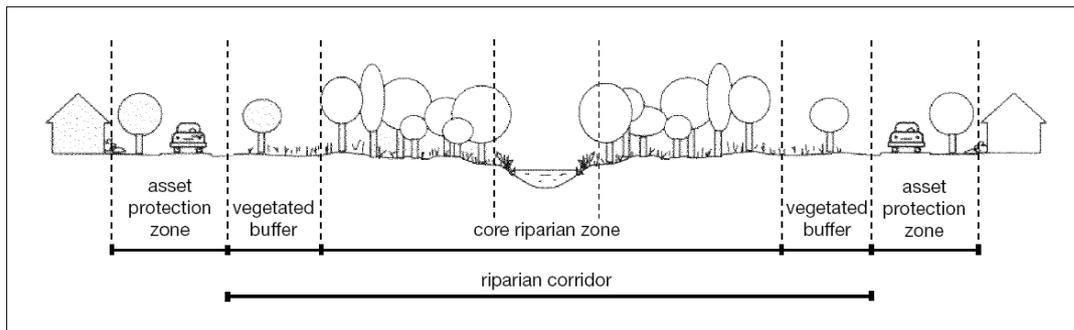


Figure 1: Illustrates a typical Riparian Corridor (Courtesy of the Department of Water and Energy (2008))

7 BUSH FIRE ASSET PROTECTION ZONES

- Any bush fire Asset Protection Zone (APZ) is required to be located and managed outside the required riparian corridor.
- The only variations that may be permitted to this requirement are:

- (a) The inclusion of an APZ within an area of Category 2 or 3 riparian corridor may be permitted in those parts of the corridor that are revegetated/rehabilitated as part of a proposed development;
- (b) Selective clearing of vegetation within the edge of a riparian corridor may be permitted in cases where the proposed development involves the erection of a dwelling-house or alterations and additions to an existing dwelling-house and / or ancillary structures or outbuildings and site constraints limit an alternate approach to the provision of the APZ. The extent of clearing permitted would be dependant upon the submission of supporting flora and fauna assessment.

8 FENCING

1. Fencing is to be generally restricted to the edge of the riparian corridor.
2. The design of fencing shall comply with the requirements stated in the Floodplain Management Chapter contained in Part B of this DCP.

9 INFRASTRUCTURE SERVICES AND ROADWAY CROSSINGS

1. Infrastructure services and roadway crossings are to be designed and located in a manner which maximises riparian corridor connectivity.
2. Stormwater detention basins are to be installed outside the riparian corridor, wherever possible.

10 RIVERBANK RESTORATION WORKS

1. Works to stabilise the watercourse bed or bank are to be carried out with soft engineering methods where possible. Designs should aim to maintain or mimic existing or natural hydraulic, hydrologic, geomorphic and ecological functions of the watercourse. Rehabilitation works within the riparian corridor must be co-ordinated through Council or in some cases, the Department of Water and Energy (DWE) directly.
2. All works involving soil disturbance are to be carried out in accordance with the NSW Landcom publication titled *Managing Urban Stormwater: Soils and Construction Edition 4 (March 2004)*.

11 DEVELOPMENT APPLICATION INFORMATION REQUIREMENTS

1. The following information must accompany a Development Application for any proposed development within a site containing riparian corridor land:
 - (a) A Site Plan which shows the siting and design of existing and proposed buildings, including any outbuildings or ancillary structures such as garages, sheds, pergolas and pools. The site plan shall be at a scale of 1:100, 1:200 or 1:500, depending upon the size of the subject development site.

Note: The siting, design and landscape treatment of the proposed development should maximise the habitat values (if any) and minimises disruption to the connectivity of riparian habitats.

- (b) A Survey Plan or a detailed Site Analysis plan which delineates the 'top of bank' and centreline of the watercourse. The survey / site analysis plan must also show the setback distances between existing and proposed buildings / structures and the top of bank. The survey / site analysis plan shall also show existing contour levels at 2 metre intervals and also delineate areas which are over a slope class of 18°. The

survey plan shall be at a suitable scale (ie 1:100, 1:200 or 1:500 scale), depending upon the size of the overall landholding.

- (c) A Tree Survey Plan (i.e. prepared by a registered surveyor) which shows the location and species type of existing trees and understorey shrubs within the site, especially the riparian land.
- (d) A Vegetation Management Plan (VMP) which indicates how the natural qualities of the riparian corridor have been retained or are proposed to be restored as far as possible through the retention or reinstatement of natural levels and native vegetation and / or the removal of trees (e.g. willows) and other noxious plants / vegetation.

12 VEGETATION MANAGEMENT PLAN

1. A Vegetation Management Plan (VMP) will be required to be submitted with any Integrated Development Application or Development Application lodged for any proposed development within 40 metres from the top of bank of any watercourse, lake or estuary (excluding new dwelling-houses or dual occupancies or alterations and additions to existing dwelling-houses or dual occupancies).
2. A VMP is to be prepared for all riparian lands that are intended to be transferred to Council ownership via dedication.
3. The VMP should be prepared by a suitably qualified and experienced landscape architect or horticulturist, in consultation with a consulting engineer.
4. The VMP should address a range of matters including (but necessarily limited to) the following:
 - (a) The VMP should be at a suitable scale depending upon the size of the subject site (e.g. 1:100, 1:200 or 1:500 scale).
 - (b) The VMP shall make provision for rehabilitation plantings and works within the required riparian corridor.
 - (c) Define rehabilitation program tasks, staging and timing of proposed works and monitoring and maintenance.
 - (d) Outline consultation conducted with Council's Bushcare Officer and Department of Environment, Climate Change and Water officers.
 - (e) Provide details on seed collection and propagation.
 - (f) Provide details on site preparation.
 - (g) Prepare a costing of works.
5. The following matters shall be taken into account when preparing the VMP:
 - (a) The removal of exotic stream bank vegetation is encouraged and revegetation is recommended to be with locally appropriate native species.
 - (b) Vegetation is to be planted in a manner which resembles a natural environment (finished levels and distribution, and diversity of vegetation) and maintains the lateral connectivity between the waterway and riparian vegetation. Appendix 1 recommends the specific types of vegetation which should be planted upon the toe, mid-slope and upper slopes of a watercourse embankment for bank stabilisation purposes.
 - (c) Any revegetation works should maintain (and not increase) current vegetation density as well as improve bank stability, except where the subject watercourse is heavily degraded in which case, the vegetation density may need to be increased. Any such revegetation works should take into account the following aspects:

- (i) Banks of watercourses are to be predominantly planted with dense low cover such as native grasses in the order of 4-6 tube stock (50-75mm tubes) plants per square metre.
 - (ii) Creek banks higher than 2 metres are to be sparsely planted with deeper rooted, long lived tree or shrub species (1 plant at 4 metre to 6 metre centres), to minimise bank collapse and erosion.
 - (d) Revegetation on the top of the banks should include trees and shrubs to reflect natural densities.
 - (e) Short lived plants such as Acacia species should be avoided in order to minimise flood hazard from woody debris in watercourses and to maintain long term bank stabilisation.
 - (f) Plantings are to be replaced if more than a 10% loss of stock occurs.
 - (g) The VMP should reflect any relevant flood studies (i.e. modelled for either the entire catchment or the specific development) in order to ensure that the proposed vegetation densities do not net increase the flood affectation upon surrounding properties in the locality.
6. The VMP is to be implemented by persons suitably qualified in bushland rehabilitation and must be under the supervision of a person with professional qualifications, knowledge and experience in bushland rehabilitation practices.
7. For any land proposed to be transferred to Council, all necessary revegetation or other works are to be completed in accordance with the approved VMP to the satisfaction of Council, prior to Council accepting the transfer of the land. Further, the developer may be responsible for a minimum 6 month maintenance period for any revegetation or other works in the riparian corridor.

Appendix: 1 – Riparian Vegetation Rehabilitation Guidelines

Vegetation type	Benefits in relation to erosion and bank stability.	Planting/ rehabilitation guide			Example species
		Toe of bank	Bank	Top of Bank	
Aquatic plants	<p>Aquatic macrophytes such as sedges, rushes and reeds are shallow rooted species which grow at the margins of the mean water level. They readily colonise wet areas.</p> <p>Macrophytes protect against fluvial scour as they slow the flow close to the bank. They also provide a valuable water quality function by filtering out fine sediments, and pollutants.</p> <p>They flourish in conditions of low velocity (about 0.2m/s) but will withstand short periods of inundation and high velocity associated with flooding.</p> <p>Macrophytes cause little flow resistance when the water depth is greater than the plant height. Plants lay over in high water flows.</p>	<p>This should be the dominant form of vegetation on the toe of bank and instream where there is consistent moisture/ flow.</p> <p>Macrophytes will generally not survive for long periods of time in water that is more than 0.5m deep.</p>	<p>Not appropriate</p> <p>Should only be planted where there is continuous moisture / flow.</p>	<p>Not appropriate.</p>	<p><i>Typha orientalis</i>,</p> <p><i>Phragmites australis</i>,</p> <p><i>Eleocharis sphacelata</i>,</p> <p><i>Schoenoplectus validus</i>,</p> <p><i>Persicaria decipiens</i>,</p> <p><i>Triglochin procera</i>,</p> <p><i>Ludwigia peploides</i>,</p> <p><i>Juncus usitatus</i>,</p> <p><i>Baumea articulata</i>,</p> <p><i>Alisma plantago-aquatica</i>.</p>
Ground-covers	<p>Groundcover vegetation is typically less than 1m high. It can include grasses, sedges, forbes, and scramblers.</p> <p>Groundcovers provide very effective surface erosion control on stream banks if they provide continuous cover. Isolated, clumped plants can aggravate soil erosion.</p> <p>Groundcover species do not generally contribute to the mass stability of banks</p>	<p>Should be planted alongside aquatic plants at the toe of the bank.</p>	<p>Groundcovers should dominate bank planting to provide erosion control.</p> <p>Groundcovers alone do not provide sufficient bank stability, as they have shallow root systems and only provide stability to the surface soil. Therefore on banks they need to be planted in combination with</p>	<p>Groundcovers should form an equal part of the top of bank vegetation which should include tree cover, shrub or small tree cover and canopy tree cover.</p> <p>Top of bank vegetation should aim to recreate natural vegetation structure and species composition.</p>	<p><i>Carex longebrachiata</i>,</p> <p><i>Lomandra longifolia</i>,</p> <p><i>Hibbertia scandens</i>,</p> <p><i>Glycine tabacina</i>,</p> <p><i>Poa labillardieri</i>,</p> <p><i>Doodia aspera</i>,</p> <p><i>Pandorea pandorana</i>,</p> <p><i>Themeda australis</i>,</p> <p><i>Microlaena</i></p>

Vegetation type	Benefits in relation to erosion and bank stability.	Planting/ rehabilitation guide			Example species
		Toe of bank	Bank	Top of Bank	
	<p>because of their limited root depth.</p> <p>Groundcovers generally have little effect on flood levels.</p>		a scattered cover of occasional deeper rooted shrubs and/or long living trees.		<p><i>stipoides</i>,</p> <p><i>Imperata cylindrica</i>,</p> <p><i>Bothriochloa biloba</i>,</p> <p><i>Austrodanthonia caespitosa</i>,</p> <p><i>Echinopogon caespitosus</i>,</p> <p><i>Oplismenus aemulus</i>, <i>Entolsia marginata</i>, <i>E stricta</i>,</p> <p><i>Viola hederacea</i>,</p> <p><i>Juncus usitatus</i>,</p> <p><i>Commelina cyanea</i>,</p> <p><i>Dichondra repens</i>,</p> <p><i>Dianella caerulea</i>,</p> <p><i>Cympopogon refractus</i></p>
Shrubs (or small multi-trunked trees)	<p>Understorey shrubs and small multi-stemmed trees can provide effective erosion control if the branches prevent high velocity water from contacting the soil. They also contribute to bank stability as their rooting systems are shallower than larger trees, but often still penetrate to 1m.</p> <p>Shrubs have the greatest potential to increase flood levels so avoid planting dense shrubs in areas where flood control is important.</p>	Shrubs should usually be avoided at the toe of bank.	<p>Scattered shrubs (not clumped) can be planted to contribute to bank stability.</p> <p>On sites where flood control is critical, scattered trees may be better suited than shrubs to provide bank stability as they have less impact on flood levels.</p>	Shrubs can be planted at natural densities on the top of bank.	<p><i>Indigofera australis</i>,</p> <p><i>Streblus brunonianus</i>,</p> <p><i>Breynia oblongifolia</i>,</p> <p><i>Leucopogon lanceolatus</i>,</p> <p><i>Acacia longifolia</i>,</p> <p><i>Rapanea variabilis</i>,</p> <p><i>Tristaniopsis laurina</i>,</p> <p><i>Notelaea venosa</i>,</p> <p><i>Livistona australis</i>,</p> <p><i>Pittosporum revolutum</i>,</p> <p><i>Bursaria spinosa</i>,</p> <p><i>Dodonaea triquetra</i>.</p>

Vegetation type	Benefits in relation to erosion and bank stability.	Planting/ rehabilitation guide			Example species
		Toe of bank	Bank	Top of Bank	
Single trunk trees	<p>Trees provide the main form of bank reinforcement due to their lateral and deep rooting systems. This prevents major slumping and collapse of banks.</p> <p>Generally well spaced trees with branches above the flood level provide little hydraulic interference.</p> <p>Planting of short lived wattles (eg <i>Acacia mearnsii</i>) and pioneer species should be avoided in proximity to high flow water levels. They have a short life span and often aggravate flood waters by causing blockages within infrastructure.</p> <p>Drier banks are more stable than wet ones because the weight of the soil mass is reduced. For this reason trees in particular are beneficial as they contribute to significant water uptake.</p>	<p>Scattered trees may be valuable at the toe of slope to prevent bank slumping.</p> <p>Do not clump or group trees.</p> <p>Planting density of trees should not exceed an estimated 1 tree per 6m.</p>	<p>Scattered trees enhance bank strength.</p> <p>Do not clump or group trees.</p> <p>Planting density of trees should not exceed an estimated 1 tree per 6m.</p>	<p>Tree cover on the top of bank should reflect natural vegetation structure and densities. However, avoid short lived trees unless they can be removed once they have performed their function of providing cover for the establishment of other longer term species.</p> <p>Where a bank is actively eroding, the riparian zone and planting of trees should be wide enough to allow the vegetation away from the bank line to mature by the time the erosion front reaches that point.</p>	<p><i>Eucalyptus pilularis</i>, <i>E. tereticornis</i>, <i>E. longifolia</i>, <i>E. amplifolia</i>, <i>E. robusta</i>,</p> <p><i>Melaleuca stypheoides</i>,</p> <p><i>Melaleuca linariifolia</i>,</p> <p><i>Casuarina glauca</i>,</p> <p><i>Casuarina cunninghamiana</i>,</p> <p><i>Ficus coronata</i>.</p> <p>Rainforest species:</p> <p><i>Alectryon subcinereus</i>,</p> <p><i>Guioa semigaluca</i>,</p> <p><i>Cryptocarya glaucescens</i>,</p> <p><i>Cryptocarya microneura</i>,</p> <p><i>Acmena smithii</i>,</p> <p><i>Scalopia braunii</i>,</p> <p><i>Backhousia myrtifolia</i>,</p> <p><i>Alphitonia excelsa</i>,</p> <p><i>Diospyros australis</i>,</p> <p><i>Claoxylon australe</i>,</p> <p><i>Croton verrauxii</i>,</p> <p><i>Glochidion ferdinandi</i>, <i>Stenocarpus salignus</i>.</p>