

WATER MANAGEMENT

Introduction

24A Site Design for Water Management

- 24.1 Development Type for Water Management
- 24.2 Location of Development for Water Management
- 24.3 Locating the Development on Site

24B Storm Water Discharge

- 24B.1 General
- 24B.2 Stormwater Disposal from Location A Properties
- 24B.3 Stormwater Disposal from Location B Properties
- 24B.4 Stormwater Disposal from Location C Properties
- 24B.5 Stormwater Disposal from Location D Properties
- 24B.6 Relocating Pipes and Modifying or Releasing Easements where Council is the Authority

24C On-site Stormwater Management

- 24C.1 General
- 24C.2 Effective Stormwater Management
- 25C.3 General Controls for On-Site Stormwater Management
- 24C.4 Mandatory Rainwater Tank Requirements
- 24C.5 Controls for On-site detention
- 24C.6 Stormwater Quality Control

24D Existing Drainage Systems

- 24D.1 General

24D.2 Flood Studies and the Design Flood Standard

24D.3 Development Over or Adjacent to a Natural Waterbody, Open Channel or Drainage Depression

24D.4 Development Over or Adjacent to an Underground Pipeline

24D.5 Tennis Courts and Other Sporting Surfaces

24D.6 Fences

24D.7 Swimming Pools and Spas

24E Road & Trunk Drainage Design

24E.1 Design procedures

24F On-site Wastewater management

24F.1 On-site wastewater management

24R References

24R.1 Design of On-site Detention Systems (OSD)

24R.2 Design of Property and Interallotment Drainage Systems

24R.3 Flood Study Requirements

24R.4 Terms of Positive Covenants and Restrictions on use

24R.5 OSD Exemption Map

INTRODUCTION

This Part facilitates development in achieving the requirements of KLEP Clause 5.21 - *Floodwater Planning*.
Clause 6.5 - *Stormwater and Water Sensitive Urban Design*.

For some development types State Environmental Planning Policy (*Sustainable Buildings*) 2022 will apply.

Part 24A categorises:

- i) development types, eg new dwellings or retail premises, and
- ii) site location by drainage patterns, eg draining towards the road, or draining towards bushland.

These matters guide the location of development, including water management measures, on the site.

Part 24B outlines how stormwater is ultimately to be discharged from the site.

Part 24C outlines methods of effective stormwater management on site, prior to disposal. This includes methods to improve both water quality and quantity of runoff from the site, to protect downstream neighbours and ecosystems.

There is considerable overlap in the objectives of modern techniques of stormwater management. For instance, water tanks not only store water for re-use as a water conservation technique, but with constant use, also have huge potential to reduce one of the biggest pressures on urban waterways, namely increased intensity and frequency of runoff. Likewise, a purpose designed green roof can both slow runoff from a site and improve water quality while providing aesthetic and insulation benefits to a building.

Therefore the guidance provided in each relevant section of *Part 24C* is specifically related to the objective of that section. There is significant opportunity with careful design to maximise the number of objectives being met, with the minimum number of techniques, or with a variety of techniques best suited to the site, or the desired appearance of the site.

Part 24D guides development in relation to existing drainage systems, such as easements, underground pipes, overland flow paths, and waterways and outlines the requirements of a flood study.

Part 24E guides work (other than minor maintenance) proposed to be undertaken within the road and trunk drainage system.

Part 24F guides proposals where water is intended to be conserved by treating and re-using wastewater (greywater) on the site.

24A Site Design for Water Management

- 24A.1 Development Type for Water Management
- 24A.2 Location of Development for Water Management
- 24A.3 Locating the Development on Site

24A.1 DEVELOPMENT TYPE FOR WATER MANAGEMENT

Objectives

- 1 *To plan water management techniques that are appropriate to the development and location.*
- 2 *To manage water to preserve, enhance and complement existing environmental, social and aesthetic conditions within and external to the site.*
- 3 *To design measures to support and enhance sustainable water management.*
- 4 *To ensure that development does not increase surface and subsurface runoff to downstream properties.*

Controls

Select the Type from those listed below (1-9) that best represents the development proposed. Note that Type 9 is for any other development type not listed in the previous eight categories. The majority of controls applicable to Type 9 development will be determined by Council on an individual basis in consultation with the developer.

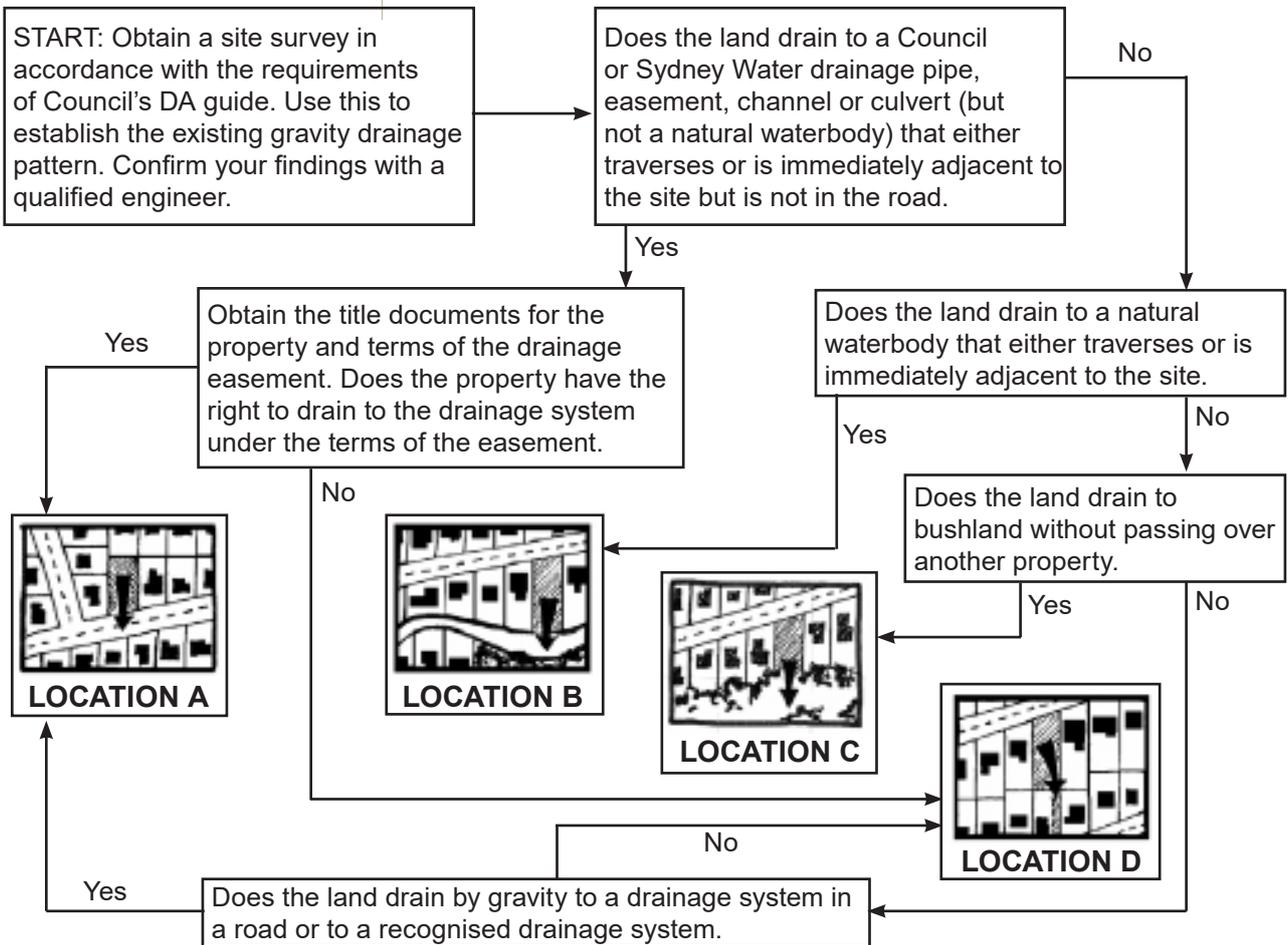
- Type 1 Minor alterations and additions - any alteration or addition to a single detached dwelling or secondary dwelling where the increase in hard surface area is less than 100m².
- Type 2 Major alterations and additions - construction of a secondary dwelling or any alteration or addition to a single detached dwelling where the increase in hard surface area exceeds 100m².
- Type 3 New single dwellings including replacement single dwellings.
- Type 4 Dual Occupancies- two dwellings on one allotment (either attached or detached), where either one or both of the dwellings are new.
- Type 5 High and medium density development - any development involving three or more dwellings on one allotment, regardless of the size of the allotment and regardless of whether the dwellings are attached or detached. Includes seniors housing, multi-dwelling housing and residential flat buildings.
- Type 6 Business, Commercial or Retail Premises - any building to be used for business, commercial or retail purposes, and mixed use developments such as shop top housing.
- Type 7 Open Space - land used exclusively for recreational purposes, whether passive or active recreation, including any buildings erected on the land, where the land is primarily permeable and landscaped.
- Type 8 Subdivision other than strata subdivision.
- Type 9 Any other development.

24A.2 LOCATION OF DEVELOPMENT FOR WATER MANAGEMENT

Further controls that may apply	
	SECTION B PART 17 - Riparian Lands

Controls

Determine which of the following situations (Locations A – D) described below most closely resembles the location of the development site with respect to the natural drainage direction of stormwater. You may determine this by working through the flow chart below and check against the example below and the full descriptions following.



24A.2 LOCATION OF DEVELOPMENT FOR WATER MANAGEMENT (continued)

Controls

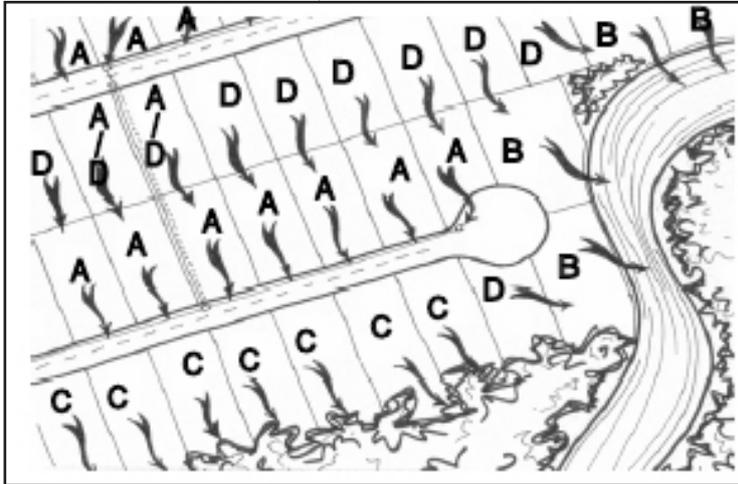
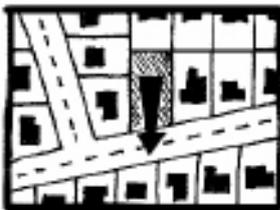


Figure 24A.2-1:
Examples of Location Types



Location A

Land that drains directly to a Council or Sydney Water drainage system in the road or drainage reserve (including a gutter, pipe or road) without the need for stormwater runoff to pass over another private property. This includes land traversed by or immediately adjoining a trunk drainage system where a legal right to connect already exists.



Location B

Land that drains directly to a natural waterbody (see LEP definitions) that traverses (crosses) or intersects the subject site. At least one bank of the waterbody is to be located within or immediately adjacent to the subject site.



Location C

Land that drains directly to bushland.



Location D

Any other land, being land that is to pass its stormwater over one or more intervening downstream private properties or public land to reach a recognised drainage system in a road reserve, drainage reserve or waterbody. This includes land where a private drainage easement is required (whether or not this has been obtained) and properties that are traversed by or immediately adjoining a trunk drainage system where there is no existing legal right to connect to the system.

24A.3 LOCATING THE DEVELOPMENT ON SITE

Further controls that may apply	
SECTION B PART 17 - Riparian Lands	

Objectives

- 1 To plan and design buildings and structures that preserve, enhance and complement existing environmental, social and aesthetic conditions within and external to the site.
- 2 To design water management measures that are complementary to the proposed development.
- 3 To design water management measures that support and enhance sustainability and improve the natural environment.

Controls

Buildings are to be located on properties in accordance with the controls set out below.

- 1 The development is not to be located so as to impede, divert or increase the rate or concentration of stormwater flow across a boundary onto adjoining private property (eg. by placing a solid wall along a boundary).
- 2 Sufficient space is to be allowed on the property for the installation and operation of water management measures as required in this Part of the DCP.

Note: Development within 'waterfront land' may be Integrated Development. Integrated Development requires consent from at least one public body other than Council.

- 3 Above ground elements of the stormwater management system, such as tanks and pumps are not to be located in the front setback of a development.
- 4 Above ground rainwater tanks are not to exceed 10,000 litres in storage capacity per tank.
- 5 Stormwater management devices such as on site detention systems and large water tanks, should be located within the basement or beneath other impermeable areas. eg. - driveways.
- 6 Where there is more than one dwelling, stormwater management devices should be located in common areas.
- 7 The stormwater management system is not to result in changes to the existing ground levels within the dripline of trees to be retained.

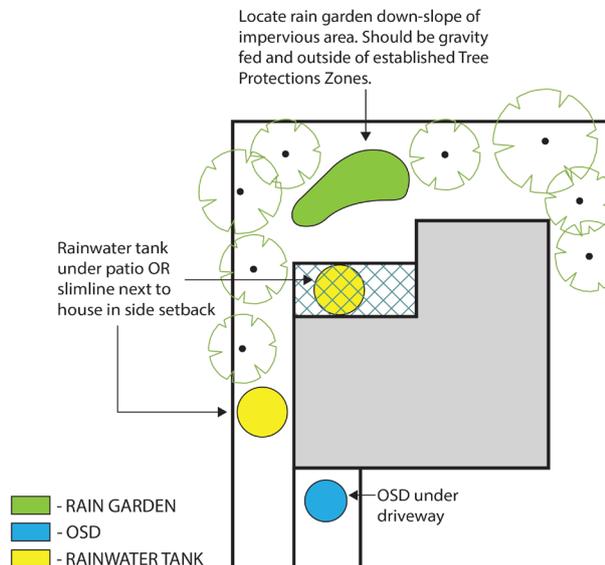


Figure 24A.3-1: Allow sufficient space for installation and operation of required water measures.

Note: Raingarden is to be integrated into the existing landscape setting and be gravity fed and outside established Tree Protection Zones.

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24B Stormwater Discharge

- 24B.1 General
- 24B.2 Stormwater Disposal from Location A Properties
- 24B.3 Stormwater Disposal from Location B Properties
- 24B.4 Stormwater Disposal from Location C Properties
- 24B.5 Stormwater Disposal from Location D Properties
- 24B.6 Relocating pipes and modifying or extinguishing easements where council is the authority

READ WITH

SECTION B
PART 17 - Riparian Lands

SECTION C
PART 24 - Water Management
24R.2: Design of Property and Interallotment
Drainage systems

REFER TO

Ku-ring-gai Council
Technical Guideline for Water Management



24B. 1 GENERAL

Objectives

- 1 *To achieve a high level of residential safety and amenity.*
- 2 *To conserve the natural environment of Ku-ring-gai and adjoining areas.*
- 3 *To minimise the adverse impact of stormwater runoff on neighbouring properties.*
- 4 *To ensure adverse impacts are not increased beyond what was present prior to the development.*
- 5 *To minimise the adverse impact of stormwater runoff on the natural environment*

Controls

Note: For all location types refer to - *Ku-ring-gai Council Technical Guideline for Water Management*.

Note: For the control of stormwater runoff and water quality measures refer to *Figure 6: Typical Stormwater Pit Details in the Ku-ring-gai Council Technical Guideline for Water Management*.

- 1 Stormwater is to be discharged from the site in accordance with the controls for the relevant location category, as identified in *Part 24A* of this DCP.
Note: Where Council drainage easement is designed to only convey "roadwater", the terms of the easement is to be legally updated to allow for the site drainage connection.
- 2 Stormwater that is not retained for a use or appropriately infiltrated on site is to generally be directed to a public drainage system comprising gutters, streets, pipes, box culverts and channels.
- 3 The scale of the development and the site conditions (including factors such as the lie and type of the land) will inform the selection of the most appropriate form of stormwater discharge.
- 4 In the selection of the means of stormwater disposal, particular regard is to be given to downstream impacts.

Carrying Out Drainage Works

- 5 Drainage systems for stormwater disposal is to comply with *AS3500.1:2021: Plumbing and Drainage Water Services* or any standard replacing that standard.

Note: See Council Website for the *Ku-ring-gai Council Easement Management Policy*.

24B. 2 STORMWATER DISPOSAL FROM LOCATION A PROPERTIES

Controls

Discharge to Kerb and Gutter/Table Drain

- 1 Piped drainage from the boundary line of the development to the street gutter or table drain is to have a minimum 1% longitudinal fall towards the street gutter.
- 2 The total discharge from any dwelling on a lot to the street gutter or table drain is not to exceed 25 litres per second for development Type 3 and above.

Note: Where this is not possible, stormwater is to be discharged to an enclosed system (pipe, box culvert, road pit). Alternatively, on-site detention may be required to lower the total discharge rate, or the site coverage contributing to the discharge, reduced.
- 3 For Development Types 1, 2 and 3 where piped drainage line crossings from the site boundary are to be employed:
 - i) the piped drainage line crossing is to extend no further than 20m from the development site across the frontage of a neighbouring property (see note) except where the location of trees prevent such piped crossings;
 - ii) the crossing line is to be at an angle not less than 45° from the line of the frontage of the neighbouring property;
 - iii) the crossing line is to run directly behind, and parallel to the street kerb as far as the discharge point. Any necessary drainage line crossing of driveways are to be constructed in a trafficable grade, directly behind the layback and parallel to it, subject to Council approval. (These requirements may be varied by Council where they are demonstrated to be impracticable and where a suitable alternative route is demonstrated); and
 - iv) the proposed piped crossing will not compromise existing or future vehicular access to the neighbouring property or to services, trees or similar.

Note: Details of the proposed route are to be provided to Council in the form of scale plans with all these features shown.
- 4 For development types 4 – 9, piped drainage line crossings to the street drainage system are to take place directly outside the frontage of that development and is not to encroach across the frontage of any neighbouring property.
- 5 Connection to existing secondary footpath drainage systems, such as pipes beneath the concrete footpath, will not be permitted as they have limited capacity and block easily.
- 6 Connections to concrete kerb and gutter is to comply with *Figure 12: Connection of Drainage Line to Kerb in the Ku-ring-gai Council Technical Guideline for Water Management*.

24B.2 STORMWATER DISPOSAL FROM LOCATION A PROPERTIES (continued)

Controls

- 7 When discharge is proposed to an open table drain, the pipe outlet is to terminate flush with the property-side edge of the table drain and is to be fully encased in a minimum 100mm thick mass concrete for the final 300mm length of the pipe.

Note: Where the applicant cannot comply with any of the above requirements due to site constraints, an alternative method of connection may be proposed for consideration by Council.

Discharge to an Existing Council Pipe in the Road Reserve or a Drainage Reserve

- 8 Discharge to an existing piped (in-ground) drainage system in the road or a drainage reserve may be an option where:
- Such a system exists in reasonable proximity to the site and it is not possible to direct stormwater to a Council kerb and gutter or table drain; or
 - The peak site discharge proposed exceeds 25 litres per second and it can be demonstrated that the hydraulic grade line of the inground drainage system (to which connection is proposed) is lower than the outlet of the property drainage system during the 5% AEP event.
- 9 Stormwater is to be discharged to an existing Council pipe in the road reserve. Connection to the Council drainage pipe is to, at Council's discretion, be undertaken in conjunction with the establishment of a grated gully (access) pit to Council standards. Details of new pits will need to be submitted to Council. All details are to be submitted with an application for a *Roads Act* approval.

Discharge to an Extension of the In-Ground Piped System in the Road Reserve

It may be possible to extend an existing downstream in-ground street drainage system on either the property side or the opposite side of the street. This is only allowed where no other connection is possible. In such cases, the following controls apply.

- 10 The in-ground drainage line is to be extended using a steel reinforced or fibre reinforced piped system to convey 5% AEP year trunk flows (minimum of 375mm diameter rubber ring jointed reinforced or fibre reinforced concrete pipe), generally at gutter lip alignment.
- 11 The extended drainage line is to connect to a new Council standard grated gully pit that is to be established outside the development site.
- 12 The feasibility of such a proposal is to be established by a suitably experienced and qualified civil engineer.

24B.2 STORMWATER DISPOSAL FROM LOCATION A PROPERTIES (continued)

Controls

- 13 A detailed design is to be prepared by a suitably experienced and qualified civil engineer based on design criteria obtained from the roads authority (Refer to 24E of this Part).

Note: The full cost of such works is to be borne by the developer.

Note: The design is subject to the approval of the roads authority (Council or TfNSW) under the Roads Act 1993 and no work may be undertaken until approved.

Note: The feasibility of such a proposal is to be demonstrated with any DA submission.

Connection to a Council or Sydney Water Formed Channel or Pipeline within or adjacent to the Subject Site

Note: A 'formed channel' generally means a concrete or stone-lined channel located in a position that may not necessarily coincide with any historical waterbody. For example, a formed channel may have been constructed to convey runoff from a road to a nearby natural watercourse. In the event that a legal right to connect exists, the following controls apply (where no legal right exists, the property is likely to be Location D rather than Location A):

- 14 The terms of any easement over the channel/pipe system to which connection is proposed is to legally permit the subject site to discharge its stormwater into it and be demonstrated to Council.

Note: Ascertaining this may require independent legal advice.

- 15 Where the formed channel/pipe system crosses intervening downstream properties before the next downstream area of road or drainage reserve, permission to convey the stormwater runoff from the development site by way of the formed channel/pipe is to be established under the terms of an easement on the title of each affected downstream property.
- 16 The formed channel/pipe is to have sufficient hydraulic capacity to accept the additional flow from the post developed site of a 5% annual exceedance probability. The hydraulic capacity is to be determined having regard to existing and cumulative future flow rates in that system.
- 17 The outlet is to be designed to minimise backwater influence from the receiving system.
- 18 Connection is to be made to a surcharge pit prior to direct connection to a Council pipeline. Connection to a Council pipeline is to be made in accordance with *Figure 11: Typical Junction Pit including Private Connections in the Ku-ring-gai Council's Technical Guidelines for Water Management*. For all pipes a junction pit is to be constructed at the connection point.
- 19 Where connection is to a Sydney Water stormwater pipe, the design tailwater for a sealed pipe drainage system connecting to such a channel is to be the top of the channel unless otherwise specified by Sydney Water.

24B.2 STORMWATER DISPOSAL FROM LOCATION A PROPERTIES (continued)

Controls

- 20 Any other site specific requirements of the Council or Sydney Water is to be satisfied.

Note: Council may require the establishment of an on-site detention system at the development site (regardless of whether this is required in accordance with *24C of this Part*).

24B. 3 STORMWATER DISPOSAL FROM LOCATION B PROPERTIES

Further controls that may apply

SECTION B PART 17 - Riparian Lands

Controls

- 1 Disposal of stormwater from Location B properties is to be undertaken in accordance with the NSW Department of Primary Industries 'Office of Water' document 'Guidelines for Outlet Structures on Waterfront Land, 2012'.

Note: This document is available at <https://water.dpie.nsw.gov.au/>
- 2 Where an existing connection is in poor condition, the stormwater outlet structure is to be upgraded in line with the *Guideline for Outlet Structures on Waterfront Land* and the *Ku-ring-gai Council Technical Guideline for Water Management*.
- 3 Where there is bushland between development and the waterbody, water quality treatment in accordance with Part 24C.6 of this Part prior to discharge to the watercourse.

Note: On some sites, discharge directly to the waterbody may not be appropriate. Advice and evidence from an appropriately qualified and experienced ecological expert may be required.

24B. 4 STORMWATER DISPOSAL FROM LOCATION C PROPERTIES

Controls

Urban stormwater flowing into bushland is the major factor that causes weeds to become established in natural areas. In order to minimise such impacts, the following controls apply to Location C properties.

- 1 The developer is to demonstrate to Council that all stormwater entering bushland will be dispersed sufficiently so as to not cause downstream erosion, scour or pollution. This may be achieved by using a raingarden, infiltration or dispersal trench system or slotted pipe to practical depth (where site conditions prevent a deeper trench structure) established at the highest practicable level within the site, parallel to the site contours. Any technique used is to be designed in accordance with Council's Technical *Guideline for Water Management*.

Note: In some circumstances this may require OSD as part of the stormwater management system.

- 2 For new single dwellings (Development Type 3), the maximum post developed built-upon area draining to the dispersal trench/level spreader system is not to exceed 35% of the total site area.
- 3 For alterations and additions (Development Types 1 & 2), the post-development total site area draining to dispersal trench/level spreader system is not to exceed the pre-developed built-upon area.

24B. 5 STORMWATER DISPOSAL FROM LOCATION D PROPERTIES

Further controls that may apply		
		SECTION C PART 24R.2 - Design of Property and Interallotment Drainage Systems

Controls

Council requires that stormwater is discharged from a site in a controlled manner under gravity to a recognised public drainage system. Accordingly, where this could be achieved but for the existence of another property downstream, Council will require that, where possible, an interallotment easement for drainage be utilised to legally provide a controlled gravity drainage solution as far as the nearest available recognised public drainage system.

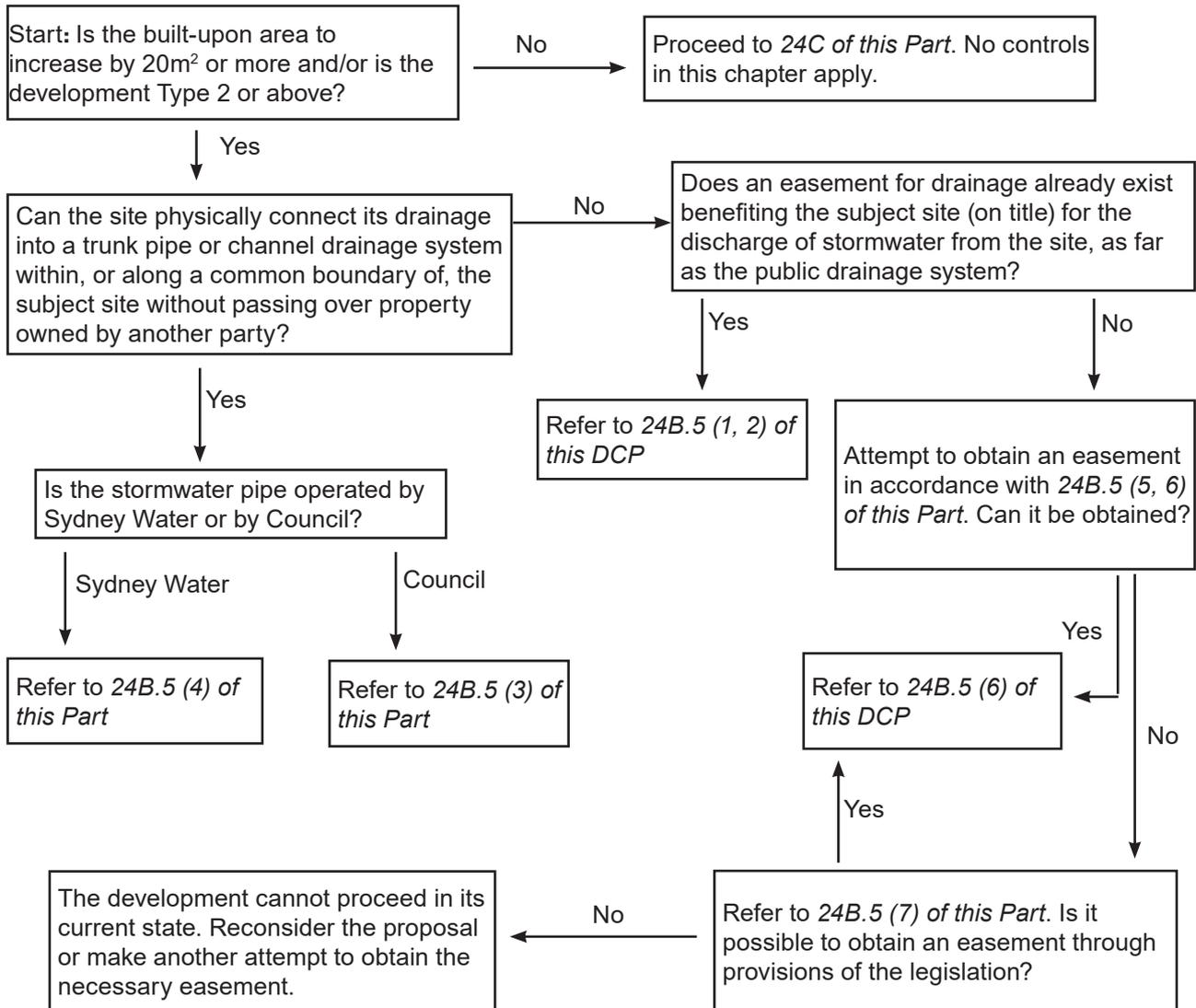
The necessary easement for interallotment drainage as far as the recognised public drainage system may already exist on the title of the subject site (generally described as being appurtenant to, or benefiting, the site). If not, it will be necessary for the owner of the subject site to obtain the necessary easement for drainage. Properties over which an easement may be created include private properties and public parks and reserves.

It may also be possible to connect into a trunk drainage system traversing or directly adjacent to a subject site. (Where the legal right to do so already exists, the property is a Location A property – Refer to 24A.2 of this Part). Where there is presently no legal right to connect to the trunk drainage system, Council may consider an application for a direct connection, as necessary, depending on the physical condition and capacity of the trunk system; the consent of the downstream owners; terms of the easement (where one exists); and the intent of the receiving trunk system.

24B.5 STORMWATER DISPOSAL FROM LOCATION D PROPERTIES (continued)

Controls

Where the use of, or creation of, an easement for drainage is not possible, it may be possible to utilise other methods of disposal depending on the scale and type of development. The following flow chart explains how to determine the manner in which to dispose of stormwater from a Location D property:



Note: Exposed aerial drainage other than downpipes will not be approved by Council.

Note: Council strongly encourages the developer to seek the services of a conveyancing solicitor or experienced legal professional in order to clarify the standing of a site with respect to use of drainage easements. Council does not have in-house experts in property conveyancing matters.

24B.5 STORMWATER DISPOSAL FROM LOCATION D PROPERTIES (continued)

Controls

Discharge to an existing interallotment drainage easement

The development application is to:

- 1 Demonstrate to Council the existence of the interallotment drainage easement that allows the site to drain by gravity as far as a recognised and appropriate public drainage system. This will require provision of the title documents for the affected properties and the subject property. Such title documents are available from the Land and Property Information NSW.
- 2 Include either:
 - i) documentation from a registered surveyor or qualified engineer demonstrating the existence of either suitable drainage infrastructure within the easement system to be utilised (capacity and condition); or
 - ii) a scale plan showing the proposed drainage infrastructure to be placed in the existing easement to drain the subject site.

Note: In the event that the existing easement or piped system is not satisfactory in terms of capacity or length, Council will require the system to be upgraded or extended (Refer to 24R.2 of this Part).

Connection to a formed channel or council pipeline within the subject site

- 3 Permission to connect to a formed channel or drainage pipe will be granted by Council and at the discretion of Council only where it can be demonstrated that:
 - i) the terms of any easement over the channel/pipe system, to which connection is proposed, legally permit the subject site to discharge its stormwater into it and this can be demonstrated to Council;
 - ii) the said channel/pipe is located within or directly adjacent to the development site;
 - iii) where the formed channel/pipe system crosses intervening downstream properties before the next downstream area of road or drainage reserve, permission to convey the stormwater runoff from the development site by way of the formed channel/pipe is established under the terms of an easement or easements on the title of all affected downstream properties;
 - iv) the pipe / formed channel has sufficient hydraulic capacity to accept the additional flow from the post developed site and the hydraulic capacity is determined having regard to existing and cumulative future flow rates in that system;
 - v) the outlet is designed to minimise backwater influence from the receiving system;

24B.5 STORMWATER DISPOSAL FROM LOCATION D PROPERTIES (continued)

Controls

- vi) where it is found that an existing Council owned channel/pipe is present on site that is not within an easement, a suitable easement will be created over the drain in favour of Council, at no cost to Council, or else the easement moved accordingly also at no cost to Council;
- vii) drainage systems for stormwater disposal complies with *AS3500.1:2021 – Plumbing and Drainage Water Services* or any subsequent standard replacing that standard;
- viii) connection to a formed stormwater channel/pipe is made in accordance Figure 11: Typical Junction Pit Including Private Connections in the Ku-ring-gai Council Technical Guideline for Water Management; and
- ix) any other site-specific requirements of the Council are satisfied.

Note: Please refer to Council's Easement Management Policy for information relating to the connection and alteration of easements.

Connection to a Sydney Water stormwater pipe in an easement

- 4 The following controls apply:
- i) Written consent is to be obtained by the proponent from Sydney Water and submitted to Council;
 - ii) All necessary easements for drainage exist to benefit the subject site;
 - iii) All relevant requirements of Sydney Water are to be satisfied prior to development consent being granted by the Council; and
 - iv) The design tailwater for a sealed pipe drainage system connecting to such a channel is to be the top of the channel unless otherwise specified by Sydney Water.

Procedures for obtaining new private interallotment drainage easements

- 5 The first step: Approaching the downstream owners creation of a new interallotment drainage easement is to be attempted for all Location D properties where the built-upon area is to increase by 20m² or more (where built-upon area will increase by less than this area, please proceed to *Part 24C*). All attempts are to be in accordance with the steps set out below.
- i) The developer is to establish the most appropriate route between the subject site and point of connection to the downstream public drainage system, together with any alternate routes. This may be in a road reserve, a drainage reserve, or a natural watercourse. The developer should contact an appropriate engineer to make the necessary investigations where such a location is not apparent. If trees are on or near the route, an arborist is to also be consulted.

24B.5 STORMWATER DISPOSAL FROM LOCATION D PROPERTIES (continued)

Controls

- ii) After establishing the route, the developer is to write to the owners of all the relevant downstream properties requesting an interallotment drainage easement as far as is necessary to connect into a recognised public drainage system. The letter may offer financial compensation and is to indicate that the burdened property owner would not be responsible for maintenance of the easement.

Note: Appropriate financial compensation may be determined by a registered Valuer but will be subject to negotiations between both parties.

Note: It is recommended that the services of a conveyancing solicitor be engaged in this process.

- iii) The developer is to obtain a written response from the landowners of the properties approached in control (ii) above. This will either consent to, or refuse, the creation of the necessary easement(s) for drainage. Where refusal occurs, refer to 24B.5 (7) of this Part.
- iv) Where consent is given, the developer is to provide a copy of the signed agreement(s) to Council with any development application lodged.

Note: Where a signed agreement is obtained and submitted as part of DA documentation, the consent authority will impose a condition of consent requiring the legal registration and demonstration of the necessary easement. Alternatively, depending on the circumstances, Council may require registration of the easement on title prior to any DA consent being given. All costs associated with the registration of the easement on title is to be borne by the applicant.

- 6 The second step: Prepare the design as per 24R.2 of this Part. If the development application is to be approved it will be on a deferred commencement basis with the registration of the interallotment drainage easement with Land and Property Information NSW (LPI) completed before the consent becomes operational..

Where the downstream landowners agree to the creation of an easement, the following steps are to be carried out.

- i) A survey plan, suitable for registration at LPI, is to be prepared by a registered surveyor on behalf of the proponent showing the location of the easement. The necessary terms of the drainage easement is to be prepared.

Note: The width of the easement to be created is to have regard to the required size of pipe that will be placed in the easement and sufficient excavation width in the event of maintenance. Refer to 24R.2 for the required widths and placement of easements.

- ii) The survey plan, owners' written approval, application form and fees are to be lodged by the developer at the LPI. The Council is to be nominated in the Section 88B Instrument as a party whose consent is required to release, vary or modify an easement.
- iii) Written advice to the effect that the easement has been registered is to be obtained by the developer from the LPI and

24B.5 STORMWATER DISPOSAL FROM LOCATION D PROPERTIES (continued)

Controls

supplied to the relevant landowners, the certifying authority as is necessary in the approval process and to Council for its records

Note: The services of independent professionals with relevant experience should be sought in this process. Council does not provide legal advice in this respect.

Using legislation to obtain a drainage easement

- 7 In the event that all reasonable attempts to obtain the consent of the relevant landowners for the creation of an interallotment drainage easement have failed, provisions of *Section 88K of the Conveyancing Act 1919* or *Section 40 of the Land and Environment Court Act 1979* may be utilised. Council does not encourage the use of these provisions and supports negotiation with adjoining property owners. However, Council does recognise that these provisions exist.

Note: Independent legal advice is to be sought if either of these options are to be pursued.

Providing evidence that a legal inter-allotment drainage easement cannot be obtained

- 8 In the event that an easement cannot be obtained from one or more downstream parties, the following documentary evidence is to be submitted to Council in support of any Development Application:
- i) A copy of all letters sent to landholders of neighbouring properties containing all feasible easement routes indicating an offer of appropriate financial compensation and explaining that the burdened property would not be responsible for maintenance of the easement; and
 - ii) A signed copy of the letters received from owners of the neighbouring properties through which an interallotment drainage easement was sought, stating that an easement will not be granted.

Note: In the event that it is not possible to obtain such a letter, a written account of any response obtained from the property owners may suffice. This evidence will be subject to independent verification by Council.

Note: Some development will not be approved by Council where an easement cannot be obtained.

Discharge of stormwater within the site

On-site discharge of concentrated stormwater flows by infiltration/absorption into soils on the site is considered to be inadequate in most areas of Ku-ring-gai. This is because the majority of soils are clay-based and have a low to very low infiltration rate or shallow bedrock.

- 9 Discharge of stormwater within the site may involve:
- i) One or more dispersal trenches constructed at the point of disposal designed to disperse stormwater across a site in

24B.5 STORMWATER DISPOSAL FROM LOCATION D PROPERTIES (continued)

Controls

- a sheet flow to provide an opportunity for water take-up by vegetation downstream from the trench;
- ii) A series of infiltration trenches constructed on sandy soils where bedrock is not close to the surface, and;
 - iii) other methods designed to ensure the infiltration/absorption of water into the site such as rain gardens, soaks or swales.
- 10 Discharge of stormwater within the site will only be permitted where all of the following conditions are satisfied (applies to Development Type 1, 2 or 3 only).
- i) It is demonstrated that direct drainage by gravity to the street drainage system, a public drainage system or recognised natural watercourse within the property or to a drainage easement is not possible.
 - ii) It is demonstrated that no drainage easement either exists over adjoining properties or is readily available through negotiation.
 - iii) It is demonstrated that all other alternatives have been comprehensively examined and demonstrated to be inappropriate or ineffective.
 - iv) A rainwater reuse system is incorporated into the development with a least one connection to a toilet.
 - v) It is demonstrated that, for new single dwellings (Development Type 3), the maximum post developed built-upon area draining to the:
 - a) infiltration/absorption trench system will not exceed 30% of the total site area; or
 - b) dispersal/level spreader trench system will not exceed 30% of the total site area. A dispersal/level spreader is only acceptable where an infiltration/absorption trench system is not possible due to topography, geology or biodiversity restrictions.

Note: a geotechnical investigation report will be required to confirm soil depth and permeability rate.
 - vi) It is demonstrated that, for alterations and additions (Development Types 1 & 2), the post-development built-upon area draining to:
 - a) an infiltration/absorption trench system will not exceed the greater of
 - b) 30% of the total site area; or
 - c) a dispersal/level spreader trench system. A dispersal/level spreader is only acceptable where an infiltration/absorption trench system is not possible due to topography, geology or biodiversity restrictions. It cannot exceed the greater of
 - d) 30% of the total site area; or

Note: a geotechnical investigation report will be required to confirm soil depth and permeability rate

24B.5 STORMWATER DISPOSAL FROM LOCATION D PROPERTIES (continued)

Controls

- vii) The design and construction of the system are undertaken in accordance with *Figure 1: Typical Absorption Trench and Figure 4: Typical Level Spreader Dispersion System in the Ku-ring-gai Council Technical Guideline for Water Management*.

Charged drainage systems

A charged drainage system is a sealed drainage system containing permanent ponded water that is forced out under pressure by the height of water above the outlet / discharge point.

Council does not readily encourage the use of charged drainage systems. This is because of their susceptibility to blockage by leaf debris and sediment and the requirement for a high maintenance regime that may not be met by new or uninformed owners. The failure of such systems results in roof gutter overtopping and the increased potential for flooding/damp problems within or adjacent to premises.

However, in certain cases, where the layout of the site and proposed building design permits, a charged drainage system may be used to aid in controlling stormwater disposal from a site. This may be useful where an easement for drainage cannot be obtained and it is necessary to limit the degree of on-site stormwater disposal that is undertaken in accordance with the controls set out in 24B.5 - 'Discharge of Stormwater within the Site' of this Part.

Discharge of stormwater from the site by way of a charged drainage system will only be permitted where all of the following controls are satisfied (applies to Development Type 1, 2 or 3 only):

- 11 Not more than 120 square metres of roof area and four charged downpipes from any one building are required;
- 12 It is demonstrated that direct drainage by gravity to the street drainage system, a public drainage system or recognised natural watercourse within the property or to a drainage easement is not possible;
- 13 It is demonstrated that no drainage easement exists either over adjoining properties or are readily available through negotiation;
- 14 It is demonstrated that all other alternatives have been comprehensively examined and demonstrated to be inappropriate and ineffective;
- 15 The design for the system is to be prepared by a qualified civil or hydraulic engineer;
- 16 A stilling pit is to be provided at the property boundary from which the drainage line to the street gutter has positive fall by gravity to preclude the possibility of street water backflow;
- 17 A minimum of 1.5m head (height) is to be available from the roof gutter to the invert of the inlet in the stilling pit;
- 18 A minimum of 0.8m head (height) is to be available from the roof gutter to the top of the rainwater tank;

24B.5 STORMWATER DISPOSAL FROM LOCATION D PROPERTIES (continued)

Controls

- 19 Hydraulic grade line calculations are to be undertaken by a suitably qualified and experienced engineer that demonstrates that the proposed system will have sufficient operating head (A freeboard of at least 300mm is to be allowed between the roof gutter level and the hydraulic grade line at the top of the respective downpipe);
- 20 The drainage line from the stilling pit to the street system is to be in accordance with control in 24B.2 (1-7) of this Part;
- 21 The property drainage system is to be fully sealed from the level of the roof gutter to the stilling pit;
- 22 The charged system is to be a minimum uPVC sewer grade 100mm diameter;
- 23 Leaf guards are to be established on all proposed roof gutters to minimise debris entering the system. Providing leaf guards to existing gutters is strongly encouraged;
- 24 A grated cleanout pit is to be established adjacent to all system low-points in which is provided a screw-capped sealed extension of the respective main charged drainage line;
- 25 An appropriate flap valve is to be established over the inlet pipes to the stilling pit in order to minimise mosquito nuisance;
- 26 Drainage systems for stormwater disposal is to comply with *AS3500 – Plumbing and Drainage* and;
- 27 Exposed aerial drainage will not be approved by Council, except for guttering and vertical downpipes and diagonal lines where they are directly feeding a rainwater tank required under the controls in this DCP.
- 28 The design and construction of the system are undertaken in accordance with *Figure 3: Combined Charged Line/Absorption Trench in the Ku-ring-gai Council Technical Guideline for Water Management*.

Pump-out systems

- 29 Council will only give consent to pump-out systems for development Types 1, 2 and 3 in rare instances and subject strictly to the applicant fully demonstrating compliance with a number of design

24B.5 STORMWATER DISPOSAL FROM LOCATION D PROPERTIES (continued)

Controls

controls. This is because of:

- i) The susceptibility of pumps to failure during power outages which commonly occur during storms of higher rainfall;
 - ii) The potential impact of a failed pump-out drainage system on the downstream properties;
 - iii) The necessity for a high maintenance regime that may not be met by new or uninformed occupants; and
 - iv) Pumping water into an upstream or adjacent catchment can exacerbate existing flooding problems.
- 30 Stormwater disposal from a site by way of a pump-out system will only be permitted where it can be fully demonstrated that the owner or Council, in approving the pump-out system, could not reasonably be held liable for exacerbating or introducing a flooding problem in the immediate drainage system which is receiving the pumped runoff.
- 31 Pump-out systems are to comply with the controls set out below.
- i) The Development is to be type 1, 2 or 3 only.
 - ii) The applicant is to demonstrate in writing that no easement may be obtained for the discharge of stormwater from the site.
 - iii) The pump-out system is not to be the sole means of stormwater discharge from the site.
 - iv) The pump-out system is to be employed only as an additional means of stormwater discharge where an absorption trench is proposed to operate, where the impervious area to be drained exceeds 30% of total site area as defined in 24B.5 (10v) of this Part.
 - v) The total impervious area to be pumped is not to exceed 100m²
 - vi) The pump-out system is to be used in conjunction with an absorption trench system which drains a separate impervious area of 30% of the total site area as defined in 24B.5 (10v) of this Part.
 - vii) Runoff pumped to the street frontage is not to enter an existing drainage system where flooding affects private and/or public property including parks and reserves. In this respect, it is to be demonstrated by a suitably experienced and qualified civil engineer using suitable hydraulic analysis that:
 - there are no existing flooding issues causing damage or nuisance to property adjacent to or burdened by the drainage system which is receiving the pumped runoff; and
 - increasing the volume of runoff in the receiving system would not create a new, or exacerbate, an existing drainage issue in any downstream private property; and
 - the cumulative impact of pumping more than one property to the same receiving drainage system has been considered; and

24B.5 STORMWATER DISPOSAL FROM LOCATION D PROPERTIES (continued)

Controls

- the drainage system that would receive the additional pumped runoff is of sufficient width and capacity to handle additional runoff as determined in (ii); or
 - the drainage system immediately downstream at the nearest sag point receiving the pumped runoff drains directly to the bush via a formal drainage system without impacting upon private property.
- viii) The pump-out system is to have a visible ponding area available for temporary storage during pump failure with an absolute minimum capacity for the 1% AEP, 2 hour event falling on the corresponding impervious area draining via the pump system.
- ix) A duty and standby pump with alternating switches is to be provided within a sump in the ponding area, together with a fuel generator on site capable of operating the pump-out system when no power is available.
- x) A stilling pit is to be provided at the property boundary, with gravity drainage provided between the stilling pit and the discharge point in accordance with controls in 24B.2 (1-7) of this Part. A non-return or flap valve is to be placed at the point the rising main enters the stilling pit. If a stilling pit is impossible, some other form of cleanout/backflow prevention is to be provided.
- xi) Overflow from the ponding area of the pump-out system is to be formally drained to the site dispersal system.

Pump-out example:

A Location D site of 930 m² proposing a new dwelling (Type 3) with hard surface area generating runoff (including roof, driveway and all other areas generating runoff) of 390 m² (42% of the total site area) proposed with access to an easement refused by the relevant owners. Under the controls of 24B.5 (10v) of this Part, a maximum of 30% of the total site area, or 280m², could drain to an on-site dispersal trench system. However, provided that it may be demonstrated by a experienced and qualified civil/hydraulic engineer that the above pump-out controls are met in full, a pump out system could be considered to pump the additional 110m² (12% of site area) proposed above the 30% threshold permitted by 24B.5 (10v) of this Part. In this case, the applicant would need to provide a visible storage area of 5.6 m³ volume based on the 100 year 2 hour storm of 51.2mm/hr falling on 110m². This would be in addition to any controls required under BASIX or this DCP.

24B. 6 RELOCATING PIPES AND MODIFYING OR RELEASING EASEMENTS WHERE COUNCIL IS THE AUTHORITY

Controls

- 1 The application is to demonstrate that the relocation of the pipeline and /or easement will not have any adverse impacts on the following:
 - i) the hydraulic efficiency of the re-routed system;
 - ii) the potential for blockages within the system;
 - iii) the management of overland flow;
 - iv) water quality and riparian health;
 - v) costs associated with ongoing maintenance of the stormwater asset.
- 2 A Council drainage easement is to be created over any new line of pipe and any redundant easements are to be extinguished.
- 3 The release or extinguishment of an easement will only be permitted where it can be demonstrated that it is redundant to existing or future stormwater management needs.
- 4 All associated design, documentation, relocation, valuation, stamp duty, compensation and legal costs are to be borne by the applicant.
- 5 The application and procedures are to be consistent with Council's Easement Management Policy.

24C On-site Stormwater Management

24C.1 General

24C.2 Effective Stormwater Management

24C.3 General Controls for On-Site Stormwater Management

24C.4 Mandatory Rainwater Tank Requirements

24C.5 Controls for On-site detention

24C.6 Stormwater Quality Control

REFER TO**Ku-ring-gai Council
Technical Guideline for Water Management**

24C.1 GENERAL

Objectives

- 1 *To ensure stormwater management is integrated with the overall site design and reflects the site analysis.*
- 2 *To ensure that development does not increase surface and subsurface runoff to neighbouring properties.*
- 3 *To consider the existing capacity of the public drainage system.*
- 4 *To minimise stormwater discharge and reduce runoff days to protect and improve stream health*
- 5 *To ensure that development does not adversely affect the integrity of natural waterways, subsurface water and ecosystems.*
- 6 *To ensure stormwater management measures are functional and effective for the duration of their existence.*
- 7 *To maximise rainwater re-use.*

Controls

- 1 Stormwater is to be managed efficiently on-site and runoff controlled to assist in the prevention of:
 - i) flooding of public and private properties;
 - ii) overland water flows;
 - iii) undesirable changes in flow regime to bushland;
 - iv) erosion of creek beds, embankments and bushland areas;
 - v) transportation of gross pollutants, nutrients and chemical pollutants;
 - vi) spread of weeds;
 - vii) undesirable impacts on the character of the street.
- 2 Stormwater is to be managed on-site to assist in the maintenance of:
 - i) stream flow;
 - ii) water quality in creeks, rivers, groundwater and harbours;
 - iii) waterway and riparian ecosystems;
 - iv) groundwater dependant ecosystems; and
 - v) the natural recharge of groundwater.

Note: Council encourages the design of innovative stormwater management systems. Such systems are to be informed by the soil type on the site. It should be recognized that soils in Ku-ring-gai are not generally appropriate for retention systems that involve infiltration.

Note: Where water sensitive urban design features do not preclude screen and canopy planting, they can be included in the calculations of deep soil landscaping.
- 3 Colours and materials of built elements of the stormwater management system that are visible to the public is to be sympathetically treated to minimise visibility.

24C.2 EFFECTIVE STORMWATER MANAGEMENT

Controls

An appropriate method or combination of methods are to be provided on the site to manage stormwater quality and flows. The system is to be designed to ensure the optimum outcome for both the catchment and the subject site. Available management techniques include rainwater tanks, detention basins and tanks, infiltration basins and trenches, passive irrigation tanks, raingardens (biofiltration gardens), green roofs, dense native vegetation buffer strips, vegetated swales, biofiltration swales, rainscaping and dispersal trenches.

Note: Some techniques, such as green roofs, are predominantly used for water quality treatment, microclimate regulation and aesthetics, rather than for retention or detention. However, consideration of retention or detention contribution will be made where such benefits can be demonstrated through modelling.

Note: Biofiltration systems can be used for stormwater quality and flow management. Refer to *Figure 7: Typical Biofiltration System* and *Figure 8: Biofiltration System Standard Details* in the *Ku-ring-gai Council Technical Guideline for Water Management*.

These systems can be designed to retain or detain stormwater:

- 1 On-site Retention (OSR) is a stormwater management system that keeps water on site for re-use in the hydrological cycle or as an alternative to mains water. OSR controls the volume of runoff during rainfall and storm events. Stormwater is not sent directly off the site, reducing runoff draining to pipelines, minimising flood events, conserving water and reducing the impact on the natural water cycle.
- 2 On-site Detention (OSD) works involve holding back stormwater temporarily within a site and then releasing it at a controlled rate. It controls the rate of runoff and reduces peak discharges during storm events; to minimise the load on pipelines and to minimise flood events. OSD does not alter the total volume of stormwater leaving the site and normally does not allow the stormwater to be used before it leaves the site.
- 3 In many situations a combination of OSD and OSR may be appropriate. In general, the factors that the designing engineer should take into account when determining the stormwater management techniques for a site are:
 - i) the timing of peak flows from the site relative to those from the upstream catchment which drain to the same point. This is influenced by the time of concentration and the proximity of the site to the catchment point. Generally, in upper parts of the catchment water needs to be detained, whereas in lower areas it may be preferable to allow most of the stormwater to leave the site immediately;
 - ii) the proximity of the subject property to environmentally sensitive areas such as bushland. Specifically, OSD can be problematic where a site drains to bushland as constant seepage causes weed growth;
 - iii) the impact of any proposed stormwater management method on the streetscape and neighbouring properties, particularly in terms of aesthetics.



Figure 24C.2-1
Informal raingarden



Figure 24C.2-2
Formal detention pond
amphitheatre in public space
(www.wsud.org)

24C.2 EFFECTIVE STORMWATER MANAGEMENT (CONTINUED)

Controls

- 4 Both OSR and OSD options are to be designed and constructed to meet water quality controls in accordance with 24C.6 of this Part. This can be achieved by incorporating litter screens, proprietary devices, biofiltration or infiltration within the design.

24C.3 GENERAL CONTROLS FOR ON-SITE STORMWATER MANAGEMENT

Controls

This section is based on the principles of effective stormwater management (Refer to 24C.2 of this Part) and contains the controls that will form the basis for assessing any stormwater management proposal.

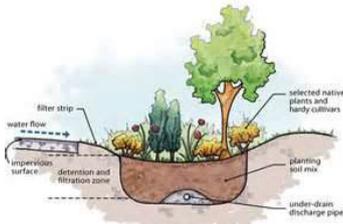


Figure 24C.3-1
Concept design of a
raingarden



Figure 24C.3-2
Vegetated Infiltration basin

- 1 The stormwater management system, as far as is practicable, is to be designed so as to improve water quality and assist in maintaining stream flow and the water regime.
- 2 The stormwater management system, as far as is practicable is to be designed to control discharge rates to prevent downstream flooding. On site detention will be required in most circumstances.
- 3 The design of the stormwater management system is to be based on:
 - i) for location A, B and D properties
 - the deep soil landscaping or built-upon area requirements in Section A of this DCP
 - ii) for location C properties:
 - the requirements of 24B.4 of this Part.

Note: Where the proposed built-upon area is less than the maximum permissible built-upon area, the design is to still be based upon the maximum permissible built-upon area.

Note: For larger sites where development is obviously precluded from certain areas, a merits based assessment may be considered by Council for the basis of area calculations.

Stream Flow Controls

- 4 In order to maintain and improve stream flow the number of runoff days from the site is to be reduced by 50% compared to the base case. This is to be achieved through the incorporation of both a rainwater tank and landscape measures, as outlined below.

Note: Base case for the purpose of 4) above refers to the number of runoff days that would result from the proposed development without stormwater management measures.

 - i) landscapes should be designed to ensure runoff from impervious areas of the site is directed to raingardens or other vegetated areas for infiltration (rainscaping) rather than being directly connected to the stormwater system. Permeable paving may also be used to reduce the frequency and intensity of runoff.

Note: This may not be possible on some sites due to the presence of large areas of exposed rock, existing drainage issues or ecological constraints. Where these circumstances apply, a Pre-DA meeting with Council is recommended.

Note: The impermeability factor for permeable (porous) paving is available in the Technical *Guideline for Water Management*.

- a) runoff is to be controlled to ensure it does not cause flooding to the dwelling or neighbouring properties.

Note: Typical details of the porous system is to be in accordance with *Figure 5: Typical Porous Paving Details in the Ku-ring-gai Council Technical Guideline for Water Management*.



Figure 24C.3-3
Permeable paving used to reduce runoff to bushland on a Location C property.

24C.3 GENERAL CONTROLS FOR ON-SITE STORMWATER MANAGEMENT (continued)

Controls

- ii) for Development Types 5, 6, 8 and 9; and for proposed variations to iii) below:
 - a) Rainwater tanks are to be sized and installed in accordance with table 24C.4-1, and
 - b) A suitably qualified and experienced engineer is to certify that the proposed management measure(s) to be used at the site (whether proprietary or otherwise) will achieve the reduction in runoff days in 2) above;
 - iii) for Development Types 3 and 4, and for Type 2 where the development includes alterations and additions to a bathroom or laundry. The following will be deemed to comply with the reduction in runoff days in 2) above:
 - a) Rainwater tanks sized and installed in accordance with table 24C.4-1 and either of the following:
 - b) For rainscaping, the size of the area receiving runoff is to be 30% of the contributing hardstand area for clay soils and 20% for other soils, or
 - c) An unlined raingarden with a filter surface area in accordance with 24C.6-2.
- 5 The selected stormwater techniques is to be designed and constructed in accordance with the specifications for the relevant technique. The specifications can be found on Council's website.

Subsurface Water Controls

- 6 Subsurface water management systems are to be designed to transfer subsurface water through, around or under the proposed development to maintain the natural subsurface water regime.

Where an impediment to the natural flowpaths is created as a result of the nature of the construction methods utilised or the bulk of the below-ground structure, artificial drains such as perimeter drains and through drainage may be utilised. These systems may only be utilised where it can be demonstrated that the natural flow regime is restored both up-gradient and down-gradient of the site, without any adverse effects on

- i) surrounding property;
- ii) infrastructure;
- iii) groundwater dependent ecosystems;
- iv) threatened species, populations, and ecological communities;
- v) bushland;
- vi) riparian lands; and
- vii) watercourses

Note: Ongoing dewatering of any development may need approval from NSW DPI Office of Water for an aquifer interference activity.

Note: Additional information relating to shallow subsurface soil water and vegetation impacts may be required.

24C.3 GENERAL CONTROLS FOR ON-SITE STORMWATER MANAGEMENT (continued)

Controls

- 7 Subsurface water management systems are to be designed to be easily maintained. Council may require a Positive Covenant (see 24R.4 of this Part) to ensure the continued functioning and maintenance of the approved subsurface water management system.
- 8 For development types 4 and above, basements are to be fully tanked, unless:
 - i) 3ML/year limit is met; and
 - ii) Hydrological assessment to demonstrate the receiving system can accept flows.

24C.4 MANDATORY RAINWATER TANK REQUIREMENTS

Controls

For all Locations (A-D), at least one rainwater tank is to be established to capture as much as possible roof water from the primary building(s) on the property. The controls are as set out in the table below:

Table 24C.4-1: Mandatory Rainwater Tank Requirement by Development Type

Type	Description	Minimum Tank Storage Volume	Minimum Use of Retained Water	
Type 1 <20m ²	Alts & adds to a single detached dwelling or secondary dwelling. Increase in hard surface area.◆	A water tank is strongly recommended but not mandatory,	Where installed, are to be connected to garden. Connection to toilet and laundry hot water is also encouraged.	
20-100m ²	Alts and Adds to single or secondary dwellings where the development is increase in hard surface area.◆	Where proposal does not involve a bathroom or laundry	The minimum tank storage volume is 2,000L, or, compliance with BASIX, whichever is the greater.	For garden irrigation only.
	Where proposal involves a bathroom or laundry.	The minimum tank storage volume is 2,000L, or in compliance with BASIX, whichever is the greater.	Is to be at least one connection to laundry or toilet.	
Type 2	Alts and Adds or construction of secondary dwellings >100m ² increase in hard surface area.◆	The minimum tank storage volume is 5,000L, or in compliance with BASIX, whichever is the greater.	Connection for garden irrigation and for internal use.	
Type 3	Single Dwellings in sites less than 1000m ² .	The minimum tank storage volume is 5,000L, or in compliance with BASIX, whichever is the greater.	Connection for garden irrigation and for internal use.	
	Single Dwelling in sites greater than 1000m ² .	The minimum tank storage volume is 10,000L; or in compliance with BASIX, whichever is the greater.	Is to be at least one internal connection to laundry or toilet.	
	Single Dwellings in locations B, C and D (where an inter-allotment drainage cannot be obtained or it is located within the OSD exemption map 24.R.9) is to provide rainwater storage in lieu of OSD.			

24C.4 MANDATORY RAINWATER TANK
REQUIREMENTS (continued)

Controls

Table 24C.4-1: Mandatory Rainwater Tank Requirement by Development Type (continued)

Type	Description	Minimum Tank Storage Volume	Minimum Use of Retained Water
Type 4	Dual Occupancy	For any new dwelling: <ul style="list-style-type: none"> The minimum tank storage volume is 5,000L; or in compliance with BASIX, whichever is the greater; plus <ul style="list-style-type: none"> 2,000L for any existing dwelling to be retained 	Connection to garden, toilet and laundry and hot water is encouraged for the existing dwelling.
Type 5	High and medium density	The minimum tank storage volume is that required to meet the 50% reduction in runoff days specified in control 24B.3-4, or compliance with BASIX whichever is the greater.	Number of connections required to meet the specified target. Is to also be connected to garden, podium plantings, green roofs and walls.
Type 6	Business, Commercial, Retail	The minimum tank storage volume is that required to meet the 50% reduction in runoff days specified in control 24B.3-4, or compliance with BASIX or the Green Star Rating, whichever is the greater.	Number of connections required to meet the specified target. Is to be connected to garden, podium plantings, and any green roofs and walls.
Type 7	Open Space	2,000L for every five toilets or part thereof in any building erected.	Is to be connected to toilets. Where possible also for irrigation.
Type 8	Subdivision	2,000L for any dwelling to be retained on a newly created lot.	The minimum use of retained water will be garden irrigation. Connection to toilet and laundry and hot water is also encouraged.
Type 9	Any Other Development	As determined by Council, dependent on development type	

◆ Or where total site Built Upon Area is above 60%.

Note: The mandatory rainwater tank volume requirement may be met using one or more tanks, as appropriate to the site and the required use of stormwater.

Note: The installation of rainwater tanks are to be in accordance with *Figure 2: Typical Rainwater Reuse Tank and Use in the Ku-ring-gai Council Technical Guideline for Water Management*.

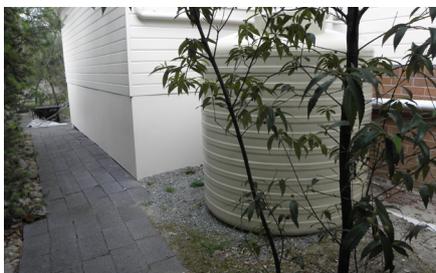


Figure 24C.4-1
Rainwater tank blends
with dwelling

24C.5 CONTROLS FOR ON-SITE DETENTION

Controls

Part 24C.5 applies to locations A, B and D (where connection to an easement is available), and in some circumstances to Location C properties where bushland overland flow is directed to downslope properties.

- 1 OSD Exemptions will only be considered for properties identified on the OSD Exemption Map in 24R.5.

Note: Exempting of OSD will be subject to Council approval.

Note: Developments on properties which benefit from an OSD exemption may be subject to additional rainwater reuse tanks requirements in accordance with part 24C.4.

- 2 The orifice plate is to be installed in any discharge control pit at the same time as the pit is connected to the outlet pipe. The on-site detention system is not to discharge uncontrolled runoff into the downstream drainage network.
- 3 To protect the streetscape character, above ground on-site detention systems in the front setback are to be avoided.

Development Type 1 and 2

- 4 OSD is not required for development Types 1 and 2 unless the development increases the BUA to over 60% of the site area, or it is required to control rates of runoff into existing stormwater systems.

Development Types 3, 4, 5 and 6

- 5 Any rainwater retention system is to be included as part of the stormwater management system and is to comply with the installation specifications available on Council's website.
- 6 In areas where it is desirable that peak outflows from the subject site do not coincide with the peak flow for the catchment as a whole, the permitted site discharge and storage volume is to be calculated in the following manner:
 - i) Determine in which OSD drainage catchment the site is located (refer to the *Ku-ring-gai Council Technical Guideline for Water Management*);
 - ii) Use the information and calculation sheet in the *Ku-ring-gai Council Technical Guideline for Water Management* to determine the permitted site discharge and minimum OSD storage volume required for the development; and
 - iii) Deduct from the minimum storage volume (SSR1 or SSR2 from the *Ku-ring-gai Council Technical Guideline for Water Management*) the minimum volume of the any rainwater tank required at 24B.4 of this Part up to an absolute maximum of 10% of SSR provided the tank, is at least, plumbed to toilet and garden irrigation.

Note: The permitted site discharge (PSD) is to remain as specified in the *Ku-ring-gai Council Technical Guideline for Water Management*.

24C.5 CONTROLS FOR ON-SITE DETENTION (continued)

Controls

- iv) Areas, such as green roofs, permeable paving, and hard stand directed to raingardens or rainscaping, may be included in the impervious area bypassing the detention system in the On-site Detention system, calculation sheet (in the *Ku-ring-gai Council Technical Guideline for Water Management*).
- 7 Except where it is demonstrably not practicable, the stormwater management system is to incorporate at least two different devices or techniques so as to reduce the risk of total system failure, ie. rainwater tanks may NOT be the sole means employed for on-site stormwater management.
- Note:** Examples of means that may be acceptable to Council (depending on site circumstances) include:
- i) a rainwater tank and OSD; or
 - ii) a rainwater tank, OSD and a raingarden.
- 8 The system is to be designed such that overflow from the retention system is captured by the OSD device(s) employed on the site and disposed of in accordance with Part 24B.

Development Types 7, 8, and 9

- 9 For development where construction of sealed driveways or roadways with an area greater than 200m² is proposed, an on-site detention system will be required to treat that area prior to discharge into the Council system. The SSR and PSD for this system is to be calculated using the on-site detention calculation sheet in the *Ku-ring-gai Council Technical Guideline for Water Management* and based upon the total impervious area to be constructed under the subdivision application.
- Note:** The creation of new lots will not be approved unless adequate provision for gravity drainage is demonstrated for each of the lots to be created. This will include demonstration of the necessary easements as required.
- 10 Tennis Courts are to be constructed as on-site detention systems unless otherwise approved.
- Note:** For other type 7, 8, and 9 developments it is recommended that Councils pre-DA service be used, prior to the lodgement of a DA.

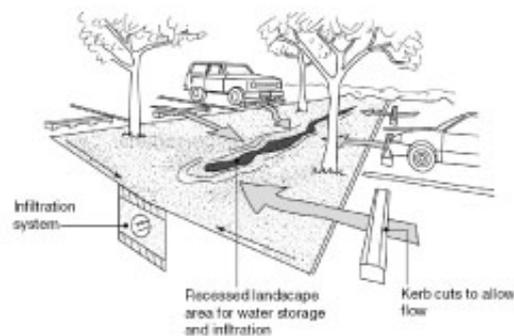


Figure 24C.5-1:
Biofiltration systems can be incorporated into vegetated areas within car parks reducing the on site detention requirements.

24C.6 STORMWATER QUALITY CONTROL

Controls

- 1 The captured stormwater is to be treated to the standards set out in the table 24C.6-1.

Table 24C.6-1: Captured Stormwater Treatment Standards

Pollutant	Baseline Annual Pollutant Load (kg/ha/yr)	Standard to be achieved (kg/ha/yr)
Gross Pollutants	500	30% (70% reduction) = 150
Total Suspended Solids	900	15% (85% reduction) = 135
Total Phosphorus	2	35% (65% reduction) = 0.7
Total Nitrogen	15	55% (45% reduction) = 8.25

- 2 For Development Types 3 and 4, and Type 2 where the development includes alterations and additions to a bathroom or laundry. The following will be deemed to comply with 1) above:
 - i) direction of roof area to a rainwater tank;
 - ii) green roof;
 - iii) permeable paving;
 - iv) direction of runoff from impermeable surfaces to rainscaping.

Note: See the Technical Guidelines for Water Management for green roof and permeable paving standard details.

- 3 For any remaining impermeable surface area, a raingarden or raingardens may be provided with a filter surface area of 2.5% of the remaining impermeable surface area. Design guidance can be found of Council's website: (krq.nsw.gov.au)

- 4 Raingardens, particularly those within the front setback, on a Heritage Item, or in a Heritage Conservation Area, are to give consideration to its appearance, including the planting.

- 5 For the purpose of 2) above, the area of impermeable surface used to calculate the required raingarden surface area can be reduced by the following:

- i) area of roof that is directed to a rainwater tank;
- ii) area of green roof;
- iii) area of permeable paving;
- iv) area of impermeable surfaces where runoff is directed to rainscaping.

Note: Gross pollutant load has been set higher than typical Australian values reflecting the significant weight of leaf litter generated within Ku-ring-gai.

Note: Within the Ku-ring-gai local government area the vegetation associated with soils derived from Hawkesbury sandstone are particularly intolerant to phosphorus. For this reason, water quality standards for phosphorus and gross pollutants leaving a site have been set at a high standard. It is important to note that the pollutant load standard to be achieved for phosphorus is based on technology currently available.

Note: Standards to be achieved are a percentage of the 'baseline annual pollutant load', which is defined as the expected post-development pollutant load that would be discharged from the site over the course of an average year if no stormwater reuse or treatment measures were applied. The load is determined based on average rainfall of 1200 mm per year from a 50% impervious catchment with concentrations derived from average values reported in Engineers Australia Australian Runoff Quality (as updated).



Figure 24C.6 -1

A green roof can reduce the required OSD, insulate the roof, encourage small wildlife, and provide enjoyment for local residents.

Source author: Sookie

24C.6 STORMWATER QUALITY CONTROL (continued)

Controls



Figure 24C.6 -2
A local raingarden connected to the overflow of a rainwater tank improves water quality and reduces runoff to the adjoining bushland.

- 6 For Development Types 5, 6, 8 and 9 (including car parks):
 - i) all stormwater flows from regular rainfall events (up to the 40% AEP storm) are to be captured for treatment prior to discharge to the stormwater drainage system.
 - ii) a suitably qualified and experienced engineer is to certify that the proposed management measure(s) to be used at the site (whether proprietary or otherwise) will achieve the standards for water quality required in this DCP;
 - iii) the design is to be based on MUSIC modelling prepared in accordance with Council's MUSIC Modelling Guidelines available on Council's website (www.krg.nsw.gov.au) and in the MUSIC-link function within MUSICv6 (or the latest version).
 - iv) the certification and modelling is to be submitted with the development application.
 - where MUSICv6 (or the latest version) is used a MUSIC-link validation report for Ku-ring-gai Council is to be submitted with the development application
 - where an older version of MUSIC is used the model files are to be submitted to Council to enable MUSIC-link validation to be undertaken.
 - any model using parameters not in line with Councils MUSIC modelling guidelines are to provide clear justification for any variation.

Note: modelling software other than MUSIC may be used, however all assumptions, inputs and parameters used are to match Councils MUSIC modelling guidelines and be clearly explained/demonstrated. Council may also require the model to be certified by a third party (at the proponents expense).
- 7 The treatment measure(s) is to include one or more of the following methods or other as appropriate:
 - i) Proprietary device/s including an independent certification that it is able to capture and treat or retain the pollutant load specified;
 - ii) Any appropriate method described on Council's website or other technique appropriate to the site including:
 - retention (ponds, wetlands);
 - retention and filtration (raingarden, sand filters, permeable paving);
 - re-use and re-charge (rainwater tanks and infiltration systems); or
 - filtering and conveyance (vegetated swales); and
 - Gross Pollutant Traps (GPTs).
- 8 Treatment is to occur as close as practicable to the source to maximise effectiveness.
- 9 Where it is proposed to treat stormwater using one or more proprietary devices, technical specifications from the manufacturer are to be provided with the development application as evidence of the performance capabilities of the device.
- 10 Council will require a Positive Covenant or restriction on use (see 24R.4 of this Part) for any approved proprietary device to ensure the continued functioning and maintenance of the device.

24D Existing Drainage Systems

- 24D.1 General
- 24D.2 Flood Studies and the Design Flood Standard
- 24D.3 Development Over or Adjacent to a Natural Waterbody, Open Channel or Drainage Depression
- 24D.4 Development Over or Adjacent to an Underground Pipeline
- 24D.5 Tennis Courts and Other Sporting Surfaces
- 24D.6 Fences
- 24D.7 Swimming Pools and Spas

READ WITH
SECTION B PART 17 - Riparian Lands

REFER TO
Ku-ring-gai Council Technical Guideline for Water Management



24D.1 GENERAL

Objectives

- 1 *To ensure existing stormwater flow paths and drainage systems are preserved during all rainfall events.*
- 2 *To ensure natural watercourses and floodplain processes are maintained.*
- 3 *To ensure flows maintain or mimic natural or pre-development conditions.*
- 4 *To enhance the environmental function of urban creeks and riparian lands.*
- 5 *To preserve the integrity of existing open waterbodies.*
- 6 *To minimise the detrimental effects on neighbouring properties.*
- 7 *To ensure accessibility to existing and future underground piped drainage systems is preserved for maintenance and construction purposes.*
- 8 *The impact of flood events is not increased.*
- 9 *To protect new development from inundation or flood damage.*

Controls

Controls 1 - 3 below are only relevant where it is proposed to undertake development adjacent to or over an existing drainage system (including a natural waterbody). In such situations the following controls apply:

- 1 Development is to be kept clear of floodways.
- 2 Development is not to impede overland flows.
- 3 Development in the vicinity of drainage systems are not to result in:
 - i) increased incidences of flooding;
 - ii) damage to property and belongings;
 - iii) risk to life;
 - iv) loss of environmental amenity and integrity; or
 - v) difficulty in maintaining or upgrading an associated drainage system.

Note: There may also be shallow overland flow paths and depressions that may not be formally identified in the flood planning area that are to be considered in design.

24D.2 FLOOD STUDIES AND THE DESIGN FLOOD STANDARD

Controls

A flood study is undertaken to identify the reach and depth of overland flows associated with drainage systems on or near a site and to assess the impact of development on such flows and vice versa. Drainage systems include underground pipes, natural watercourses, open channels and depressions.

Note: Council has completed flood studies for selected catchments. Refer to Flooding Ku-ring-gai (nsw.gov.au)

- 1 Where a Catchment Flood Study has been completed and the site is identified on the Flood Planning Area map any development proposal is to demonstrate:
 - i) Development is confined to a part of the site which is flood free; or
 - ii) All dwellings are set at or above the specified freeboard; and
 - iii) Development will not exacerbate flooding depth, extent or flow velocities on adjoining properties; and
 - iv) Any part of the dwelling house or any ancillary development that is erected at or below the flood planning level is to be constructed of flood compatible material, and able to withstand the forces exerted during a flood by water, debris and buoyancy up to the flood planning level.

Note: Absence of Flood Planning Area or Probable Maximum Flood mapping on a property does not mean the site is free from overland flows during major rainfall events – all development is to carefully consider potential flow paths and incorporate good drainage design to minimise potential impacts during major rainfall events.

2. Where a Catchment Flood Study has not been completed or Council considers that a development proposal, associated with a nearby drainage system, may:
 - i) be subject to inundation from overland flows causing damage to property or belongings; and/or
 - ii) be subject to structural damage from overland flows or debris associated with the overland flows; and/or
 - iii) impede the passage of stormwater associated with the design flood standard to cause a rise (afflux) in the flood level upstream greater than 50mm; and/or
 - iv) divert overland flows onto or into surrounding properties; and/or
 - v) increase the downstream velocities of flow for the design flood standard.

Council reserves the right to request that a flood study be undertaken and prepared in accordance with 24R.3 of this Part.

24D.2 FLOOD STUDIES AND THE DESIGN FLOOD STANDARD (continued)

- 3 The design flood standard is to be calculated based on either:
 - i) the overland flow associated with the 1% AEP storm event with any above-ground channels and underground pipes / culverts operating at a maximum of 50% capacity; or
 - ii) the overland flow associated with the 20% AEP storm event with any above-ground channel or underground pipes / culverts fully blocked;
 - iii) whichever is the greater.
- 4 For sensitive and hazardous development Council may require the adoption of events between the 1% AEP and Probable Maximum Flood (PMF) as the design flood event where it is considered that the proposed works pose a greater than usual risk to persons and/or property.
 - i) Sensitive and hazardous development includes:
 - a) Early education and care facilities.
 - b) Educational establishments.
 - c) Emergency services facilities.
 - d) Group homes.
 - e) Hospitals.
 - f) Respite day care centres.
 - g) Seniors housing.
 - h) Hazardous storage establishments.

24D.3 DEVELOPMENT OVER OR ADJACENT TO A NATURAL WATERBODY, OPEN CHANNEL OR DRAINAGE DEPRESSION

Further controls that may apply

**SECTION B
PART 17 - Riparian Lands**

Controls

Note: Development within 40m of 'waterfront land' may be Integrated Development. Integrated Development requires consent from at least one public body other than Council.

The following controls apply to development over or adjacent to a natural waterbody, open channel or drainage depression.

- 1 Where works are proposed to be undertaken adjacent to the design flood standard conveyance zone associated with a watercourse, open channel or drainage depression, and Council considers it to be necessary, a flood study is to be prepared in accordance with 24R.3 of this Part to demonstrate that the development will not:
 - i) be subject to inundation from flows associated with the watercourse causing damage to property or belongings; and /or
 - ii) be subject to structural damage from flows associated with the watercourse or debris associated with the flows; and/or
 - iii) impede the passage of stormwater associated with the watercourse to cause a rise (afflux) in the flood level upstream greater than 50mm; and/or
 - iv) divert flows associated with the watercourse onto or into adjacent properties; and/or
 - v) increase the downstream velocities of flow for the design flood standard.

- 2 Bridges may be considered, where:
 - i) the underside of any bridge structure, including any attached utility services, is not less than 300mm above the level of the design flood standard;
 - ii) the existing velocity of water in the watercourse would not be affected;
 - iii) not more than one bridge is established per property; and
 - iv) the watercourse and banks beneath the bridge are stabilised by rock lining or equivalent to prevent erosion that would otherwise result from reduced plant growth due to restricted solar access.

Note: Lower level bridges may be considered subject to demonstration that they are structurally adequate, will not impact upon stormwater flows (including backwater affecting upstream property) and will enable dry access during storm events up to the 5% AEP.

24D.3 DEVELOPMENT OVER OR ADJACENT TO A NATURAL WATERBODY, OPEN CHANNEL OR DRAINAGE DEPRESSION (continued)

Controls

- 3 Where the design flood standard is less than 20m³/s, or identified as overland flow on the Flood Planning Area Map* the minimum floor level of all enclosed areas and structures, including all habitable floor areas, is to be either:
- i) 300mm above the design flood standard level; or
 - ii) 300mm above the highest existing ground level along the associated overland flow path; or
 - iii) whichever is the greater, except in the case of garages, where the minimum height is to be 150mm instead of 300mm, and in-ground swimming pools, which is to be designed in accordance with the provisions of 24D.7 (4) of this Part

*where a flood study has been completed.

- 4 Where the design flood standard exceeds 20m³/s, or as identified as mainstream flow on the Flood Planning Area Map* the minimum floor level for all enclosed areas, including all habitable floor areas, are to be 500mm above the design flood standard level, except in the case of garages, where the minimum height is to be 300mm, and in-ground swimming pools, which is to be designed in accordance with the provisions of 24D.7 (3,4,5) of this Part.

*where a flood study has been completed.

Note: Council may require, as a condition of consent, that the following burdens be placed on the title of the subject property over the following areas of the property:

- i) a restriction-on-use over the determined design flood standard conveyance zone for an overland flow path associated with a natural waterbody, open channel or drainage depression, the terms of which do not permit the placement of any structures within that zone which may impede the design flood standard; and/or
 - ii) a drainage easement to the benefit of Council and/or upstream properties as applicable.
- 5 Safety fencing that is required to reduce hazard to persons to acceptable limits may be installed in any areas that are subject to overland flow. Safety fencing is to be able to withstand a velocity x depth ratio of 0.4m²/s, not impede flows or debris, and meet the minimum requirements of AS1926.1-1993: Fencing for Swimming Pools or any standard that replaces it. If fencing is not feasible, other suitable measures may be provided to restrict access to areas which exceed this limit.
- 6 Parking areas are not to be established in areas where vehicles would become buoyant in an overland flow zone, and hence unstable. A maximum velocity x depth ratio of 0.6m²/s to 0.7 m²/s applies in these instances in accordance with Australian Rainfall and Runoff.

Note: Australian Rainfall and Runoff is published by Engineers Australia www.eabooks.com.au. Information on updates to Australian Rainfall and Runoff can be found at www.arr.org.au

**24D.4 DEVELOPMENT OVER OR ADJACENT TO
AN UNDERGROUND PIPELINE**

Further controls that may apply	
	SECTION B PART 17 - Riparian Lands

Controls

- 1 The exact location of any drainage line within (or out of) any drainage easement is to be established by a registered surveyor, including size, depth to obvert from ground levels and changes in direction, and shown on a scaled drawing.
- 2 Notwithstanding the controls contained in this section, development is not permitted over or adjacent to a drainage easement and/or pipe unless it also meets the requirements of 24D.3 (3,4) of this Part.
- 3 No structure will either encroach upon or be located within a drainage easement. Where no easement is present, no structure will encroach within a 1.5 metre wide zone either side of an underground drainage system, with the exception of carports and other open-faced structures, where:
 - i) existing overland flow paths are maintained, i.e there is no substantial alteration to existing ground levels;
 - ii) the pipe size does not exceed 525mm;
 - iii) all sides of the structure are open-faced to not less than 300mm above the top water level of any overland flow path;
 - iv) the structure has a minimum 2.5 m head clearance along the length of the easement or pipeline;
 - v) footings do not encroach into the easement and are not located where they would cause any structural loading on an underground pipe;
 - vi) velocity x depth profiles of associated overland flows do not exceed 0.4 m²/s; and
 - vii) the structure is readily removable and would not compromise future access to the in-ground drainage system for maintenance or upgrade.
- 4 Parking stands to be paved as set out below.
 - i) paving, where finished ground levels over the pipe or easement will not be substantially altered, where existing overland flow paths will be maintained and where a suitable full-depth expansion joint or equivalent measure is provided along the easement boundaries or 1.5 m from the centreline. Paving is to be readily removable for future maintenance or upgrade;
 - ii) eave overhangs where a minimum 2.5m head clearance to ground level is provided;

24D.4 DEVELOPMENT OVER OR ADJACENT TO AN UNDERGROUND PIPELINE (continued)

Controls

- iii) footings that extend to at least the depth of the invert of the associated pipe or that are placed on competent bedrock. Refer to *Figure 10: Typical Footing Adjacent to Drainage Easements/Pipes in the Ku-ring-gai Council Technical Guideline for Water Management*;
- iv) tennis courts and other sporting surfaces in accordance with 24D.5 of this Part; and
- v) fences, where construction does not, either partly or fully, obstruct any existing overland flowpath and which comply with 24D.6 of this Part.

Note: The approval of such structures will be at the discretion of Council.

- 5 Where any structure is to be located within a drainage easement in accordance with the controls listed at clause 3 above, a written agreement to the activity is to be obtained from all beneficiaries of the easement.
- 6 Where works are required to Council's drainage systems or in easements on private land the natural form of the channel is to be reinstated where feasible as identified on the 'Riparian Lands Map' in the KLEP. See Section 6.7 of the KLEP, and Part 17 of this DCP.
- 7 Where underground drainage lines exist within private property without the benefit of an easement, Council may require the creation of an appropriate easement at no cost to Council as a condition of approval for any Development Application for the subject land.

Note: In the event that works need to be carried out on Council drainage systems for private developments or in easements, the costs of removal and replacement of any structure permitted under this section will NOT be borne by Council.

24D.5 TENNIS COURTS AND OTHER SPORTING SURFACES

Controls

Tennis courts will not generally be permitted over drainage systems, however, in certain limited circumstances, Council may consider such a proposal acceptable. A tennis court in such a location is to comply with the controls set out below.

- 1 Tennis courts are not to be constructed within the riparian land associated with any watercourse (see 'Natural Resources - Riparian Lands Map' in the KLEP).

24D.6 FENCES

Further controls that may apply

SECTION B
PART 17 - Riparian Lands

Controls

- 1 No fence of any construction type may be established within the cross-section of the main flow channel associated with watercourses.
- 2 No fence of solid construction may be established over a natural watercourse, open channel or drainage depression.
- 3 Fences, whether located at boundaries or within a property, are to not obstruct any overland flow path associated with a watercourse, open channel, easement or drainage depression.
- 4 Any fence located within an overland flow path as defined by the flood design standard is to be of open construction to at least 300mm above the flood design standard level.

24D.7 SWIMMING POOLS AND SPAS

Controls

- 1 Swimming pools, spas and associated equipment are to be located not less than 1.5m from any outer edge of an underground drainage system operated by Council, regardless of whether an easement has been created for the drainage system.

Note: This is to ensure that Council will be able to maintain the system without compromising the pool structure (eg. lifting plant).

- 2 Where it is proposed to establish a pool adjacent to the design flood standard conveyance zone associated with an overland flow path, watercourse, channel or drainage depression, a flood study is to be prepared in accordance with the provisions of 24D.2 of this Part and 24R.3 of this Part to ascertain the design flood standard and demonstrate that the pool structure will:
 - i) not impede the flow of stormwater associated with the design flood standard so as to cause a rise (afflux) in the flood level upstream greater than 50mm;
 - ii) not increase the downstream velocities of flow for the design flood standard; and
 - iii) not be subject to structural damage associated with the conveyance of the design flood standard (water) or the impact of debris transported by the flows.
- 3 Where the design flood standard flow is less than 20m³/s, the minimum finished level of the swimming pool or spa coping is to be not less than 150mm above the design flood standard level.
- 4 Where the design flood standard flow is greater than 20m³/s, the minimum finished level of the swimming pool or spa coping level is to be not less than 300mm above the design flood standard level.
- 5 No swimming pool or spa is to be established where it will be subject to inundation from the calculated design flood standard.

Note: The presence of silt, debris and other pollutants in overland flows can severely compromise the life of the pool, spa and associated equipment where they are inundated. In this respect, covenants or similar which place the onus for maintenance of the swimming pool or spa on the property owner where it is known that they will be inundated will not be considered by Council.

24E Road and Trunk Drainage Design

24E.1 Design procedures

REFER TO

**Ku-ring-gai Council
Technical Guideline for Water Management**



24E.1 DESIGN PROCEDURES

Objectives

- 1 To ensure proper management of stormwater capture and conveyance.
- 2 To achieve high standard of safety, health and amenity for persons, vehicles and property.
- 3 To manage and conserve the Ku-ring-gai environment.
- 4 To minimise risk to vehicles and property from the impacts of stormwater runoff.
- 5 To preserve existing stormwater flow paths and drainage systems during all rainfall events.

Controls

As required under legislation (including the Roads Act 1993), a design plan is to be prepared and submitted to Council for approval when any work other than minor maintenance is to be undertaken within the road and trunk drainage system.

Note: Further detail may be found in other Council documents such as Council's Specification for Road and Drainage Works.

Note: Sufficient information is to be provided for Council to assess the proposed drainage design.

Note: The care, control and management of the road and trunk drainage system, including the network of pipes, overland flow paths and natural and constructed channels, is the responsibility of Council, so any work performed on it may only be carried out with Council's knowledge and approval.

General Controls

- 1 All designs are to be prepared by a qualified civil engineer.
- 2 All calculations and designs are to be in accordance with the procedures set out in *Australian Rainfall and Runoff*.
- 3 All submissions of calculations to Council are to, where appropriate, include:
 - i) a catchment plan showing each sub-catchment and overland flow path;
 - ii) engineering plans detailing the proposed construction; and
 - iii) calculations shown on the calculation sheet contained in *Australian Rainfall and Runoff*.
- 4 Where the calculations are to be performed by approved computer modelling, full details of the input and output files are to be provided in hard copy and in acceptable electronic form.

Note: *Australian Rainfall and Runoff* is published by Engineers Australia www.eabooks.com.au. The most recent version of *Australian Rainfall and Runoff* should be used unless otherwise specified by council. Information on updates to *Australian Rainfall and Runoff* can be found at www.arr.org.au/

Hydrological Calculations

- 5 All hydrological calculations submitted to Council for approval is to be carried out in accordance with the procedures set out in *Australian Rainfall and Runoff* and in accordance with recognised engineering practice.

Note: For drainage systems in all catchments, Council has 20% and 1% AEP flow information available. This can be obtained by completing a Technical Services search form (available from Customer Service) and payment of the relevant fee.

- 6 For catchments greater than 1.5 hectares and/or where there is more than one contributing catchment, peak flowrates are to be determined using a recognised runoff routing computer model such as DRAINS.

24E.1 DESIGN PROCEDURES (continued)

Controls

Note: In all other cases, use of the rational method for determining flowrates will be considered acceptable. In these instances, the calculation sheet shown in *Australian Rainfall and Runoff* is to be included together with a plan clearly showing the catchment areas and overland flowpaths.

Note: In some areas 1 dimensional modelling may not be considered sufficient and Council may require 2 dimensional modelling to be undertaken

- 7 Runoff coefficients and times of concentration are to give due consideration to likely future development within the catchment.

Recurrence Intervals

- 8 Drainage systems are to be designed to provide both minor and major flow conveyance systems as detailed in *Australian Rainfall and Runoff*
- 9 All enclosed stormwater drainage systems are to be designed to have minimum capacity to cater for a 5% AEP storm, unless otherwise approved by Council.
- 10 An overland flowpath is to be established to accommodate the surcharge from rainfall for a storm recurrence interval of either the 1% AEP with all pipelines 50% operational or the 20% AEP with all pipes blocked, whichever provides the greatest surcharge.
- 11 Constructed trunk stormwater drainage channels are to be designed to have sufficient capacity to convey the 5% AEP rainfall event with appropriate freeboard at the bankfull level together with provision to convey the 1% AEP event in overbank flow.

Note: Council may require the recurrence intervals specified herein to be increased having regard to the particular circumstances of each case or where danger to persons or risk of significant property damage warrants such an approach.

Note: Rainfall intensities for Ku-ring-gai as derived from Australian Rainfall and Runoff are included in Ku-ring-gai Rainfall Intensity Frequency Duration Data.

Note: Topographical maps may be purchased in whole or in part from Council.

Note: Council does not retain a complete record of the locations, sizes and levels of all components of its drainage system. Upon written application to Council, relevant information may be researched for the applicant, however, Council cannot guarantee that the correct information is held in its records.

Hydraulic Calculations and System Design

- 12 Pipeline design for road and trunk drainage is to be performed using the hydraulic gradeline method set out in *Australian Rainfall and Runoff*.
- 13 Minimum internal pipe diameter is to be 375mm.
- 14 Minimum pipe gradient is to be 1.0% to allow for cleaning and self-flushing.

24E.1 DESIGN PROCEDURES (continued)

Controls

- 15 Pipe velocity is to be between 0.5m/s and 7.0m/s and preferably between 1.0m/s and 5.0m/s during the design storm to ensure the flow is self-cleansing but not likely to cause scour.
- 16 Minimum pipe cover in areas not subject to vehicular loading is to be 300mm (measured from the crown of the pipe).
- 17 Minimum pipe cover in areas subject to vehicle loading is to be 450mm. Appropriate design of bedding and backfill is also required.
- 18 Pipe classes, backfill and bedding is to be determined using the AS3725 or any standard replacing that standard.

Note: Pipeload available from the Concrete Pipe Association Australia <http://www.cpa.org.au/> can be used for bedding design and determining pipe class to be used.

- 19 Except where approved by Council, pipes are to be rubber ring jointed reinforced concrete pipes to comply with the requirements of Australian Standard AS4058 or any standard replacing that standard.

Note: Council does not permit the use of pipes or traditional concrete lined channels or their equivalent to replace existing open watercourses. Where new drainage channels are proposed, they are to be designed and constructed in an environmentally sensitive manner that mimics the environmental benefit of a natural open watercourse. This would typically involve the use of large sandstone rocks that are tightly packed to form a stable channel and also to provide niches for habitat function, sediment collection and plant growth. The size of individual rocks will depend on the design velocity of flood flow along the channel. The channel design will require sensitive design by the engineer. Refer to *Figure 9: Typical Outlet Structures to Watercourse in the Ku-ring-gai Council Technical Guideline for Water Management*.

- 20 Constructed channels is to be designed to cater for a 50% blockage factor (ie, it is to be assumed that the channel is 50% blocked during the critical design storm). This applies to both the minor and major flow conveyance design.
- 21 Inlet pits are to be located and provided with kerb inlet of adequate size to relieve the flow in gutters, such that the depth does not exceed 100mm on the high side of residential roads and 75mm on the low side of residential roads and 75mm in commercial areas. Additional pits may be required in certain locations to prevent cross road flows. The location of the gully pits on curves, kerb returns and in line with normal pedestrian traffic flows is to be avoided.
- 22 The minimum pit size for any inlet, gully or junction pit on Council drainage systems is 900x900mm clear internal.
- 23 The inlet capacity of on-grade and sag inlet pits are to be determined using equations given in *Australian Rainfall and Runoff* or the charts provided in the Appendix of *Australian Rainfall and Runoff*. Allowances are to be made for blockage in accordance with the following table:

24E.1 DESIGN PROCEDURES (continued)

Controls

Inlet Type	Side Entry	Grated	Combination	Letterbox
% Capacity Blockage	10%	30%	100% side inlet capacity only	50%

Table 24E.1-1: Inlet capacity allowance requirements.

Note: Alternative capacity allowances may be considered if they are in line with Australian Rainfall and Runoff or related updates www.arr.org.au

Note: Some areas where there is a history of blocking, such as high leaf drop, high street litter load, Council may require check analysis with higher blocking factors as part of the design

- 25 All new pits are to be constructed using galvanised steel grates and sag pits are to have a minimum internal lintel width of 2.4m nominal opening.
- 26 Water depths and velocities in free surface flows are to be determined using Manning's Equation. Where uniform flow is occurring (ie. the channel cross-section, roughness and slope are constant over a reasonable distance), Manning's Equation may be applied to the cross-section without consideration of upstream or downstream influences.

Note: For most overland flow analysis, the assumption of uniform flow will not be appropriate and consideration is to be given to upstream and downstream controls, losses for afflux and other hydraulic losses.

Preparation of Stormwater Design Drawings for Trunk Systems

- 27 Stormwater design drawings submitted to Council for approval are to include a plan view of the proposed stormwater drainage layout and a drainage longitudinal section of each proposed pipeline. These are to be drawn at recognised scales and in accordance with Australian Standard AS1100, Part 401-1984 or any standard replacing that standard.
- 28 The plan view is to clearly show the location, dimensions and types of:
- all existing drainage features including drainage pipelines, channels, structures, utility services and overland flow paths;
 - all proposed drainage features including drainage pipelines, channels, structures and overland flowpaths; together with
 - all necessary information to accurately set out the proposed works including the location, coordinates and levels of survey control marks and coordinates of each drainage node.
- 29 Drainage longitudinal sections are to be provided for all proposed stormwater drainage lines. They are to be drawn to Australian Height Datum (AHD) at the same horizontal scale as the plan view and with a vertical exaggeration of five, oriented with chainages running from left to right and are to include the following:

24E.1 DESIGN PROCEDURES (continued)

Controls

- i) existing and design surface profile;
- ii) existing and design surface levels;
- iii) existing drainage pipelines;
- iv) utility services;
- v) design pit and pipe profiles;
- vi) chainages along pipe centreline;
- vii) proposed pipe grade, size and class;
- viii) design flow and velocity;
- ix) drainage structure definition; and
- x) junction and node identification.

24F On-site Wastewater Management

24F.1 On-site wastewater management



24F.1 ON-SITE WASTEWATER MANAGEMENT

Objectives

- 1 *To ensure that land is suitable for on-site sewage management and that on-site sewage management systems are designed to operate sustainably, without resulting in environmental harm or risk to public health.*

Controls

On-site Single Domestic Sewer Management

This section contains the controls that form the basis for assessing on-site domestic sewer management systems carried out on a residential premises that does not include premises comprising of more than one dwelling. This does not apply to sewage of a commercial (non-domestic) nature or greywater re-use.

- 1 Approval is required under the *Local Government Act 1993* to install and operate an onsite domestic sewer management system. Sewer management systems manage wastewater that has been used in the home including from the toilet, urinal, bidet, kitchen, laundry, baths and showers.
- 2 Domestic sewer management facilities include septic tanks with absorption trench disposal or pump out service systems, collection wells, aerated wastewater treatment systems and composting toilets.
- 3 Applications must relate to residential premises that, only comprise of one dwelling, are normally occupied by less than 10 persons and generate an average flow of less than 2,000 litres of sewage a day.
- 4 Council can only approve the installation of sewer management systems on domestic premises if the sewer management facility has been accredited by the NSW Ministry of Health. Refer to the register of accredited sewage management facilities on the NSW Health website.
- 5 Application for installation of a sewer management system is to include:
 - i) Plan to scale, showing the location of;
 - the sewage management facility proposed to be installed or constructed on the premises, and any related effluent application areas, and
 - any buildings or facilities existing on, and any environmentally sensitive areas of, any land located within 100 metres of the sewage management facility or related effluent application areas, and
 - any related drainage lines or pipework.
 - ii) Specifications of the sewage management facility proposed and NSW Health accreditation documents.
 - iii) Site assessment including details of the climate, geology, hydrogeology, topography, soil composition and vegetation of effluent application areas.
 - iv) Statement including the number of persons residing on the premises and any other factors that are relevant to the capacity of the proposed sewage management facility.
 - v) Operation and maintenance details including maintenance and servicing arrangements and action to be taken in the event of a breakdown in operation.

24F.1 ON-SITE WASTEWATER MANAGEMENT (continued)

Controls

Domestic Greywater Diversion Systems

This section contains the controls relating to installation of a greywater diversion system on a residential premises. Domestic greywater is wastewater from washing machines, laundry tubs, showers, hand basins and baths but does not include wastewater from a kitchen, toilet, urinal or bidet.

- 6 Domestic greywater diversion requires approval under the *Local Government (General) Regulation 2021* except in the following circumstances:
- i) is carried out on a residential premises that does not include premises comprising of more than one dwelling, and;
 - ii) is carried out in accordance with the Plumbing Code of Australia, and
 - iii) a sewage management facility is not installed on the premises concerned, and
 - iv) the following performance standards are achieved;
 - the prevention of the spread of disease by micro-organisms;
 - the prevention of the spread of foul odours;
 - the prevention of contamination of water;
 - the prevention of degradation of soil and vegetation;
 - the discouragement of insects and vermin;
 - ensuring that persons do not come into contact with untreated greywater;
 - the minimisation of any adverse impacts on the amenity of the premises and surrounding lands.