



Office
of Water

COASTAL ASSESSMENTS
RECEIVED
- 8 OCT 2009
NSW Department
of Planning

Front Office
P/O SW

STUART WITTINGTON
08/10/09
AS

Department of Planning
Alan Bright
GPO Box 39
Sydney NSW 2001

Contact: Christie Jackson
Phone: 02 6701 9652
Fax: 0267 01 9682
Email: christie.jackson@dnr.nsw.gov.au

6 October 2009

Dear Mr Bright,

Subject: Major Project 05_0129 'Lakes Estate' 198 Lot Residential Subdivision at Lakes Drive and North Boambee, North Boambee Valley, Coffs Harbour

I refer to your letter dated the 21 August 2009 seeking the NSW Office of Water's (NOW) comments on the Environmental Assessment (EA) for the Lakes Estate residential subdivision at Coffs Harbour. NOW understands the proposed development consists of 198 lots, an internal road network which links to the existing part of Lakes Estate, pedestrian footpaths, drainage and reticulated services to be completed in 3 stages. NOW comments are outlined as follows:

Groundwater: There does not appear to be any groundwater issues associated with the proposed development, however if groundwater is expected to be encountered during the installation of any works, a temporary dewatering licence will be required from NOW under Part 5 of the *Water Act 1912*, prior to the works being undertaken.

Riparian Issues: The EA outlines the existing works currently on the site consisting of five lakes and one wetland. There was a previous Environmental Impact Statement undertaken for the construction of Pond G2 across the main channel of the creek for Coffs Harbour City Council. NOW understands the proposed works to be undertaken in the riparian corridor are:

Western Catchment:

- o Works are proposed within 30 metres of the minor drainage line in Stage 7.2.
- o The construction of a 13 metre culvert (spanning both access roads) consisting of 2 x 1050mm diameter pipes.
- o Well graded rip rap of average diameter (300mm) placed 2 metres upstream and 5 metres downstream of 13 metre culvert.

Lakes Estate Catchment:

- o The extension of the approved channel upstream of Lake 5 to an existing dam/ pond upstream of Stage 3.2.
- o The filling of lots within Stage 3.2 to bring the ground level to at least 500 mm above the 100 year ARI flood level.

Department of
Environment, Climate Change and Water NSW



Whilst a controlled activity approval is not required for Part 3A major projects it is important that any works undertaken are consistent with NSW legislation and Government policy and guidelines. Any works located on waterfront land (ie. the bed and a distance inland of 40 metres from a river, lake or estuary) must be consistent with the former Department of Water and Energy's 'Guidelines for Controlled Activities' under the *Water Management Act 2000*.

NOW has concerns with some of the proposed riparian works associated with the development. The proposal to extend the existing approved channel upstream of Lake 5 to the existing dam upstream of Stage 3.2 in particular is not supported by NOW. This area has a well vegetated natural riparian corridor and is in an area zoned 7A for Environmental Protection. NOW supports the retention of the natural functioning riparian corridor across the site, including the retention/ establishment of an appropriate Core Riparian Zone (CRZ) and Vegetated Buffer (VB). Asset Protection Zones (APZ) for bushfire protection must be located outside of the CRZ and VB, in conjunction with the 'Guidelines for Controlled Activities' under the *Water Management Act 2000*. I have attached a copy of the guidelines for your information.

It also appears lots in Stage 3.2 are located across the watercourse and in the area zoned 7A for Environmental Protection, in particular lots 150 and 151. The proposal may have to be modified to remove lots in Stage 3.2 of the development, which interfere with the natural drainage line to maintain natural flows and the integrity of the watercourse.

The construction of the culvert must be consistent with our guidelines and must maintain existing or natural hydraulic, hydrologic, geomorphic and ecological functions of the existing watercourse.

The proponent has been in discussion with Licencing Officers in our Grafton office regarding proposed works to be undertaken on the site. The works discussed with Licencing Officers varies from the works outlined in the Environmental Assessment. It is very difficult for NOW to provide accurate consistent technical advice when the works to be undertaken on site are not clearly outlined.

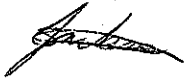
NOW requires further information clearly outlining all works to be undertaken on site including works which may have been approved under previous Development Applications with Coffs Harbour City Council or 3A permits under the repealed *Rivers and Foreshores Improvement Act 1948*. All proposed and previously approved riparian works must be clearly outlined on plans accompanying the further information. This will enable NOW to provide accurate technical advice and recommend suitable conditions for the management of the riparian areas on site.

Acid Sulphate Soil: The EA outlines there are low lying areas across the site with shallow groundwater. Part of the site has also been mapped as an area of low probability of acid sulphate soils (ASS) occurring between 1m and 3m depth below the ground surface on the former Department of Land and Water Conservation 1:25,000 Acid Sulphate Soil Risk Map of Coffs Harbour. If ASS is identified on the property at any stage the proponent will need to refer to the Acid Sulphate Soil Manual for appropriate management of these soils. NOW is concerned about potential effects of disturbed acid sulphate soils on the water quality of the groundwater table.

Harvestable Rights: The proponent must ensure any proposed structures such as dams, ponds or detention basins are consistent with the NSW Farm Dams Policy. Any structures not consistent with the policy will need to be assessed and licenced by the NSW Office of Water. I have attached a copy of the Farm Dams Policy for your information.

If you require clarification on any of the above please don't hesitate to contact me on 02 6701 9652.

Yours sincerely,



Christie Jackson
Planning and Assessment Coordinator

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Guidelines for controlled activities

Watercourse crossings

The design and construction of watercourse crossings and ancillary works, such as roads, should consider the potential impacts of the crossing structure on waterfront land. Crossings have the potential to disrupt the hydrologic, hydraulic, and geomorphic functions of a watercourse affecting flows, bed and bank stability as well as the ecological values and functions of the riparian corridor (refer to the Department's Guidelines for *Guidelines for controlled activities – Riparian corridors*).

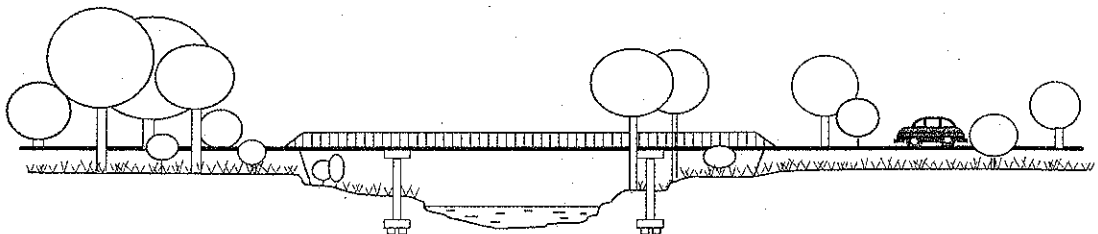
Controlled activities carried out in, on or under waterfront land are now regulated by the *Water Management Act 2000* (WMA). The Department of Water and Energy is required to assess the impact of a controlled activity to ensure that minimal harm will be done to any waterfront land, ie. the bed and a distance inland of 40 metres from a river, lake or estuary.

This means that a controlled activity approval must be obtained from the Department prior to carrying out a controlled activity.

In order to minimise the effects of structures on the hydrologic, hydraulic and geomorphic functions of a watercourse, the Department recommends crossings be designed and constructed in order to maintain the integrity of the existing channel as well as being sympathetic with the ecological values of the watercourse and its riparian corridor.

Bed level crossings or bridges which fully span the watercourse channel provide the best opportunities for maintaining these channel functions, as illustrated in Figure 1. However, alternative structures such as box culverts which can achieve equivalent riparian corridor functions may also be considered.

Figure 1. Bridge crossing over watercourse and riparian corridor



The design and construction of crossing structures should consider, but not be limited to, the following design principles:

- Identify the appropriate width of the riparian corridor in accordance with the Department's *Guidelines for controlled activities – Riparian corridors*.
- The design and construction of crossings should consider the full width of the riparian corridor and riparian corridor functions, including accommodating fully structured native vegetation.
- The design and construction footprint and extent of disturbances proposed within the riparian zone should be minimised.
- Maintain existing or natural hydraulic, hydrologic, geomorphic and ecological functions of the watercourse.
- If a raised structure or an increase in the height of the bed is proposed then proponents must demonstrate that the structure will not have a detrimental effect on the natural hydraulic, hydrologic, geomorphic and ecological functions.



- Maintain natural geomorphic processes:
 - accommodate natural watercourse functions
 - maintain the natural bed and bank profile
 - do not inhibit the movement of sediment and woody debris
 - do not increase scour and erosion of the bed or banks in any storm events
 - avoid locating structures on bends in the channel
 - where existing bed degradation occurs, address bed degradation to protect the structure and restore channel and bed stability.
- Maintain natural hydrological regimes; that is:
 - accommodate site hydrological conditions
 - do not alter natural bank full or floodplain flows or increase water levels upstream
 - do not change the gradient of the bed (except where necessary to address existing bed and bank degradation)
 - do not increase velocities by constricting flows (eg. filled embankments on approaches).
- Protect against scour; that is:
 - provide any necessary scour protection, eg. rock rip-rap and vegetation
 - scour protection of the bed and banks downstream of the structure should extend for a distance of either twice the channel width or 20 metres whichever is the lesser
 - if cutting into banks, protect cuttings against scour.
- Stabilise and rehabilitate all disturbed areas including topsoiling, revegetation, mulching, weed control and maintenance in order to adequately restore the integrity of the riparian corridor.

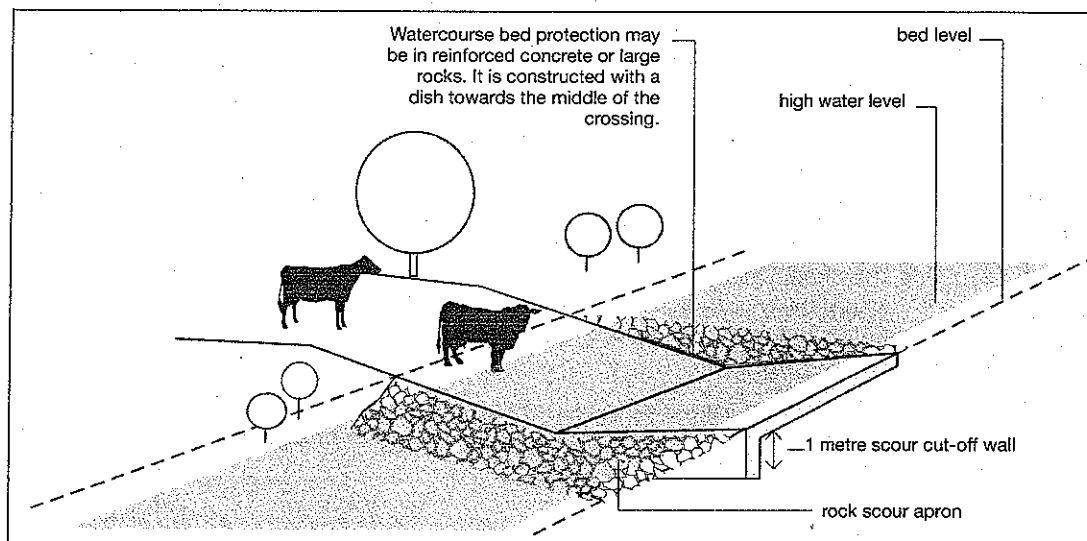
Additional considerations for design of bridges

- Ideally, bridges shall be elevated and span the riparian corridor.
- Avoid locating bridge piers or foundations within the main channel of the watercourse.
- The bridge design **must be certified** by a suitably qualified engineer.

Additional considerations for design of causeways

- The deck of the crossing shall be at the natural bed elevation.
- The crossing shall have a vertical cut-off wall on the downstream side of the crossing to a minimum depth of 1 metre and minimum width of 100 mm.
- Approaches to the crossing should be sealed and incorporate appropriate roadside drainage, eg. stabilised table drains where necessary.

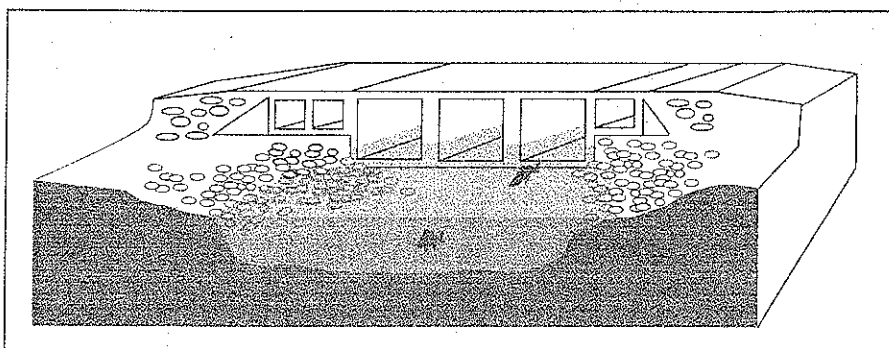
Figure 2. Splash crossing for livestock and vehicles



Additional considerations for design of culverts

- Box culverts are preferred to pipes.
- Align culverts with downstream channel.
- Incorporate elevated 'dry cells' and recessed 'wet cells' with the invert at or below the stable bed level.
- The culvert design **must be certified** by a suitably qualified engineer.

Figure 3. Road crossing allowing fish passage



When seeking approval to construct crossing structures information detailing the above requirements should be submitted to the Department for assessment. Additional information may also be required and may include but not be limited to:

- detailed design drawings which include a surveyed plan; cross sections (across the watercourse) and a long section of the watercourse, showing the proposed structure relative to existing and proposed bed and bank profiles and water levels. The cross section should extend to the landward limit of the identified riparian corridor.
- crossing design plans should include a location plan, plan view, elevation view and cross-section of the proposed crossing structure
- a report detailing pre and post construction hydraulic conditions. The report should address, bank full discharge, velocity, tractive force or shear stress, afflux (Modified RTA method is acceptable), Froude and Manning 'n', relative to the proposed structure.
- plans showing extent and designs of permanent bed and bank stabilisation works necessary for scour protection (see Department's *Guidelines for controlled activities – In-stream works*)
- a Vegetation Management Plan prepared in accordance with the Department's *Guidelines for controlled activities – Vegetation Management Plans*
- a Site Management Plan incorporating the schedule, sequence and duration of works, erosion and sediment controls, etc
- costing of all works (ie materials, labour) and stages of works (eg crossing construction, rehabilitation)
- other relevant approvals, eg. development consent.

Further information

If you require more information about controlled activity approvals please contact your local DWE office or visit our website www.dwe.nsw.gov.au

Important notes

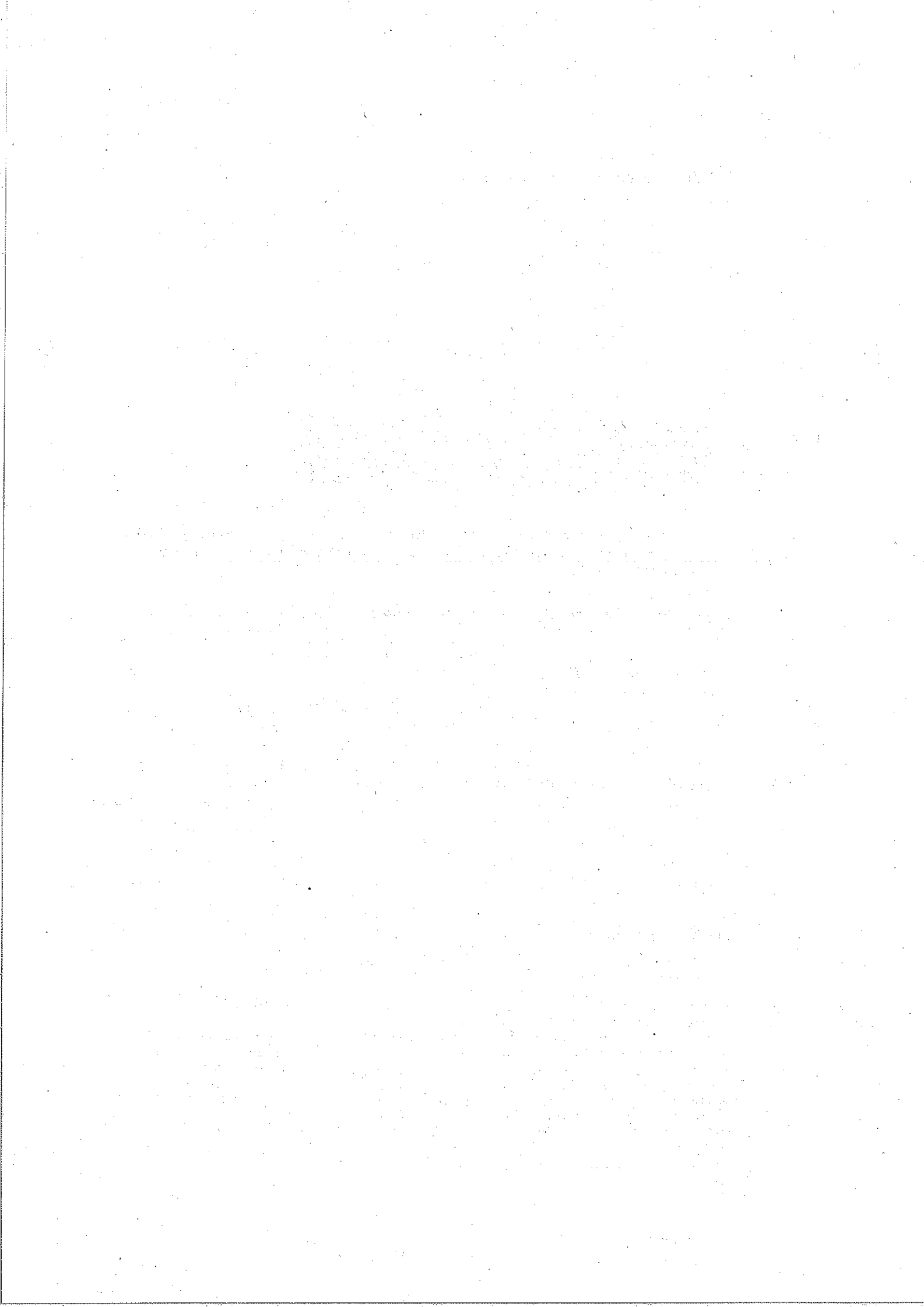
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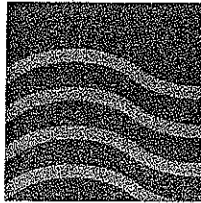
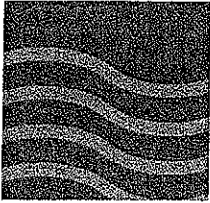
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Guidelines for controlled activities

Riparian corridors

Controlled activities carried out in, on or under waterfront land are now regulated by the *Water Management Act 2000* (WMA). The Department of Water and Energy is required to assess the impact of a controlled activity to ensure that minimal harm will be done to any waterfront land, ie. the bed and a distance inland of 40 metres from a river, lake or estuary.

This means that a controlled activity approval must be obtained from the Department prior to carrying out a controlled activity.

Riparian corridors form a transition zone between terrestrial and aquatic environments and perform a range of important environmental functions. Riparian corridors:

- provide bed and bank stability and reduce bank and channel erosion
- protect water quality by trapping sediment, nutrients and other contaminants
- provide a diversity of habitat for terrestrial, riparian and aquatic flora and fauna species
- provide connectivity between wildlife habitats
- allow for conveyance of flood flows and control the direction of flood flows
- provide an interface between developments and waterways.

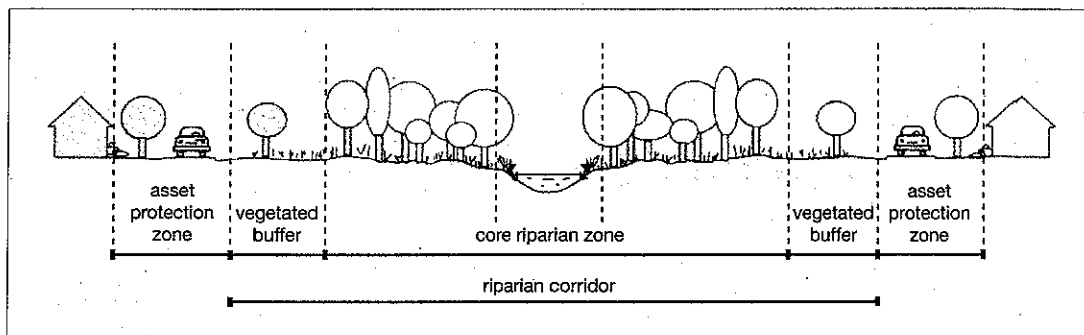
The protection or restoration of vegetated riparian areas is important to maintain or improve the geomorphic form and ecological functions of watercourses through a range of hydrologic conditions in normal seasons and also in extreme events.

When determining an appropriate width for a riparian corridor and how much riparian vegetation should be protected or re-established on a site, the following three riparian corridor zones (Figure 1) should be considered.

1. A **Core Riparian Zone** (CRZ) is the land contained within and adjacent to the channel. The Department will seek to ensure that the CRZ remains, or becomes vegetated, with fully structured native vegetation (including groundcovers, shrubs and trees). The width of the CRZ from the banks of the stream is determined by assessing the importance and riparian functionality of the watercourse (Table 1), merits of the site and long-term use of the land. There should be no infrastructure such as roads, drainage, stormwater structures, services, etc. within the CRZ.
2. A **Vegetated Buffer** (VB) protects the environmental integrity of the CRZ from weed invasion, micro-climate changes, litter, trampling and pollution. There should be no infrastructure such as roads, drainage, stormwater structures, services, etc. within the VB. The recommended width of the VB is 10 metres but this depends on merit issues.
3. An **Asset Protection Zone** (APZ) is a requirement of the NSW Rural Fire Service and is designed to protect assets (houses, buildings, etc.) from potential bushfire damage. The APZ is measured from the asset to the outer edge of the vegetated buffer (VB). The APZ should contain cleared land which means that it can not be part of the CRZ or VB. The APZ must not result in clearing of the CRZ or VB. Infrastructure such as roads, drainage, stormwater structures, services, etc. can be located within APZs.



Figure 1. Riparian corridor zones.



The Department recommends that a vegetated CRZ width based on watercourse order¹ be considered in the design of any controlled activity (see Table 1). However, the final CRZ width will be determined after a merit assessment of the site and consideration of any impacts of the proposed activity. CRZ widths should be measured from the top of the highest bank and on both sides of the watercourse.

Table 1. Recommended CRZ widths.

Types of watercourses	CRZ width
any first order ¹ watercourse and where there is a defined channel where water flows intermittently	10 metres
<ul style="list-style-type: none"> any permanently flowing first order watercourse, or any second order¹ watercourse and where there is a defined channel where water flows intermittently or permanently	20 metres
any third order ¹ or greater watercourse and where there is a defined channel where water flows intermittently or permanently. Includes estuaries, wetlands and any parts of rivers influenced by tidal waters.	20 – 40 metres ²

¹ as classified under the Strahler System of ordering watercourses and based on current 1:25 000 topographic maps

² merit assessment based on riparian functionality of the river, lake or estuary, the site and long-term land use.

Further information

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Important notes

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February 2008

Guidelines for controlled activities

Outlet structures

This guideline relates to the design of stormwater outlets and spillways from infrastructure (including roads, buildings, constructed basins/wetlands, swales or other drainage works) into a watercourse or waterfront land.

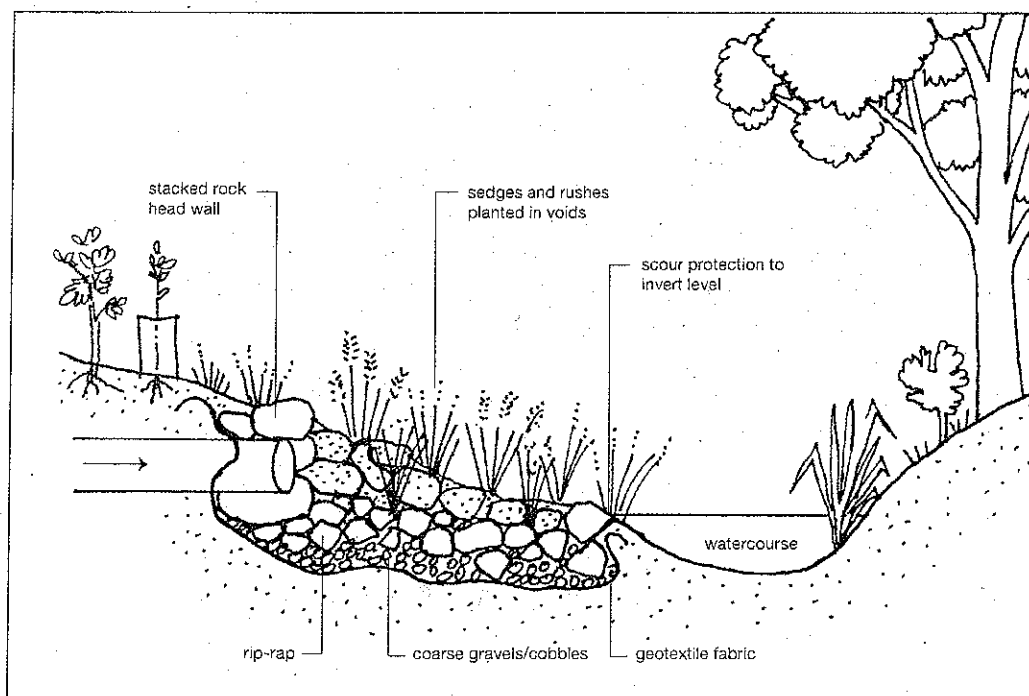
Controlled activities carried out in, on or under waterfront land are now regulated by the *Water Management Act 2000* (WMA). The Department of Water and Energy is required to assess the impact of a controlled activity to ensure that minimal harm will be done to any waterfront land, ie the bed and a distance inland of 40 metres from a river, lake or estuary.

This means that a controlled activity approval must be obtained from the Department prior to carrying out a controlled activity.

The design and construction of stormwater outlets should aim to be 'natural', yet provide a stable transition from a constructed drainage system to a natural flow regime (see Figure 1). The design and construction footprint and extent of disturbances within the riparian corridor should be minimised while still achieving the intended discharge function (refer to the Department's *Guidelines for controlled activities – Riparian corridors*).

All ancillary drainage infrastructure, such as oil/grease interceptors, sediment & litter traps, constructed wetlands and detention basins, should be located outside the riparian corridor. Run-off should be of appropriate water quality and quantity before discharging into a riparian corridor or watercourse. Appropriate rehabilitation of disturbed areas following the installation of outlet structures should adequately restore the integrity of the riparian corridor.

Figure 1. 'Natural' outlet structure.



The design and construction of outlet structures should consider, but not be limited to, the following design principles.

- Define the infrastructure route and identify the specific point of discharge. Ideally select a route along an existing cleared or disturbed area that avoids trees (preferably beyond their drip line).
- Choose a stable section of the stream for the discharge point, preferably mid-way between bends. Alternatively, if appropriate, incorporate outlet discharge points into disturbed/eroded areas which are to be stabilised or rehabilitated.
- Minimise construction footprint and ensure that disturbance to soil and vegetation within the riparian corridor is kept to the minimum extent required.
- Assess changes to the hydrology of the receiving watercourse to demonstrate that there is no detrimental impact on discharge volumes and channel velocities. Discharge velocities and flow rates should mimic 'natural' flows and not initiate erosion.
- Discharge from an outlet should not cause bed or bank instability.
- Protect the bed of the watercourse below the outlet, if not bedrock, or if bed scour is likely. Consider bank material and outlet 'jet' effect and protect the opposite streambank if required.
- Point outlet structure and direct discharge downstream.
- The outlet should not protrude beyond the streambank but tie-in with the adjoining bank alignment.
- Calculate tractive stresses generated from outlet discharges and from bank full discharges to determine rock size requirements for the structure.
- Rock rip-rap is the preferred material to provide a 'natural' outlet. Rip-rap should extend for the full extent of the design scour apron and adjoining flanks/streambank. Rip-rap should be appropriately keyed in and cut-off trenches provided.
- Rip-rap should consist of durable, angular run-of-quarry rock placed over a bedding layer of angular cobbles over geotextile. Where possible, incorporate vegetation, eg. sedges and rushes, into scour management (Figure 1).
- Grade the scour apron to the bed level of the watercourse, or just below any permanent water created by any stable feature, eg. a rock bar, within the watercourse.
- Stabilise and rehabilitate all disturbed areas including topsoiling, revegetation/regeneration, mulching, weed control and maintenance.

Figure 2. Rip-rap outlet structure with vegetation growing in voids between rocks.



When seeking approval to construct outlet structures, information detailing the above is required for the Department to assess the works.

Additional information will generally also be required and may include but not be limited to:

- detailed design drawings of outlet structures
- cross-sections and long-section of the stream
- hydrology report detailing pre and post construction hydrology of the channel
- a Vegetation Management Plan (VMP) prepared in accordance with the Department's *Guidelines for controlled activities – Vegetation Management Plans*
- a Site Management Plan incorporating the schedule, sequence and duration of works, erosion and sediment controls, etc.
- costing of all works (ie. materials, labour) and stages of works (eg. outlet structure installation, rehabilitation).

Further information

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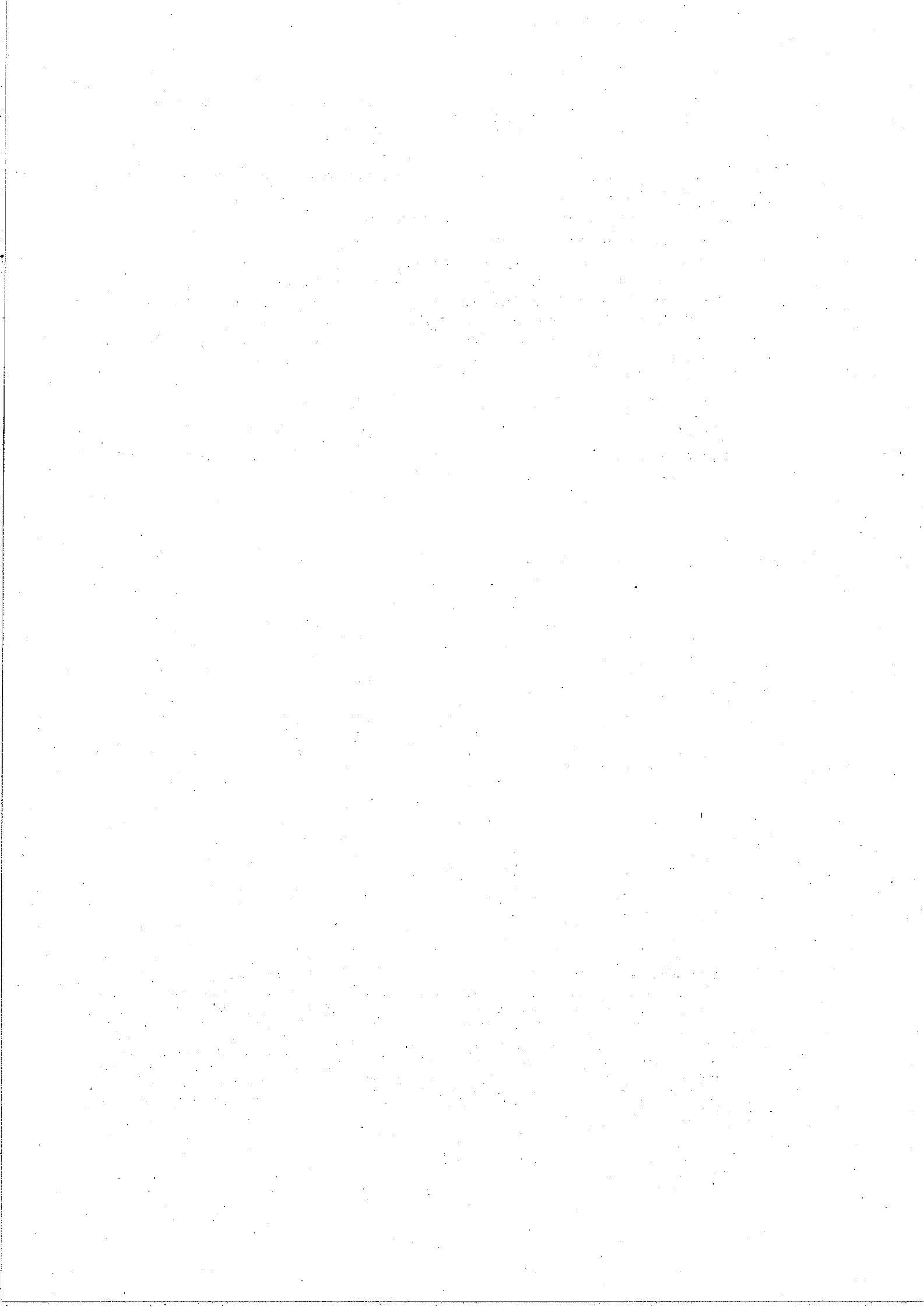
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Guidelines for controlled activities Vegetation Management Plans

Controlled activities carried out in, on or under waterfront land are now regulated by the *Water Management Act 2000* (WMA). The Department of Water and Energy is required to assess the impact of a controlled activity to ensure that minimal harm will be done to any waterfront land, ie the bed and a distance inland of 40 metres from a river, lake or estuary.

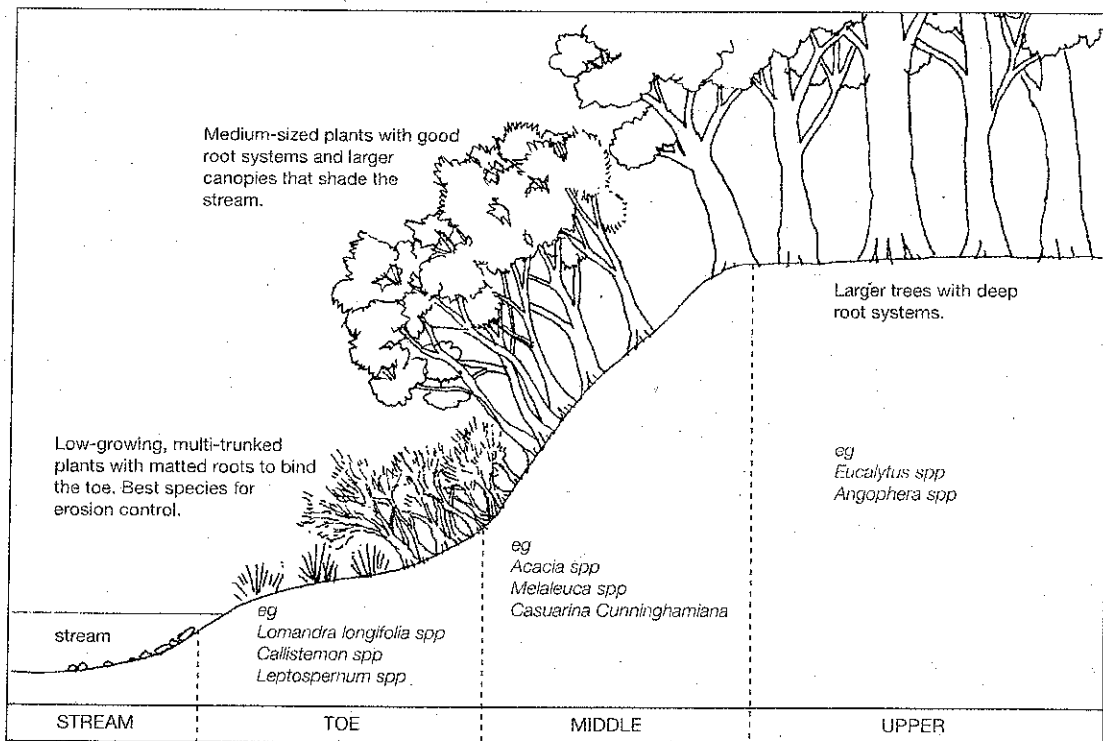
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Riparian corridors form a transition zone between terrestrial and aquatic environments and perform a range of important environmental functions. The protection or restoration of vegetated riparian areas is important to maintain or improve the geomorphic form and ecological functions of watercourses through a range of hydrologic conditions in normal seasons and also in extreme events.

A Vegetation Management Plan (VMP) which outlines the criteria for the establishment and management of a riparian corridor may be required to be prepared and submitted to the Department for assessment and approval prior to the issuing of a controlled activity approval for works in or within 40 metres of a river, lake or estuary.

The objective of a VMP is to provide for a stable watercourse and riparian corridor which emulates the native vegetation communities in the area. Figure 1 illustrates a typical riparian cross section.

Figure 1. Typical riparian cross section



Adapted from *Rivercare: Guidelines for Ecological Sustainable Management of Rivers and Riparian Vegetation*: Raine, A.W & Gardiner, J.N. (1995), LWRDCC, Canberra.



A VMP should be prepared by a suitably qualified person and should consider but not be limited to the following criteria:

- An appropriate width for the riparian corridor should be identified in accordance with the Department's *Guidelines for controlled activities – Riparian corridors*. The VMP should consider the full width of the riparian corridor and its functions including accommodating fully structured native vegetation.
- The location of the bed and banks or foreshore of waterfront land and the footprint of the riparian corridor should be clearly identified.
- Measures for controlling access and encroachments (bollards, fences, etc.) into the riparian corridor should be identified.
- Vegetation species composition, planting layout and densities should be identified. Plantings should emulate the ecotone of vegetation naturally or previously occurring along the waterfront land. Mature vegetation communities are generally well structured, comprising trees, shrubs and groundcover species. The required mix of these species relates to the actual community to be emulated and the size of the area/s to be rehabilitated. Planting densities should achieve quick vegetative cover and root mass to maximise bed and bank stability along the subject watercourse.
- Seed/plant sources should be identified and where possible native plants and seed sources of local provenance should be utilised.
- Exotic vegetation should be avoided. Use of exotic species for the purposes of temporary soil stabilisation is permitted provided they are sterile, non-invasive and easily eradicated when permanent vegetation is established.
- Details of the planting program, rehabilitation methods and staging should be provided. Other revegetation techniques such as hydro-seeding, direct seeding, brush matting or assisted natural regeneration may be considered.
- Maintenance requirements should extend for a minimum of two years after the completion of works or until such time as a minimum 80% survival rate for all plantings and a maximum five percent (5%) weed cover for the treated riparian corridor (controlled activity) is achieved.
- Project tasks should be defined and described, including a schedule detailing the sequence and duration of works necessary for the implementation of the VMP.
- Maps or diagrams which identify the proposed riparian area, existing vegetation, vegetation to be retained, vegetation to be cleared, footprint of construction activities, areas of proposed revegetation etc should be prepared.
- Photographs of the site should be supplied and photo points should be identified for future monitoring and reporting purposes. The photo points should be identified by GPS coordinates or by survey particularly for large scale earthworks or extractive industries.
- Costings for the implementation of all components and stages of the work including materials, labour, watering, maintenance, monitoring and reporting, etc should be prepared.
- Processes for monitoring and review, including a method of performance evaluation, should be identified. This should include assessing the need for replacing plant losses, addressing deficiencies, problems, climatic conditions, successful completion of works, etc.

Further information

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Guidelines for controlled activities

Laying pipes and cables in watercourses

This guideline relates to the laying of pipes and cables in or across watercourses and the adjoining riparian corridor for utilities such as sewage, water, gas, electricity and communications.

Controlled activities carried out in, on or under waterfront land are now regulated by the *Water Management Act 2000* (WMA). The Department of Water and Energy is required to assess the impact of a controlled activity to ensure that minimal harm will be done to any waterfront land, ie the bed and a distance inland of 40 metres from a river, lake or estuary.

This means that a controlled activity approval must be obtained from the Department prior to carrying out a controlled activity.

When considering the placement of utilities in or across watercourses the design and construction footprint and the extent of disturbances proposed in the watercourse and riparian corridor should be minimised. Appropriate rehabilitation of disturbed areas post installation will be required to adequately restore bed and bank stability as well as the integrity of the vegetated riparian corridor.

The design and installation of utilities in or across a watercourse should consider, but not be limited to, the following:

- Identify the appropriate width of the riparian corridor in accordance with the Department's *Guidelines for controlled activities – Riparian corridors*. The location and installation of utilities should consider the full width of the riparian corridor and riparian functions including accommodating fully structured native vegetation.
- The design and construction footprint, and extent of disturbances to soil and vegetation within the watercourse and riparian corridor, should be minimised.
- Ideally, existing easements should be utilised. Utilities should be incorporated within existing cleared or disturbed areas with (or adjacent to) other crossing points such as roads, particularly if future maintenance and on-going access is required.
- Maintain existing or natural hydraulic, hydrologic, geomorphic and ecological functions of the watercourse. Demonstrate that the utility installations will not impact on these functions.
- Identify options for works and show rationale for the selection of preferred options.
- Directional boring under watercourses is preferred to trenching through a watercourse so that construction impacts are minimised.
- Directional boring considerations:
 - Minimise or avoid disturbance to channel bed and banks
 - Minimise or avoid rehabilitation, maintenance and on-going costs after construction
 - ensure depth is sufficient to avoid cave-ins
 - risk of bed collapse and frac-outs during boring
 - ensure depth does not result in exposure of assets if channel experiences bed or bank degradation
 - bore entry and exit locations should be located outside designated riparian corridors
 - recovery and removal of construction plant and materials (including drilling mud).
- Trenching considerations:
 - rehabilitation of disturbed bed and banks will be required
 - lay pipes and cables across the watercourse on the downstream side of channel bedrock outcrops (through the drop deposit zone if a plunge pool is present)



- avoid outside bends – choose a straight section of the watercourse to cross
- place infrastructure below calculated bankfull flow scour depths and allow a safety margin
- avoid concrete caps and casings at shallow depths which may become exposed by bed lowering
- backfilling should restore the channel shape and bed level to preconstruction condition
- trench is to be open for minimal length of time
- where flow in a watercourse is permanent consider staging the trench across part of the channel to maintain flows. Flows should not to be stopped unless essential; if necessary to stop flows it must be for a minimal time only.
- additional disturbances from temporary coffer dams or diverting flows around work site, vehicle and machinery access and crossings, material stockpiles, etc.
- potential water quality issues (turbidity, spills)
- recovery and removal of construction plant and materials.

When seeking approval to install utilities across a watercourse, information detailing the above should be submitted to the Department for assessment. Details of all works/activities within watercourses should be designed by suitably qualified persons.

Additional information will generally also be required and may include but not be limited to:

- Design drawings of proposed works/structures. Engineering certification may be required.
- Design drawings which include a surveyed plan, cross sections (across the watercourse) and a long section of the watercourse, showing the proposed works relative to existing and proposed bed and bank profiles and water levels. The cross section is to extend to the landward limit of the identified riparian corridor.
- A report detailing pre and post construction hydraulic, hydrologic and geomorphic conditions.
- Plans showing the extent and designs of bed and bank stabilisation works for scour protection.
- Photographs of the site should be supplied and photo points should be identified for future monitoring and reporting purposes. The photo points should be identified by GPS coordinates or by survey particularly for large scale earthworks or extractive industries.
- A Vegetation Management Plan prepared in accordance with the Department's *Guidelines for controlled activities – Vegetation Management Plans*
- A Site Management plan incorporating the schedule, sequence and duration of works, erosion and sediment controls, monitoring and reporting, etc.
- Costing of all works (ie materials, labour) and stages of works (eg channel stabilisation, rehabilitation)
- Other relevant approvals, eg, development consent.

Further information

If you require more information about controlled activity approvals please contact your local DWE office or visit our website www.dwe.nsw.gov.au

Important notes

DWE has prepared these guidelines in good faith. In the case of any inconsistency between the guidelines and the controlled activity approval or legislation, the controlled activity approval or legislation will prevail to the extent of that inconsistency.

Nothing in these guidelines is taken to authorise a controlled activity. These guidelines are designed to provide information to assist in the design of any development or work that constitutes a controlled activity and the preparation of an application for a controlled activity approval. Users are advised to seek professional advice and to refer to the legislation and any relevant approvals, as necessary, before taking action in relation to any matters covered by the guidelines.

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Guidelines for controlled activities

In-stream works

This guideline relates to the design and construction of works within a watercourse and/or riparian corridor. Such works may include enhancements of the watercourse, rehabilitation, channel modifications, bed controls, pipe and cable trenching and laying, etc.

Controlled activities carried out in, on or under waterfront land are now regulated by the *Water Management Act 2000* (WMA). The Department of Water and Energy is required to assess the impact of a controlled activity to ensure that minimal harm will be done to any waterfront land, ie the bed and a distance inland of 40 metres from a river, lake or estuary.

This means that a controlled activity approval must be obtained from the Department prior to carrying out a controlled activity.

The design and construction of works and activities within a watercourse and/or the adjoining riparian corridor should aim to be as 'natural' as possible. A watercourse 'rehabilitation' design philosophy rather than a 'construction' philosophy should be applied.

Consultation with relevant government agencies at the concept stage (of development) and during the design phase is recommended so that good outcomes can be identified, planned for and achieved.

The design and construction footprint, and the extent of disturbances within the riparian corridor, should be minimised while achieving the desired function and outcome. All ancillary infrastructure such as asset protection zones (APZ), utility easements, detention basins and water quality control structures, roads, paths/cycle ways, etc. should be located outside of any riparian corridor. Runoff should be of appropriate water quality and quantity before discharging into a riparian corridor or watercourse. Appropriate rehabilitation of disturbed areas following the works should restore the integrity of the watercourse and riparian corridor.

In order to minimise the impacts of in-stream works on the hydrologic, hydraulic and geomorphic functions on a watercourse, all works and activities should be designed and constructed to maintain the integrity of the existing channel, as well as being sympathetic with the ecological values of the watercourse and its riparian corridor.

The design and construction of in-stream works should consider, but not be limited to, the following design principles:

- Identify the appropriate width of the riparian corridor in accordance with the Department's *Guidelines for controlled activities – Riparian corridors*.
- The design and construction of in-stream works should consider the full width of the riparian corridor and riparian functions, including accommodating fully structured native vegetation.
- Identify options for works and show rationale for the selection of preferred options.
- The design and construction footprint and the proposed extent of disturbances to soil and vegetation within the riparian corridor should be minimised.
- Maintain or mimic existing or natural hydraulic, hydrologic, geomorphic and ecological functions of the watercourse. Demonstrate that the in-stream works will not have a detrimental effect on these functions.



- Maintain natural geomorphic processes; that is:
 - accommodate natural watercourse functions
 - establish natural bed and bank profiles, eg. meanders, chains of ponds, surface water pools and riffles, bed controls, etc.
 - allow for the movement of sediment and woody debris
 - do not increase scour and erosion of the watercourse bed or banks in any storm events
 - avoid locating works or structures on bends in the channel unless they are structures to restore stability
 - where existing bed degradation occurs, address bed degradation to protect structure and restore channel bed stability.
- Maintain natural hydrological regimes; that is:
 - accommodate site hydrological conditions, eg. maintain low flows
 - do not alter natural bank full or floodplain flows. Modifications to watercourses should be based on roughness coefficients that represent the 'natural' state including fully structured mature riparian vegetation.
 - do not change the gradient of the bed (except to address existing bed and bank degradation).
 - do not increase velocities by constricting flows.
- Protect against scour by designing and providing any necessary scour protection, eg. rock rip-rap and vegetation.
- Stabilise and rehabilitate all disturbed areas including topsoiling, revegetation, mulching, weed control and maintenance in order to adequately restore the integrity of the riparian corridor.
- Monitor and maintain all in-stream works until suitably stabilised.

When seeking approval to construct in-stream works, information detailing the above is required for the Department to assess the works and authorise the activity if acceptable. Details of all in-stream works/activities should be designed by suitably qualified persons.

Additional information will generally also be required and may include but not be limited to:

- Detailed design drawings of proposed works. Engineering certification may be required.
- Detailed design drawings which include a surveyed plan, cross sections (across the watercourse) and a long section of the watercourse, showing the proposed works relative to existing and proposed bed and bank profiles and water levels. The cross section is to extend to the landward limit of the identified riparian corridor.
- Report detailing pre and post construction hydraulic conditions. The report should address, bank full discharge, velocity, tractive force or shear stress, afflux (Modified RTA method is acceptable), Froude and Manning 'n', relative to the proposed structure.
- Plans showing extent and designs of permanent bed and bank stabilisation works necessary for scour protection.
- Photographs of the site should be supplied and photo points should be identified for future monitoring and reporting purposes. The photo points should be identified by GPS coordinates or by survey particularly for large scale earthworks or extractive industries.
- A Vegetation Management Plan prepared in accordance with the Department's *Guidelines for controlled activities – Vegetation Management Plans*.
- A Site Management plan incorporating the schedule, sequence and duration of works, erosion and sediment controls, monitoring and reporting, etc.
- Costing of all works (ie materials, labour) and stages of works (eg. channel stabilisation, rehabilitation)
- Provide for a maintenance period of a minimum of two years after practical completion of each stage, depending on the extent and risk of the works or until suitably stable. Maintenance should include sediment and erosion control, replacement of any works/areas damaged or destroyed by flows and flooding or vandalism, and any other requirements necessary to ensure a naturalised stable watercourse system is functioning by the end of the maintenance period.
- Other relevant approvals eg development consent.

Further information

If you require more information about controlled activity approvals please contact your local DWE office or visit our website www.dwe.nsw.gov.au

Important notes

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Disclaimer

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MEMORANDUM

TO : SAC, [illegible]

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Farm dams - do you need a licence?

All rural landholders in NSW are able to maintain or build farm dams. There are several categories of farm dams that do not require a licence.

Harvestable rights dams

1. Farm dams that capture up to 10% of runoff

Licences are not required for harvestable rights dams built on hillsides and minor streams that capture up to 10% of the average regional rainfall runoff from their property.

The total capacity of all dams on a property allowed under the harvestable right is called the Maximum Harvestable Right Dam Capacity (MHRDC). The MHRDC is based on 10% of the average regional rainfall runoff of the property and takes into account local evaporation rates and periods between rainfall replenishments.

To calculate your MHRDC see Farm Dams - what size dam you can build without a licence?

2. Farm dams built before 1999

Licences are not required for farm dams built before 1999 when the harvestable right was introduced, provided these dams are **only used for stock and domestic watering purposes**.

These dams must be included when assessing your right to build additional harvestable right dams.

3. Farm dams up to one megalitre on small properties

Licences are not required for farm dams up to one megalitre in size on small properties where the Maximum Harvestable Right Dam Capacity (MHRDC) is less than one megalitre and where the property was **approved for subdivision before 1 January 1999**.

No further harvestable right dams may be constructed; any new dams above this allowance must be licensed.

The importance of location and purpose

When determining whether you need a licence for farm dams you must consider the dams' locations and purposes. Table 1 shows where licences are needed. To allow for differences in the reliability of rainfall and runoff across NSW (drier inland areas for example) the MHRDC multiplier numbers vary across the State.

Table 1. Farm dam location and use

Location of dam	Used for stock or domestic purposes	Used for irrigation or commercial purposes
On hillsides, gullies, and minor streams ¹ and capacity is less than MHRDC	No licence or approval required	No licence or approval required
On hillsides, gullies, and minor streams ¹ and capacity is more than your MHRDC	Not permissible – your harvestable right should provide more than enough water ²	Licence or approval required
On permanent creek or river	Licence or approval required	Licence or approval required ³

¹ Minor streams are defined by the Strahler stream ordering method as 1st or 2nd order streams that do not have permanent river flow. See *Farm dams – where can they be built without a licence?*

² DWE may provide consent for some dams where the additional harvesting of water is justified and will not adversely impact the environment and other users.

³ See *What are rural landholders' basic rights to water?*

Special dams exempt from harvestable right calculations

The following farm dams should not be included when you are calculating the MHRDC for your property but **the dam construction may require consent** (perhaps as part of a licence) from the Department of Water and Energy (DWE).

1. Dams for the control or prevention of soil erosion (gully control structures) where no water is reticulated or pumped from them and the size of the structure is the minimum necessary to fulfil the erosion control function. If you fence off the dam as part of the erosion control program, water may be reticulated to a trough in an adjacent paddock without prejudicing the exempt status.

2. Dams for flood detention and mitigation provided no water is reticulated or pumped from them. These dams serve specific functions and, apart from a small pondage, should only store water for a short period during and immediately after floods. Such storages are exempt provided they function effectively. If any water is pumped or reticulated from such a storage it can no longer be considered to be exempt and must be considered in calculating your MHRDC.

3. Dams for the capture, containment and recirculation of drainage and/or effluent, that conform to best management practice or are required by regulation to prevent the contamination of a water source. The harvestable right is not intended to be contrary to initiatives to prevent pollution of water sources. Many landholders are required to install dams to capture contaminated water or to collect and re-use irrigation tailwater. These dams are not considered in assessing your harvestable right.

4. Dams endorsed by DWE for specific environmental management purposes.

Small dams may need to be constructed for specific environmental management outcomes. In such cases, permission in writing from DWE is required to obtain this exempt status before construction of the dam commences.

5. Dams without a catchment.

These include turkeys nest dams and ring tanks and are replenished by pumping from rivers or from groundwater. These works have no natural catchment and operate to store water only. (Note: Both the pumps that divert water into these storages and the dams themselves require consent from DWE.)

6. All farm dams, whatever their size, in the arid Western Division of NSW (see *Farm Dams in the Western Division of NSW*).

Where do I get more information?

Contact the water licensing officer at your local Department of Water and Energy office (contact details are on the website or phone 1800 353 104), or email information@dwe.nsw.gov.au

More information sheets on water management in NSW are available on our website www.dwe.nsw.gov.au

MAY 2008

Farm dams - what size are your existing dams?

You need to know your current dam capacity to determine whether your existing farm dams need to be licensed or whether you can build more dams without a licence or approval. A simple method of estimating dam capacity is provided here.

If the capacity of any of the dams is estimated to be greater than 10 megalitres you will need to do a more accurate calculation to determine the dam's capacity. Contact your local office of the Department of Water and Energy.

Step 1. Determine if any of the dams on your property should not be included in the calculation of your Harvestable Right Dam Capacity (see *Farm dams – do you need a licence?*), that is:

- existing dams licensed prior to 1 January 1999;
- special dams exempt from harvestable rights; and
- dams located on permanently flowing watercourses.

Step 2. List in Table 1 all the dams on your property that are part of your harvestable right.

Step 3. Determine the width, length and depth of each dam and fill in the calculation table accordingly.

Step 4. Using the formula relevant to the dam shape, calculate surface area in square metres of each dam and enter in the table.

Step 5. Using the following formula, calculate the volume in cubic metres (m³) and enter the results in the table.

$$\text{Volume (m}^3\text{)} = 0.4 \times \text{Surface Area} \times \text{Depth}$$

0.4 is a conversion factor that takes into account the slope of the sides of dams.

Step 6. Calculate the capacity of each dam in megalitres (ML) by dividing the volume in cubic metres (m³) by 1000 and enter in the table.

Step 7. Add up the storage capacity of all your dams in the table to give your Total Existing Dam Capacity.

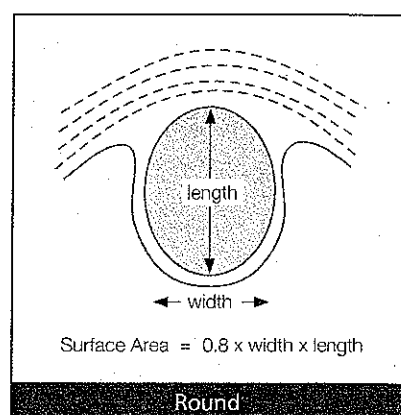
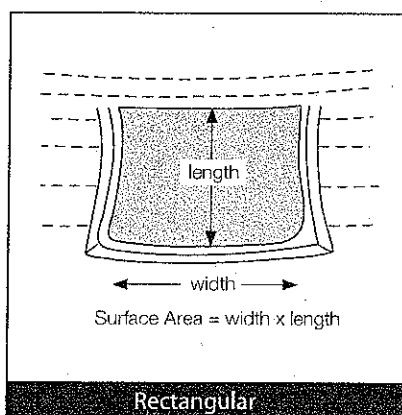
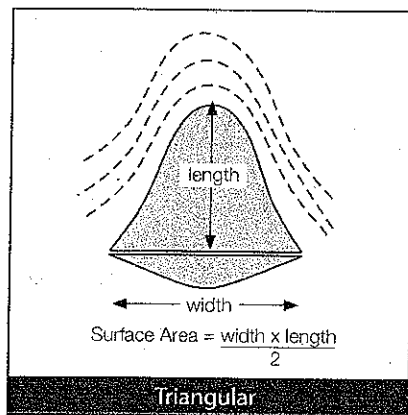


Table 1: Calculation table

Dam name or Number eg Ram paddock	Width (m)	Length (m)	Depth (m)	Surface Area (m ²)	Approx volume (m ³)	Dam capacity (ML)	Additional Information eg date constructed
Total existing dam capacity							

How much is 1 megalitre (ML)?

One megalitre is approximately equivalent to:

- an olympic-sized swimming pool;
- 5.5 standard rainwater tanks - a 40,000 gallon rainwater tank contains approximately 180,000 litres or 0.18 of a megalitre;
- 14.5 hours of pumping water using a 100mm pump.

Some comparisons with other units of measurement:

- 1 megalitre (ML) = 1 000 cubic metres
- = 1 000 000 litres
- = 1 308 cubic yards
- = 219,969 gallons

Where do I get more information?

Contact the water licensing officer at your local Department of Water and Energy office (contact details are on the website or phone 1800 353 104), or email information@dwe.nsw.gov.au

More information sheets on water management in NSW are available on our website www.dwe.nsw.gov.au

Note: This information does not constitute legal advice.
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Farm dams - have you considered everything?

When building a farm dam, it is important to make sure that the appropriate consent or licence has been obtained. Make sure that the dam is carefully located so that it is effective, safe and has minimal impacts on neighbours and the environment. All legal requirements, such as local council regulations, or consents from government agencies such as NSW Fisheries, also apply.

Licence

Unless a farm dam is part of your harvestable right you will need a licence or consent from the Department of Water and Energy (DWE). More information of whether you need a licence is found in the information sheets What are rural landholders, basic rights to water and Farm dams - do you need a licence?

Minimal impacts and erosion control

Seek expert advice regarding farm dam design and location before commencing construction of any farm dam. Even if you do not require a licence for your farm dam, it is still your responsibility to minimise impacts on your neighbours and the environment. Discuss the matter with your neighbours before constructing a new dam.

Also ensure that during all stages of construction you provide adequate erosion control and minimise disturbance to waterways, areas of native vegetation, sites of cultural significance and in coastal areas, avoid disturbing acid sulfate soils.

Consents

Apart from determining whether your new farm dam needs a licence/ approval, you may need other consents.

1. Designated Developments under the *Environmental Planning and Assessment Act 1979*

Consent from local government is required for dams:

1. with a maximum surface area of more than 0.5 hectares located:
 - (i) in or within 40 metres of a natural waterbody, wetland or an environmentally sensitive area, or
 - (ii) in an area of high watertable, or acid sulfate, sodic or saline soils
2. with a surface area of water of more than 20 hectares or a maximum total water volume of more than 800 megalitres.

2. Local Planning Regulations

In many local government areas local environment plans and other planning regulations require consent for construction of dams.

3. Designated Floodplains

If you are considering construction on a designated floodplain you will need to seek consent from DWE regarding flood flow diversion impacts.

4. Fish Passage

Under the Fisheries Management Act 1994, any new dam or modification to an existing dam may require the owner to provide for fish passage. Contact your local NSW Fisheries office for further advice. All licensed works must be referred but works not licensed may still require fish passage.

Where do I get more information?

Contact the water licensing officer at your local Department of Water and Energy office (contact details are on the website or phone 1800 353 104), or email information@dwe.nsw.gov.au

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Farm dams - where can they be built without a licence?

Farm dams that are part of the harvestable right of your property can be located on hillsides, gullies and minor watercourses. For more information on harvestable rights see *Farm dams - do you need a licence?*

What is a minor watercourse?

Minor watercourses are defined by the Strahler stream ordering method (Figure 1) as 1st or 2nd order watercourses that do not permanently flow. The Strahler system is explained as follows.

- Starting at the top of a catchment, any watercourse that has no other watercourses flowing into it is classed as a 1st order watercourse (1).
- Where two 1st order watercourses join, the watercourse becomes a 2nd order watercourse (2).
- If a 2nd order watercourse is joined by a 1st order watercourse - it remains a 2nd order watercourse.
- When two or more 2nd order watercourses join they form a 3rd order watercourse (3).
- A 3rd order watercourse does not become a 4th order watercourse until it is joined by another 3rd order watercourse and so on.

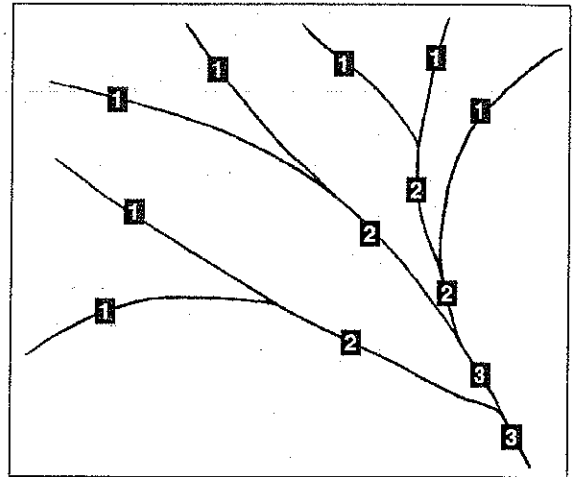


Figure 1: Strahler stream ordering

How do I work out the stream order of a river on my property?

The harvestable rights stream order can only be determined from a topographic map which has been defined under the harvestable rights regulations. Watercourses are shown on topographic maps as broken or continuous blue lines and are deemed to be continuous even if they lose definition and then reappear.

The current and most detailed map available at 1 January 1999 **must** be used. For the coast, tablelands and part of the slopes, this is a 1:25 000 scale map. Further inland it is 1:50 000. The Department of Water and Energy (DWE) can assist you in determining which map to use.

Topographic maps are generally available throughout NSW at newsagencies, Tourist Information Centres and other stores, and show watercourses, contours, towns, roads, portion boundaries and other information. They can also be viewed at DWE offices.

Example: Geoff owns a 60 hectare property near Kangaroo Valley NSW. Geoff would like to build two farm dams using his harvestable right. The following examples show where and how large Geoff's proposed dams could be.

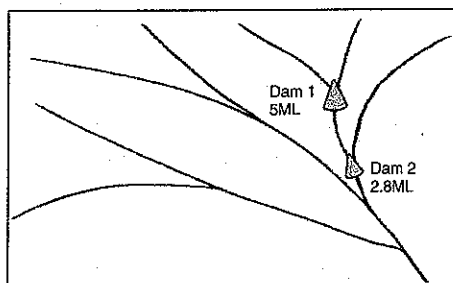
Step 1: Geoff needs to calculate his **Maximum Harvestable Rights Dam Capacity (MHRDC)**.

For information on the MHRDC see *Farm dams – what size dam you can build without a licence*.

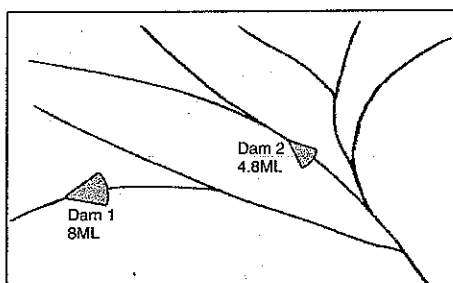
MHRDC Multiplier	=	0.13 ML/ha
Property area	=	60ha
MHRDC	=	7.8 ML

Geoff can build dams with a combined volume of 7.8 ML or less, using his harvestable right.

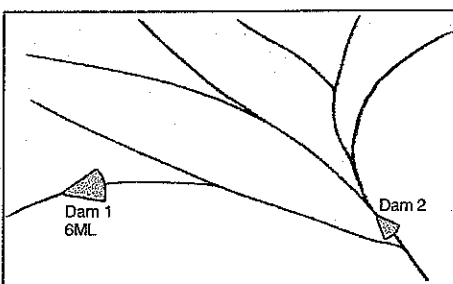
Step 2: Geoff needs to work out where to construct his harvestable rights dams on his property. He has a few alternatives to assess.



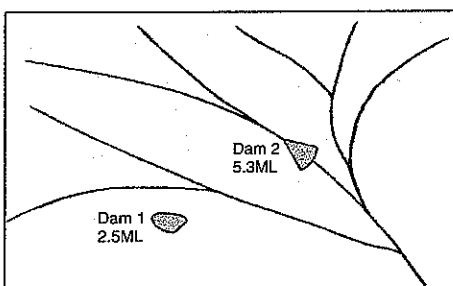
- ✓ Dams 1 and 2 are located on 2nd order streams.
- ✓ The total dam capacity of dams 1 and 2 is 7.8 ML, which is equivalent to the MHRDC for the property.



- ✗ Dam 1 is located on a 1st order stream, BUT is 8 ML i.e. it is bigger than the permissible MHRDC of 7.8 so it is not allowed under the harvestable rights provisions.
- ✓ Dam 2 is located on a 2nd order stream and is 4.8 ML. It is permissible since it is less than the MHRDC of 7.8ML. Geoff could build both dams 1 and 2 if the combined volume was 7.8 ML eg. dam 1 could be reduced to 3ML.



- ✓ Dam 1 is located on a 1st order stream and is 6 ML, which is less than the MHRDC of 7.8 ML.
- ✗ Dam 2 is located on a 3rd order river. Harvestable rights **do not apply** here. If Geoff wishes to build a dam at this location, he must obtain a licence/approval from DWE before commencing construction.



- ✓ Dam 1 is **not located on a watercourse** (i.e. it is on a "hillside") and is 2.5 ML.
- ✓ Dam 2 is located on a 2nd order stream and is 5.3 ML. The total dam capacity of dam 1 and 2 is 7.8 ML, which is equivalent to the MHRDC for the property.

Step 3: Geoff must decide which of the locations (or combination of locations) he will use to construct his harvestable rights dams.

Where do I get more information?

Contact the water licensing officer at your local Department of Water and Energy office (contact details are on the website or phone 1800 353 104), or email information@dwe.nsw.gov.au

More information sheets on water management in NSW are available on our website www.dwe.nsw.gov.au

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Farm dams - what size dam can you build without a licence?

Calculating the size of your dams

To work out the size of a farm dam, or dams that you can build without a licence, you must calculate the **Maximum Harvestable Right Dam Capacity** or **MHRDC** for your property. You must calculate your MHRDC if you wish to:

- **irrigate from an existing farm dam**

If your existing dams are within your MHRDC and are constructed on a minor stream or hillside, you can use your dams for any purpose without further approval. If not, a licence or approval will be required if you want to irrigate.

- **construct a new farm dam**

The MHRDC calculation will tell you the maximum size of a dam you can build without a licence (provided the dam is constructed on a minor stream or hillside).

- **sell part of your property**

Since the MHRDC is directly related to the size of your property, when you subdivide or sell part of your property, your MHRDC is reduced proportionally. For example, if you sell half of your property, your MHRDC is also halved.

If your property is to be subdivided, then some of the resultant properties may have dams that are greater than the MHRDC. You will need to modify the dams or apply for a licence. There is no guarantee that the licence would be issued. Consult with your local Department of Water and Energy (DWE) office before finalising your plans for subdividing or selling part of your property.

Calculating the MHRDC

To calculate your MHRDC you multiply the number of hectares of your property by the factor shown for the locality of your property on the MHRDC multiplier map. To make the calculation, follow these three steps.

Step 1. Area of Property

Determine the area of your property in hectares. This is normally found on your council rate notice.

Note: 1 hectare = 2.47 acres or 1 acre = 0.4047 hectares

Definition of 'Property' A 'property' is defined as a parcel of land valued as one unit by the Valuer General's Department (under the Land Valuation Act 1916). A 'property' will generally appear on a single rate notice from your local council.

DWE has the discretion to treat multiple parcels of land as one property for the purposes of calculating your MHRDC. Where you receive more than one rate notice because your land holding crosses local government boundaries the land holdings may be treated as one property. However, if you receive multiple rate notices because your holding is made up of land in separated parcels, it is unlikely DWE will consider the land holdings as a single property for the purposes of calculating MHRDC.

Step 2. Multiplier factor from maps

Locate your property on the map that shows the Maximum Harvestable Right Dam Capacity multiplier. It is easy to do this is online at http://www.farmdamscalculator.dnr.nsw.gov.au/cgi-bin/ws_postcode.epl. If you do not have internet access check the maps at your local office of the Department of Water and Energy.

Determine the multiplier value of the line closest to your property.

When the property is located between multiplier lines, estimate the value between the two lines. For example, if your property is located at Merriwa (Map 4) midway between the 0.06 megalitres per hectare and 0.07 megalitres per hectare lines, the multiplier value would be 0.065 megalitres per hectare.

Step 3. Finding the MHRDC

Multiply the area of your property by the multiplier from the map. The answer gives you the MHRDC for your property measured in megalitres.

This can also be done on-line at www.farmdamscalculator.dipnr.nsw.gov.au/cgi-bin/ws_postcode.epl. Departmental staff are available to assist you if you have problems in calculating the MHRDC for your property and will also help you check the relevant topographic map for a suitable location for your dam.

Example: Emily owns a 60 hectare property near Kangaroo Valley NSW. Emily would like to build two farm dams using his harvestable right.

Emily calculates her **Maximum Harvestable Rights Dam Capacity** (MHRDC) by finding the MHRDC Multiplier from the map and multiplying it by her property area (in hectares).

MHRDC Multiplier	=	0.13 ML/ha
Property area	=	60 ha
MHRDC	=	0.13 ML/ha x 60 ha
	=	7.8 ML

Emily can build dams with a combined volume of 7.8 ML or less, using her harvestable right.

Where do I get more information?

Contact the water licensing officer at your local Department of Water and Energy office (contact details are on the website or phone 1800 353 104), or email information@dwe.nsw.gov.au

More information sheets on water management in NSW are available on our website www.dwe.nsw.gov.au