

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 Rainwater tank size guide
- 24R.2 Drainage Catchments for On-site Detention
- 24R.3 Permitted Site Discharge and Minimum On-site Detention Storage Volumes
- 24R.4 On-site Detention Calculation Sheet
- 24R.5 Design of On-site Detention Systems (OSD)
- 24R.6 Design of Property and Inter-allotment Drainage Systems
- 24R.7 Flood Study Requirements
- 24R.8 Terms of Positive Covenants and Restrictions on Use
- 24R.9 OSD Exemption Map

INTRODUCTION

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

For some development types State Environmental Planning Policy (*Building Sustainability Index : BASIX*) 2004 (*BASIX*) 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.

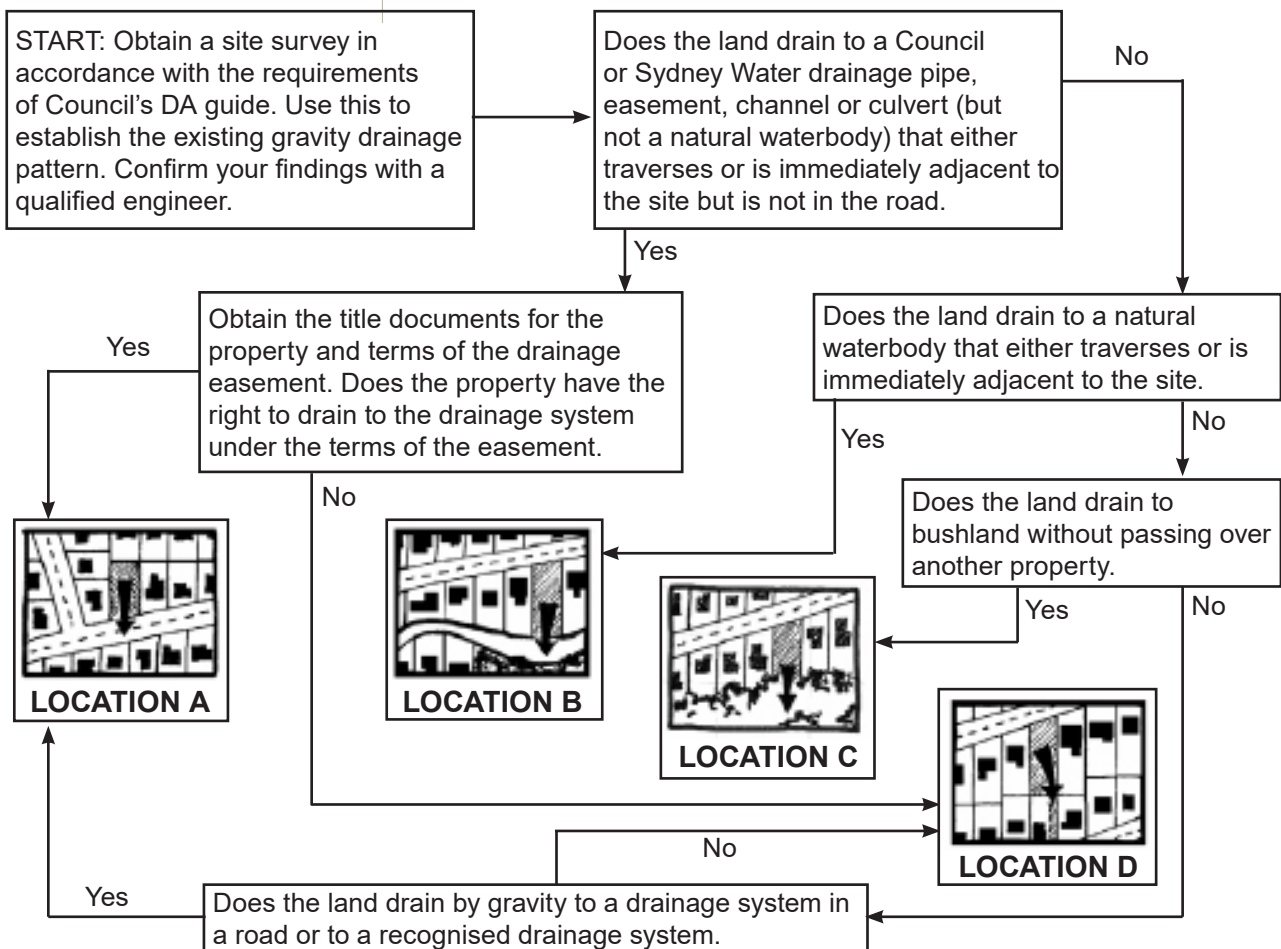
24A.2 LOCATION OF DEVELOPMENT FOR WATER MANAGEMENT

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

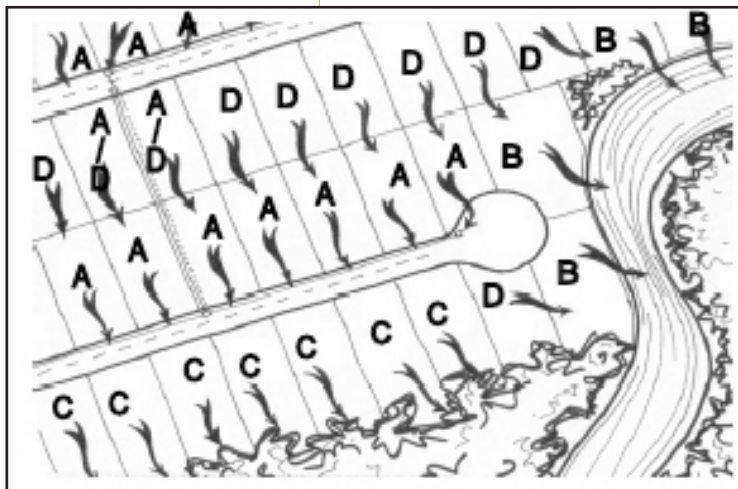
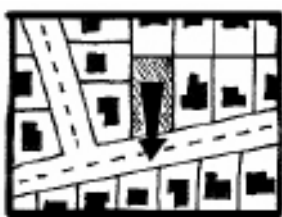


Figure 24A.2-1:
Examples of Location Types



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.



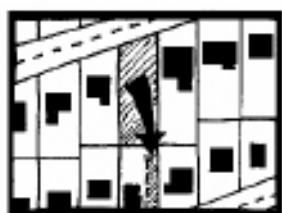
Location B

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 must 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 must 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 must be located on properties in accordance with the controls set out below.

- 1 The development must not 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 must 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 must not be located in the front setback of a development.
- 4 No more than 10,000 litres of rainwater tank storage may be located above ground.
- 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 must not result in changes to the existing ground levels within the dripline of trees to be retained.

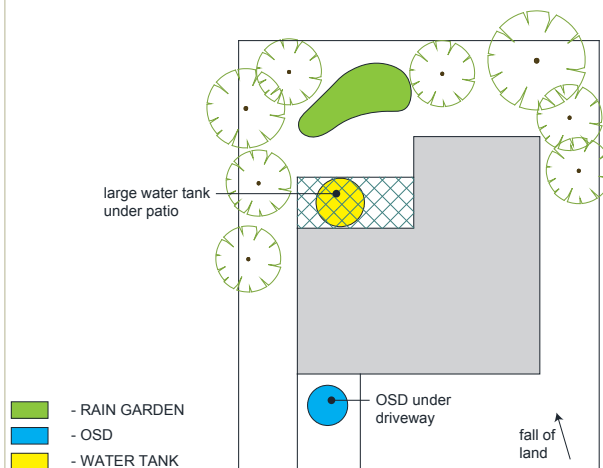


Figure 24A.3-1:
Allow sufficient space for installation and operation of required water measures.

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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.6: Design of Property and Inter-allotment Drainage systems



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

- 1 Stormwater must be discharged from the site in accordance with the controls for the relevant location category, as identified in *Part 24A* of this DCP.
- 2 Stormwater that is not retained for a use or appropriately infiltrated on site must 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 must be given to downstream impacts.

Carrying Out Drainage Works

- 5 Drainage systems for stormwater disposal must comply with *AS3500-1998: National Plumbing and Drainage Code* or any standard replacing that standard.

Note: See Council Website for the 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 must have a minimum 1% longitudinal fall towards the street gutter.
- 2 The total discharge from a single development lot to the street gutter or table drain must not exceed 25 litres per second for development Type 3 and above.

Note: Where this is not possible, stormwater must 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 must 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 must be at an angle not less than 45° from the line of the frontage of the neighbouring property;
 - iii) the crossing line must run directly behind, and parallel to the street kerb as far as the discharge point. Any necessary drainage line crossing of driveways must 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 must take place directly outside the frontage of that development and must not 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 must comply with Council Standard Drawing 82-024 (Refer to Council's Technical Guidelines for Water Management Devices).

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

Controls

- 7 When discharge is proposed to an open table drain, the pipe outlet must terminate flush with the property-side edge of the table drain and must 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:
 - i) 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
 - ii) 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 must be discharged to an existing Council pipe in the road reserve in accordance with the following controls:
 - i) For pipes of diameter up to 150mm, connection to the Council street drainage pipe must comply with Council Standard Drawing 82-024 (Refer to Council's Technical Guidelines for Water Management Devices); and
 - ii) For pipes of diameter greater than 150mm, connection to the Council street drainage pipe must, 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.

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 must 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 must connect to a new Council standard grated gully pit that must be established outside the development site.

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

Controls

- 12 The feasibility of such a proposal must be established by a suitably experienced and qualified civil engineer.
- 13 A detailed design must 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 must 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 must 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 must 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 must be established under the terms of an easement on the title of each affected downstream property.
- 16 The formed channel/pipe must have sufficient hydraulic capacity to accept the additional flow from the post developed site. The hydraulic capacity must be determined having regard to existing and cumulative future flow rates in that system.
- 17 The outlet must be designed to minimise backwater influence from the receiving system.
- 18 Connection to a Council pipeline must be made in accordance with Council Standard Drawing 82-024 (Refer to Council's Technical Guidelines for Water Management Devices). For pipes larger than 150mm diameter a junction pit must be constructed at the connection point.
- 19 Where connection is to a Sydney Water stormwater pipe, the design

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

Controls

tailwater for a sealed pipe drainage system connecting to such a channel must be the top of the channel unless otherwise specified by Sydney Water.

- 20 Any other site specific requirements of the Council or Sydney Water must 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 must be undertaken in accordance with the NSW Department of Primary Industries 'Office of Water' document 'Guidelines for Outlet Structures on Waterfront Land, 2012'.
- 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, 2012'.
- 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

Note: See Council Website for Technical Guidelines for Water Management Devices.

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 must 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 the Technical Guidelines 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 must not exceed 35% of the built-upon area.
- 3 For alterations and additions (Development Types 1 & 2), the post-development built-upon area draining to dispersal trench/level spreader system must not exceed the greater of
 - i) 35% of the total site area; or
 - ii) the pre-developed built-upon area.

24B. 5 STORMWATER DISPOSAL FROM LOCATION D PROPERTIES

Further controls that may apply		
		SECTION C PART 24R.6 - Design of Property and Inter-allotment 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.

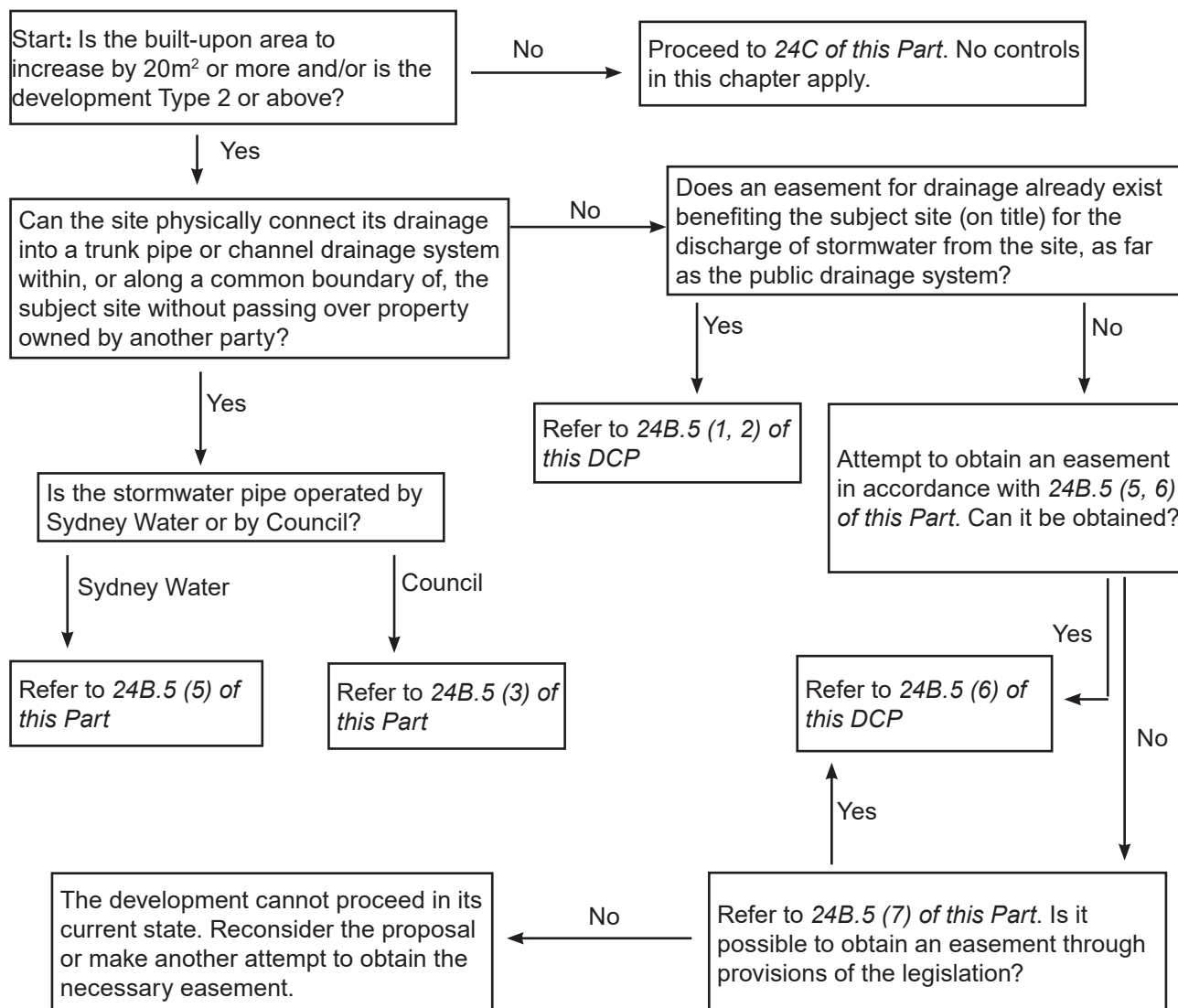
The necessary easement for interallotment drainage as far as the recognised public drainage system may already exist on the title of the subject site (generally described as being appurtenant to, or benefiting, the site). If not, it will be necessary for the owner of the subject site to obtain the necessary 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 25A.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:



*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 must:

- 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.6 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 – 1998 – National Plumbing and Drainage Code* or any subsequent standard replacing that standard;
- viii) connection to a formed stormwater channel is made in accordance with Council Standard Drawing 82-024 (Refer to Council's Technical Guidelines 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 must 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 must 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 must 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 must 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 must be in accordance with the steps set out below.
 - i) The developer must 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 must also be consulted.
 - ii) After establishing the route, the developer must write to the owners of all the relevant downstream properties requesting

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

Controls

an interallotment drainage easement as far as is necessary to connect into a recognised public drainage system. The letter may offer financial compensation and must 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 must 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 must 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 must be borne by the applicant.

- 6 The second step: Prepare the design as per 24R.6 of this Part. If the development application is to be approved it will 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 must be carried out.

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

Note: The width of the easement to be created must 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 25R.6 for the required widths and placement of easements.

- ii) The survey plan, owners' written approval, application form and fees must be lodged by the developer at the LPI. The Council must 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 must be obtained by the developer from the LPI and supplied to the relevant landowners, the certifying authority as is necessary in the approval process and to Council for its records

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

Controls

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 must 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 must 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 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 a sheet flow to provide an opportunity for water take-up by vegetation downstream from the trench;

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

Controls

- 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) It is demonstrated that, for new single dwellings (Development Type 3), the maximum post developed built-upon area draining to the:
 - infiltration/absorption trench system will not exceed 30% of the total site area; or
 - dispersal/level spreader trench system will not exceed 35% of the total site area.
 - v) It is demonstrated that, for alterations and additions (Development Types 1 & 2), the post-development built-upon area draining to:
 - an infiltration/absorption trench system will not exceed the greater of
 - 30% of the total site area; or
 - the pre-developed built-upon area;
 - a dispersal/level spreader trench system will not exceed the greater of
 - 35% of the total site area; or
 - the pre-developed built-upon area.
 - vi) The design and construction of the system are undertaken in accordance with the relevant Technical Guidelines for Water Management Devices.

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

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

Controls

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 must be prepared by a qualified civil or hydraulic engineer;
- 16 A stilling pit must 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) must be available from the roof gutter to the invert of the inlet in the stilling pit;
- 18 A maximum of 1.5m difference in level must exist between the invert level of the inlet in the stilling pit and the base of the downpipe;
- 19 A minimum of 1.0m head (height) must be available from the roof gutter to the top of the rainwater tank;
- 20 Hydraulic grade line calculations must 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);
- 21 The drainage line from the stilling pit to the street system must be in accordance with control in 24B.2 (1-7) of this Part;

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

Controls

- 22 The property drainage system must be fully sealed from the level of the roof gutter to the stilling pit;
- 23 The charged system must be a minimum uPVC sewer grade 100mm diameter;
- 24 Leaf guards must be established on all proposed roof gutters to minimise debris entering the system. Providing leaf guards to existing gutters is strongly encouraged;
- 25 A grated cleanout pit must be established adjacent to all system low-points in which is provided a screw-capped sealed extension of the respective main charged drainage line;
- 26 An appropriate flap valve must be established over the inlet pipes to the stilling pit in order to minimise mosquito nuisance;
- 27 Drainage systems for stormwater disposal must comply with *AS3500– 1998 – National Plumbing and Drainage Code*; and
- 28 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.
- 29 The design and construction of the system are undertaken in accordance with the relevant Technical Guidelines for Water Management Devices.

Pump-out systems

- 30 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 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.
- 31 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.

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

Controls

- 32 Pump-out systems must comply with the controls set out below.
- i) The Development must be type 1, 2 or 3 only.
 - ii) The applicant must demonstrate in writing that no easement may be obtained for the discharge of stormwater from the site.
 - iii) The pump-out system must not be the sole means of stormwater discharge from the site.
 - iv) The pump-out system must 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 must not exceed 100m²
 - vi) The pump-out system must 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 must not enter an existing drainage system where flooding affects private and/or public property including parks and reserves. In this respect, it must 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
 - 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 must 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 must 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.

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

Controls

- x) A stilling pit must 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 must 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 must be provided.
- xi) Overflow from the ponding area of the pump-out system must 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 13.6 m³ volume based on the 100 year 2 hour storm of 62mm/h 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 must 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 must 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



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 must 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 must be sympathetically treated to minimise visibility.

24C.2 EFFECTIVE STORMWATER MANAGEMENT

Controls

An appropriate method or combination of methods must be provided on the site to manage stormwater quality and flows. The system must 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.

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.
- 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.



Figure 24C.2-1
Informal raingarden



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

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.

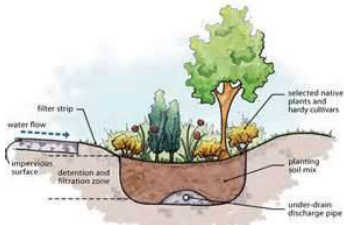


Figure 24C.3-1
Concept design of a
raingarden



Figure 24C.3 -2
Vegetated Infiltration basin

- 1 The stormwater management system, as far as is practicable, must 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 must 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 must 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 must 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 paving is available in the Technical Guidelines for Water Management Devices

- Runoff is to be controlled to ensure it does not cause flooding to the dwelling or neighbouring properties.
- ii) for Development Types 5, 6, 8 and 9; and for proposed variations to iii) below:

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

Controls



Figure 4B.3 -3
Permeable paving used to reduce runoff to bushland on a Location C property.

- Rainwater tanks must be sized and installed in accordance with table 24C.4-1, and
 - A suitably qualified and experienced engineer must 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:
- Rainwater tanks sized and installed in accordance with table 24C.4-1 and 24R.1; and either of the following:
 - 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
 - An unlined raingarden with a filter surface area in accordance with 24C.6 -2.
- 5 The selected stormwater techniques must 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 must 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) riparian lands; and
- vi) 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.

- 7 Subsurface water management systems are to be designed to be easily maintained. Council may require a Positive Covenant (see 24R.8 of this Part) to ensure the continued functioning and maintenance of the approved subsurface water management system.

Controls

- 8 Basement excavations are to be fully tanked unless it can be demonstrated that ongoing dewatering will be less than 3ML/year AND the proposal is approved by NSW DPI Office of Water. The discharge of groundwater into the public drainage system required approval from Council and will only be granted where water quality and flow requirements are met.

24C.4 MANDATORY RAINWATER TANK REQUIREMENTS

Controls

For all Locations (A-D), at least one rainwater tank must 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, must 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 2000L, 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 2000L, or, compliance with BASIX, whichever is the greater.	In accordance with 24R.1
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 as required in 24R.1, or in compliance with BASIX, whichever is the greater.	Connection to garden and for internal use.
	Secondary Dwellings		The minimum tank storage volume is requirement of 2,000L rainwater tank for all secondary dwellings.	
Type 3	Single Dwellings		The minimum tank storage volume is 5,000L; as required in 24R.1; or in compliance with BASIX. whichever is the greater.	In accordance with 24R.1
Type 4	Dual Occupancy		For any new dwelling: <ul style="list-style-type: none"> The minimum tank storage volume is 5,000L ; as required in 24R.1; or in compliance with BASIX. whichever is the greater; plus <ul style="list-style-type: none"> 2000 litres for any existing dwelling to be retained 	Connection to garden, toilet and laundry and hot water is encouraged for the existing dwelling.

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 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. Must 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. Must be connected to garden, podium plantings, and any green roofs and walls.
Type 7	Open Space	2000L for every five toilets or part thereof in any building erected	Must be connected to toilets. Where possible also for irrigation.
Type 8	Subdivision	2000L 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	

*Increase in built-upon (impervious) area.

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: Controls for the installation of rainwater tanks are contained in Councils Technical Guidelines for Water Management Devices.

Note: Type 3 developments which are not required to provide OSD (location C properties, and properties which benefit from an OSD exemption as identified in part 24R.9, etc.), must provide additional rainwater reuse tanks in lieu of OSD. The minimum tank storage volume is to be 10,000L, or compliance with BASIX, whichever is the greater.



Figure 24C.4-1
3000L water 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.

- 1 OSD Exemptions will only be considered for properties identified on the OSD Exemption Map in 24R.9.
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 must 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 of the site to over 60% or it is required to control rates of runoff into existing interallotment systems which have a capacity less than the post-developed PSD on the site, and are not proposed to be reconstructed at greater capacity. These calculations must be demonstrated to Council.

Development Types 3, 4, 5 and 6

- 5 Any rainwater retention system must be included as part of the stormwater management system and must 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 must be calculated in the following manner:
 - i) Determine in which OSD drainage catchment the site is located 24R.2 of this Part;
 - ii) Use the information in 24R.3 of this Part and the calculation sheet at 24R.4 of this Part 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 24R.3 of this Part) 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) must remain as specified at 24R.3 of this Part.

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 (refer to 24R.4)
- 7 Except where it is demonstrably not practicable, the stormwater management system must 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 must 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 Type 8 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 must be calculated using 24R.4 of this Part 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 must 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.

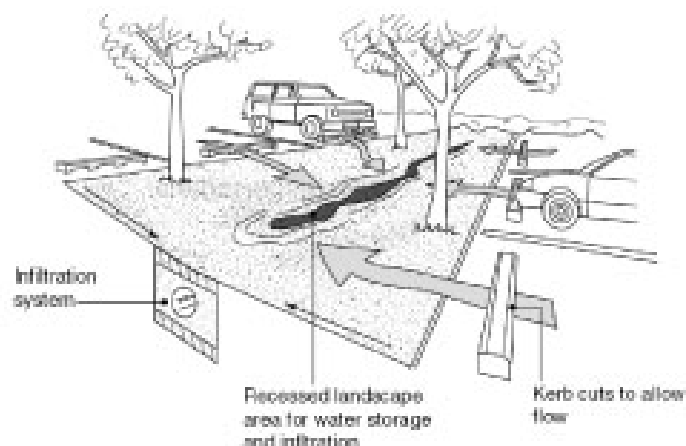


Figure 24C.5-1:
Biofiltration systems can be incorporated into vegetated areas within car parks reducing the on site detention requirements.

24C.6 STORMWATER QUALITY CONTROL

Controls

- 1 The captured stormwater must 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 Devices 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: (kg.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).

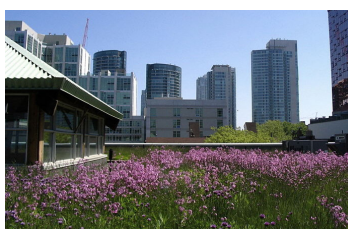


Figure 24C.6 -1

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

Source author: Sookie



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.

24C.6 STORMWATER QUALITY CONTROL (continued)

Controls

- 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) must be captured for treatment prior to discharge to the stormwater drainage system.
 - ii) a suitably qualified and experienced engineer must 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 must be submitted with the development application.
 - where MUSICv6 (or the latest version) is used a MUSIC-link validation report for Ku-ring-gai Council must be submitted with the development application
 - where an older version of MUSIC is used the model files must be submitted to Council to enable MUSIC-link validation to be undertaken.
 - any model using parameters not in line with Councils MUSIC modelling guidelines must provide clear justification for any variation.

Note: modelling software other than MUSIC may be used, however all assumptions, inputs and parameters used must 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) must 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 must 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 must 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.8 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

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 must be kept clear of floodways.
- 2 Development must not impede overland flows.
- 3 Development in the vicinity of drainage systems must not 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.

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.

- 1 Council reserves the right to request that a flood study be undertaken where it 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 adjacent properties; and/or
 - v) increase the downstream velocities of flow for the design flood standard.

The flood study must be prepared in accordance with 24R.7 of this Part.

- 2 The design flood standard must 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.

Note: Council may require the adoption of a longer recurrence interval design storm such as the Probable Maximum Flood (PMF) where it is considered that the proposed works pose a greater than usual risk to persons and/or property.

- 3 Where a flood study has been completed and the site is identified on the flood planning area map any development proposal must demonstrate:
 - i) Development will not exacerbate flooding on adjoining properties; and
 - ii) Development is confined to a part of the site which is flood free; or
 - iii) All dwellings are set at or above the specified freeboard

Note: Council has completed flood studies for selected catchments. Please check www.krg.nsw.gov.au

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 must be prepared in accordance with 24R.7 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 $20\text{m}^3/\text{s}$, 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, must 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 must be 150mm instead of 300mm, and in-ground swimming pools, which must 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 $20\text{m}^3/\text{s}$, 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, must be 500mm above the design flood standard level, except in the case of garages, where the minimum height must be 300mm, and in-ground swimming pools, which must 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 must be able to withstand a velocity x depth ratio of $0.4\text{m}^2/\text{s}$, 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 must not be established in areas where vehicles would become buoyant in an overland flow zone, and hence unstable. A maximum velocity x depth ratio of $0.6\text{m}^2/\text{s}$ to $0.7\text{m}^2/\text{s}$ 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 must 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;
 - iii) footings that extend to at least the depth of the invert of the associated pipe or that are placed on competent bedrock;

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

Controls

- 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 must 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 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 must comply with the controls set out below.

- 1 No part of the tennis court must be constructed over or 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, must 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 must 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 must 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 must be prepared in accordance with the provisions of 24D.2 of this Part and 24R.7 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 $20\text{m}^3/\text{s}$, 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 $20\text{m}^3/\text{s}$, 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 must 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

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 must 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 must 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 must be prepared by a qualified civil engineer.
- 2 All calculations and designs must be in accordance with the procedures set out in *Australian Rainfall and Runoff*.
- 3 All submissions of calculations to Council must, 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 must 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 must 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 must 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* must 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 must give due consideration to likely future development within the catchment.

Recurrence Intervals

- 8 Drainage systems must be designed to provide both minor and major flow conveyance systems as detailed in *Australian Rainfall and Runoff*
- 9 All enclosed stormwater drainage systems must be designed to have minimum capacity to cater for a 5% AEP storm, unless otherwise approved by Council.
- 10 An overland flowpath must 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 must 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 must be performed using the hydraulic gradeline method set out in *Australian Rainfall and Runoff*.
- 13 Minimum internal pipe diameter must be 375mm.
- 14 Minimum pipe gradient must be 1.0% to allow for cleaning and self-flushing.

24E.1 DESIGN PROCEDURES (continued)

Controls

- 15 Pipe velocity must 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 must be 300mm (measured from the crown of the pipe).
- 17 Minimum pipe cover in areas subject to vehicle loading must be 450mm. Appropriate design of bedding and backfill is also be required.
- 18 Pipe classes, backfill and bedding must be determined using the AS3725 or any standard replacing that standard.

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

- 19 Except where approved by Council, pipes must be rubber ring jointed reinforced concrete pipes to comply with the requirements of Australian Standard AS4058-1973 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 must 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.

- 20 Constructed channels must be designed to cater for a 50% blockage factor (ie, it must 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 must 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 must be determined using equations given in *Australian Rainfall and Runoff* or the charts provided in the Appendix of *Australian Rainfall and Runoff*. Allowances must 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 must 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 must 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 must include a plan view of the proposed stormwater drainage layout and a drainage longitudinal section of each proposed pipeline. These must 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 must clearly show the location, dimensions and types of:
 - i) all existing drainage features including drainage pipelines, channels, structures, utility services and overland flow paths;
 - ii) all proposed drainage features including drainage pipelines, channels, structures and overland flowpaths; together with
 - iii) 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 must be provided for all proposed stormwater drainage lines. They must 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 must 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 sustainable use of the water resource without compromise to lifestyle, health or amenity.*

Controls

In addition to installation of water saving devices and any required rainwater tank, water may also be conserved by treating wastewater on the site and, where appropriate, reusing it. This can take the form of greywater diversion, greywater treatment or wastewater treatment. Where on-site wastewater management is to be employed, the proposal must comply with the controls set out below:

- 1 The system must be designed, located and constructed so as to:
 - i) prevent the spread of pathogens to waterways, soil, air, animals or humans;
 - ii) prevent nuisance odour, insect pests, vermin or other amenity impacts;
 - iii) prevent contamination of soil, water or air; and
 - iv) ensure that all overflows are to the sewerage system in accordance with Sydney Water requirements.

- 2 The proposal to Council must include a design and management plan addressing relevant hydrological, hydrogeological, soil contamination and public health issues in accordance with *AS/ NZS1547:2000 On-Site Domestic Wastewater Management* or any standard replacing that standard.

- 3 Any on-site wastewater system designed for detached single dwellings must be designed in accordance with the provisions of NSW Environment and Health Protection Guidelines: On-site Sewage Management for Single Households (DLG et al, 1998).

Note: In addition to any development consent required, approval must be sought from Council under Section 68 of the Local Government Act 1993 for the installation of any on-site wastewater treatment system.

Note: The provisions of the Local Government (General) Regulation 2005 will apply to any application to which this section relates.

Note: Any system should also meet the Australian Guidelines for Water Recycling

Note: Greywater means wastewater from washing machines, laundry tubs, showers, hand basins and baths but does not include wastewater from a kitchen, toilet, urinal or bidet.

24R References

- 24R.1 Rainwater Tank Size Guide
- 24R.2 Drainage Catchments for On-site Detention
- 24R.3 Permitted Site Discharge and Minimum On-site Detention Storage Volumes
- 24R.4 On-site Detention Calculation Sheet
- 24R.5 Design of On-site Detention Systems (OSD)
- 24R.6 Design of Property and Inter-allotment Drainage Systems
- 24R.7 Flood Study Requirements
- 24R.8 Terms of Positive Covenants and Restrictions on use
- 24R.9 OSD Exemption Map

READ WITH**SECTION C****PART 24 - Water Management**

24C.4: Mandatory Rainwater Tank Requirements



24R.1 RAINWATER TANK SIZE GUIDE

Further controls that may apply

SECTION C
PART 24C.4 - Mandatory
Rainwater Tank
Requirements

This guide applies only to development types 1 to 4 as specified in 24C.6 of this Part.

Tables 24R.1-1 to 24R.1-3 provide guidance on the minimum size of rainwater tanks to meet the target of a 50% reduction in run-off days to reduce the impacts of runoff on waterways. Note that smaller tanks with a larger number of connections increases the draw-down and the available space in the tank, ensuring run-off is captured when it rains.

You may need or wish to provide a larger tank to meet water conservation objectives, for instance to meet the requirements of BASIX.

Each table has been developed for the number of uses that will be connected to a rainwater tank. Connection of the rainwater tank to as many uses as possible helps ensure there is more frequent “draw-down” and space in the tank to capture run-off when it rains.

Notes to Tables 24R.1-1 to 24R.1-3:

Connections to meet the requirements of the above tables include the following:

- i) toilet
- ii) laundry
- iii) hot water (see NSW Health: Guidelines on Using Rainwater Tanks.
Available at: www.health.gov.au/)
- iv) green Wall
- v) passive irrigation tank.

For specifications for green walls and passive irrigation tanks see specifications on Council’s website.

Multiple connections of the same type are permitted e.g. two toilets connected to the rainwater tank would be two connections and 24R.1-2 would provide the size of tank required to reduce runoff days by 50%. A maximum of connection to two toilets will be permitted for tables 24R.1-2 and 24R.1-3.

Roof area refers to the roof area connected to the tank (where possible the whole roof area is to be connected).

Garden size refers to the area to be irrigated using the rainwater tank. It does not refer to the area irrigated from the passive irrigation tank.

Any storage over the 10KL limit is required to be stored underground in accordance with Part 2 of this DCP, and are therefore highlighted for convenience.

24R.1 RAINWATER TANK SIZE (continued)

		Roof area (m ²)					
		≤100	150	200	250	300	≥ 350
Garden size (m ²)	50	2.5					
	100	2	11				
	150	2	7				
	200	2	6	14			
	250	2	5	10			
	300	2	5	9	20		
	350	2	5	8	17		
	400	2	5	8	15		
	450	2	5	8	14		
	500	2	5	8	13		
	550	2	5	8	12	20	
	600	2	5	7	12	18	
	650	2	5	7	12	17	
	700	2	5	7	12	17	

Table 24R.1-1:
Tank size (KL) with 1 connection in addition to garden

		Roof area (m ²)						
		≤150	200	250	300	350	400	≥ 450
Garden size (m ²)	50	2.5	9					
	100	2	5					
	150	2	5	10				
	200	2	5	8				
	250	2	4	8	16			
	300	2	4	7	13			
	350	2	4	7	12	20		
	400	2	4	7	11	17		
	450	2	4	7	10	15		
	500	2	4	6	10	14		
	550	2	4	6	10	14	20	
	600	2	4	6	10	13	18	
	650	2	4	6	10	13	17	
	700	2	4	6	10	13	17	

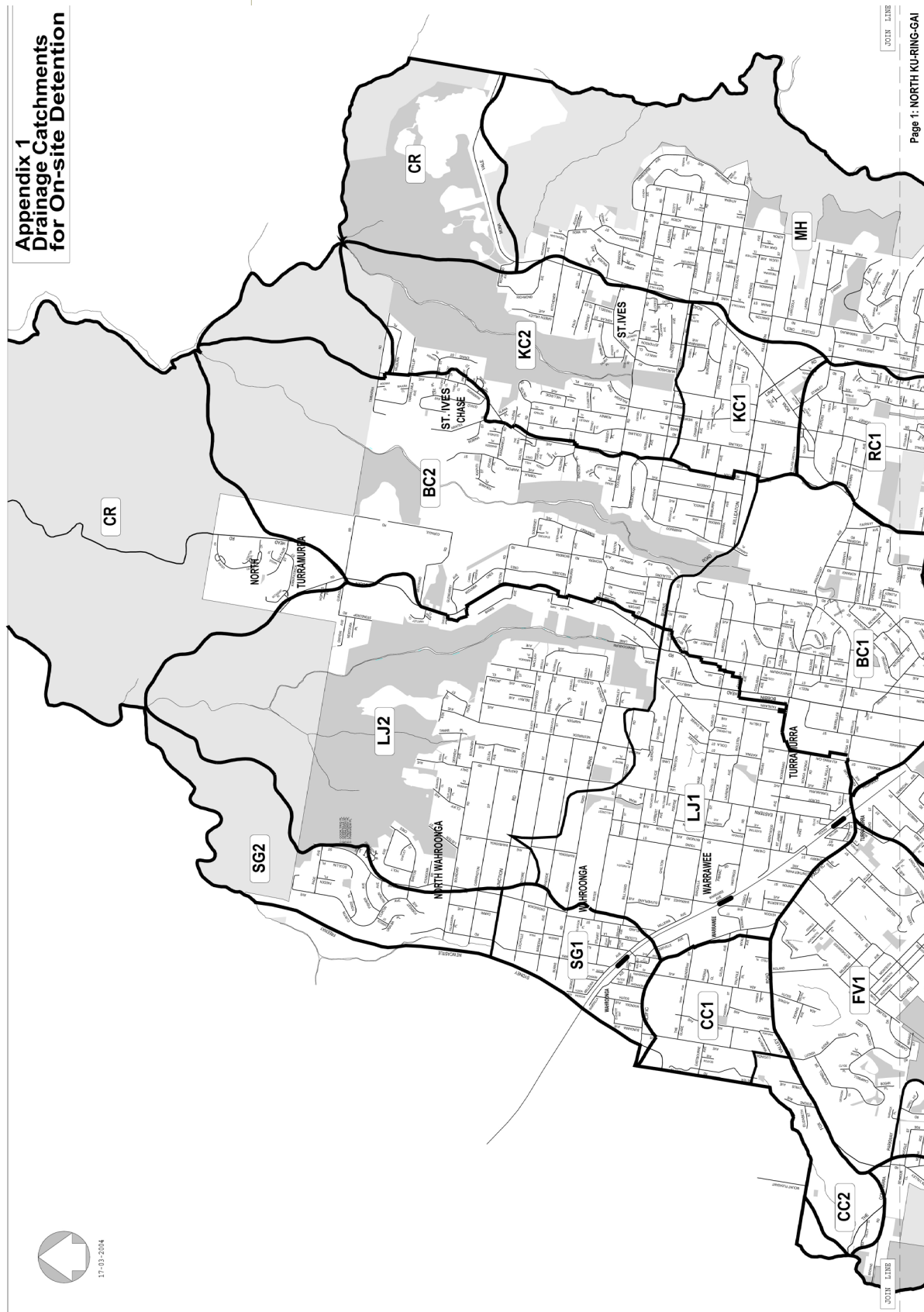
Table 24R.1-2:
Tank size (KL) with 2 connections in addition to garden

		Roof area (m ²)					
		≤200	250	300	350	400	450
Garden size (m ²)	50	2.5	5				
	100	2.5	5	10			
	150	2	4	8	18		
	200	2	4	7	12		
	250	2	4	7	11	18	
	300	2	4	7	10	15	
	350	2	4	6	10	14	
	400	2	4	6	9	13	
	450	2	4	6	8	12	19
	500	2	4	6	8	12	18
	550	2	4	6	8	11	17
	600	2	4	6	8	11	16
	650	2	4	6	8	11	16
	700	2	4	6	8	11	15

Table 24R.1-3:
Tank size (KL) with 3 connections in addition to garden

24R.2 DRAINAGE CATCHMENTS FOR ON-SITE DETENTION

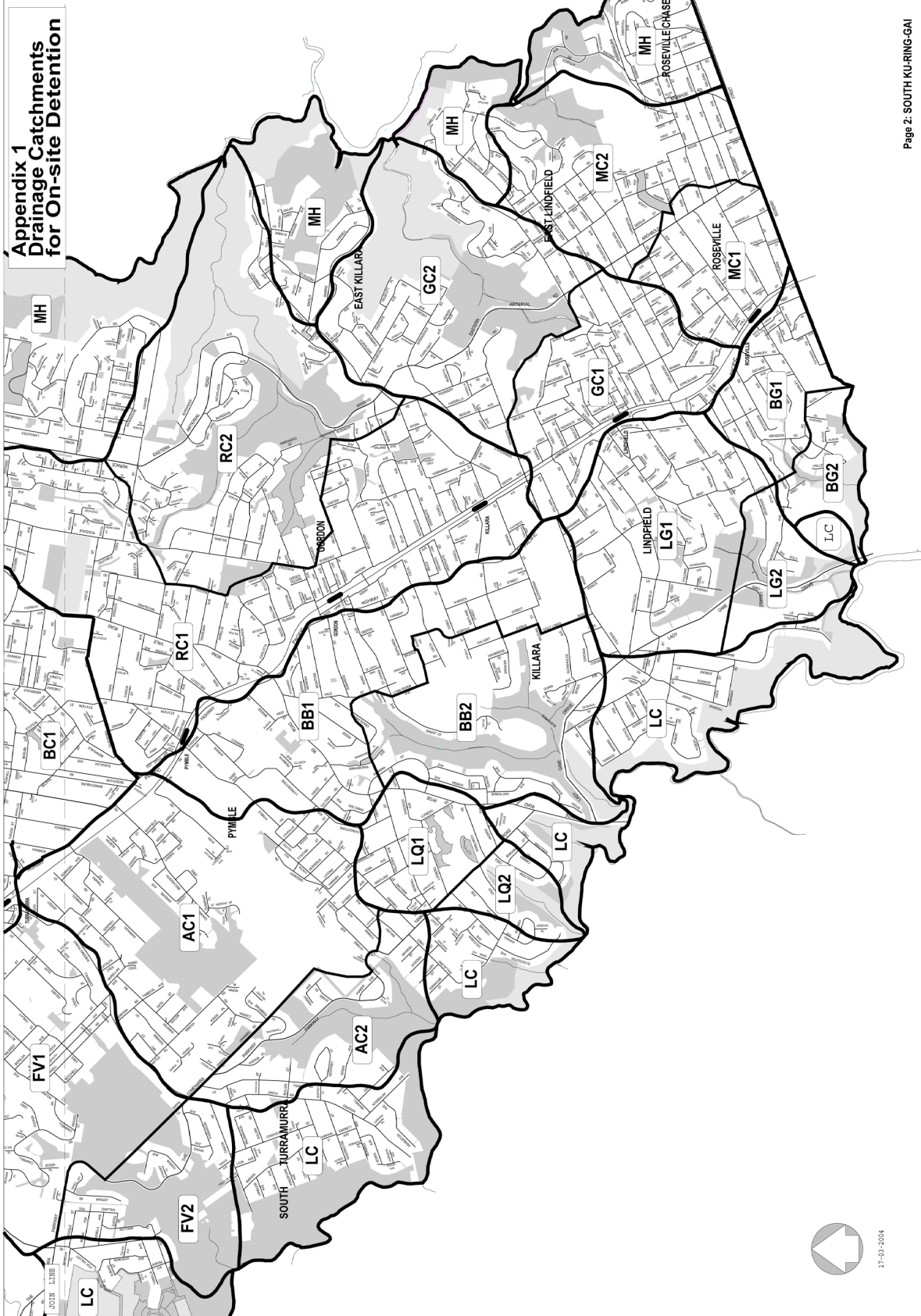
Appendix 1 Drainage Catchments for On-site Detention



Page 1: NORTH KU-RING-GAI



24R.2 DRAINAGE CATCHMENTS FOR ON-SITE DETENTION (continued)



24R.3 PERMITTED SITE DISCHARGE AND MINIMUM ON-SITE DETENTION STORAGE VOLUMES

The codes in the table below are found in *Part 25R.1 of this DCP*

Code	Catchment Area	Permitted Site Discharge (l/s/ha)	Equivalent Minimum OSD Storage Volume (m ³ /ha)
AC1	Avondale Creek	102	398
AC2	Avondale Creek	166	241
BB1	Blackbutt Creek	141	302
BB2	Blackbutt Creek	166	241
BC1	Cowan Creek	96	414
BC2	Cowan Creek	166	241
BG1	Blue Gum Creek	147	287
BG2	Blue Gum Creek	166	241
CC	Coups Creek	132	325
CR	Cowan River	166	241
FV1	Fox Valley	129	332
FV2	Fox Valley	166	241
GC1	Gordon Creek	128	336
GC2	Gordon Creek	166	241
KC1	Ku-ring-gai Creek	139	308
KC2	Ku-ring-gai Creek	166	241
LG1	Lady Game Creek	147	287
LG2	Lady Game Creek	166	241
LC	Lane Cove River	166	241
LQ1	Loftberg Quarry Creek	153	272
LQ2	Loftberg Quarry Creek	166	241
LJ1	Lovers Jump Creek	94	417
LJ2	Lovers Jump Creek	166	241
MH	Middle Harbour	166	241
MC1	Moores Creek	136	315
MC2	Moores Creek	166	241
RC1	Rocky Creek	124	345
RC2	Rocky Creek	166	241
SG1	Spring Gully Creek	134	320
SG2	Spring Gully Creek	166	241

24R.4 ON-SITE DETENTION CALCULATION SHEET

Address

Catchment Detail

1.	Catchment Name			
2.	Catchment Discharge Rate	l/sec/m ²	A	
3.	Catchment Storage Rate	m ³ /m ²	B	

Site Details

4.	Site Aream ² ^ 60% of site area	m ²	C	
5.	Area(s) not draining to the detention system.....m ²			
6.	Total impervious area (roofs, driveways, paving, etc.)	m ²	D	
7.	Impervious area bypassing detention system	m ²	E	

Permitted Site Discharge

8.	C [.....m ²] x A [..... l/sec/m ²] =	l/sec	Flow 1	
9.	Adjustment for any uncontrolled impervious flow E / D =	(<0.25)	F	
10.	Flow 1 [..... l/sec] x F [.....] =	l/sec	Flow 2	
11.	Flow 1 [.....] – Flow 2 [.....] =	l/sec	PSD	

Site Storage Requirement

12.	C [.....m ²] x B [.....m ³ /m ²] =	m ³	SSR1	
13.	If the storage is in a landscaped basin, SSR1 x 1.2 =	m ³	SSR2	

Outlet Control

14.	Height difference between top water surface level and the centre of the orifice	m	G	
15.	Orifice Diameter $21.8 \times \sqrt{\frac{\text{PSD}}{\sqrt{G}}}$	mm	OD	

PSD = Permitted Site Discharge

SSR1 = Site Storage Requirement (except for landscaped basins)

SSR2 = Site Storage Requirement (landscaped basins) (**Note: Use only SSR1 or SSR2**)

OD = Orifice Diameter

Signature..... Name.....

Qualifications..... Date

24R.5 DESIGN OF ON-SITE DETENTION SYSTEMS (OSD)

Controls

Depending on the site, stormwater may be detained above and/or below ground. Where it is above ground, it may be held in an open grassed or landscaped area or in a driveway designed for such a purpose. It is possible to use a combination of different locations. The following controls apply to on-site detention tanks:

General Controls for On-site Detention Systems (OSD)

- 1 On-site detention (OSD) must not be established across allotment boundaries unless intended to be covered by reciprocal drainage easements.
- 2 The design of the facility is to be compatible with the proposed overall site layout and landscaping and must not be unsightly.
- 3 On-site detention storages must generally be located as close as possible to the lowest point of the site.
- 4 The site drainage system must not surcharge before the on-site detention area is full to the design top-water level.
- 5 On-site detention storages must not be located in drainage easements and/or overland flow paths that convey catchment flows through the site.
- 6 The on-site detention system is to drain freely to the public drainage system for storm events up to and including the 1% AEP.

If this is not possible, compensation is to be made by increasing the storage volume provided (calculations to be submitted for approval).

The rate of discharge from the OSD system is to be calculated based on the impervious area remaining after the deep soil area is deducted from the total site area.

- 7 Where the development is on land that is to be strata titled or community titled, OSD must be located in common areas (and not in private courtyards).
- 8 Locations of on-site detention systems must be included on any new final plans of subdivision.
- 9 Cut and/or fill within the canopy areas of any trees to be retained is not permitted.
- 10 The excavation influence line must not affect footings of adjacent or neighbouring structures.
- 11 The location of the OSD must not restrict pedestrian access between a public road and any site building and must not cause hazard or inconvenience in any manner.
- 12 A spillway or overflow outlet is to be provided in all OSD systems as part of the operation of the system. The overflow must be designed to cater for total system failure (blockage) in extreme storm events and designed to safely convey all overflows up to the 1% AEP

24R.5 DESIGN OF ON-SITE DETENTION SYSTEMS (OSD) (continued)

Controls

uncontrolled flow to an adequate downstream drainage system without adverse impact on neighbouring properties.

Note: Where large overflow structures are required, Council may determine that approval for the structure is required from the Dam Safety Committee.

- 13 The overflow from the system is to be collected within a suitably located and sized drainage pipeline with a design capacity equivalent to the 1% AEP storm runoff from the site.
- 14 Overflow must not be directed to another private property unless along an overland flowpath along an easement.
- 15 The spillway is to be protected by the fixing of suitable armour over the overflow facility.
- 16 The overflow level must not be less than:
 - i) 0.3m below the floor level of all habitable areas adjacent to the OSD and
 - ii) 0.15m below the floor level of all garage areas adjacent to the OSD.
- 17 The top level of kerbs and other retaining structures is to be a minimum of 50mm above the level of flow over the spillway.
- 18 The location of all on-site stormwater detention systems is to be marked on site by the fixing of a marker plate of minimum size of 0.15m x 0.1m to the grate of the discharge control pit or nearest concrete or permanent surface in a prominent position. The plate must be of non-corrosive metal or 4mm thick laminated plastic and that contains the following wording:

This is an on-site stormwater detention system required by Ku-ring-gai Council. It is an offence to reduce the volume of the tank or basin or to interfere with the orifice plate that controls the outflow. The owner must clean the base of the outlet control pit and the debris screen of debris and sediment on a regular basis. This plate must not be removed.

- 19 A positive covenant and restriction on use is to be established for the detention system in accordance with 24R.8 of this Part.

Discharge control pits (dcp)

- 20 The discharge control pit is to have dimensions of 0.6m x 0.6m for pits up to 0.6m deep, and 0.9m x 0.6m for pits exceeding 0.6m depth.
- 21 To protect against blockage, all outflow controls are to be totally and solely enclosed by a rustproof debris screen or wire cage in accordance with the following:
 - i) the screen material is to be hot dipped galvanised mesh (Lysaght's maximesh 3030 or equivalent product);
 - ii) the minimum surface area of the debris screen must be 50 times

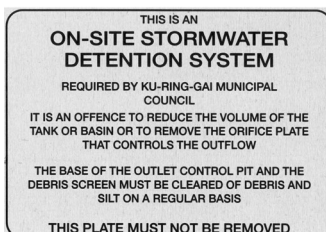


Figure 24R.5 -1
Marker plate for on-site
detention system

24R.5 DESIGN OF ON-SITE DETENTION SYSTEMS (OSD) (continued)

Controls

- the area of the outlet pipe or orifice;
 - iii) the screen is to be a minimum of 0.1m from the face of the orifice and attached (generally on a sliding mechanism) to the wall;
 - iv) the screen must be capable of removal by hand to permit cleaning and easy inspection of the outlet control; and
 - v) the inlet pipe to a DCP should direct inflows parallel to the screen. To assist in shedding debris, the screen should be positioned as close as possible to the vertical, but not less than 45 degrees to the horizontal.
- 22 A sediment collection sump must be provided below the orifice outlet to the stormwater detention system that:
- i) has a minimum depth of 0.2m below the invert of the orifice;
 - ii) is connected to the outlet pipe by means of 3 x 40mm weepholes plugged with a geofabric filter cloth; and
 - iii) includes an additional filter medium between the weepholes and the connection to the outlet that consists of 15mm river gravel wrapped in geofabric over a minimum length of 0.6m, thence to subsoil drainage connected to the main outlet (where possible).
- 23 If site discharge is controlled through installation of a choke pipe, the adopted tailwater levels are to be as follows:
- i) for systems draining directly to the street drainage system –
 - for connections to the kerb, the top of the kerb level, or
 - for connections to street drainage pits, 0.15m below the underside of the grate, or
 - for connections to footway or easement pipes or pits, the surface level of the point of connection; or
 - ii) for systems draining directly to an open channel, the top of the channel.
 - iii) for systems draining directly to a watercourse, the top of the watercourse.
- 24 If site discharge is controlled by a sharp edged orifice, the following controls apply:
- i) orifice plates are to have minimum dimensions of 0.2 x 0.2m with a minimum orifice diameter of 30mm and must be 3mm thick flat stainless steel.
 - ii) the orifice plate is to be tooled to the exact dimension as calculated and must be securely fastened in a central position over the outlet pipe using four galvanised (4) dynabolts and epoxy cement.
 - iii) orifice plates are to be flush with the wall such that flow does not pass between the plate and the wall and is to be located so that the centreline of the orifice is in line with the base of the on-site detention tank.

24R.5 DESIGN OF ON-SITE DETENTION SYSTEMS (OSD) (continued)

Controls

- iv) the following formula is to be used to calculate the required diameter of the sharp edged orifice:

$$D = 21.8 * (PSD / h^{0.5})^{0.5} \text{ where}$$

D = orifice diameter (mm) PSD = flowrate (L/s)

h = pressure head at the middle of the orifice when the system is at its maximum storage capacity (m)

Note: The formula assumes that the water level immediately downstream of the orifice is not above its obvert.

- v) where the calculated orifice diameter is less than 30mm, the detention system must be redesigned to either reduce water depths in the storage facility or to increase the catchment draining to the basin.
- vi) the outlet pipe to which the orifice discharge is connected is to have a capacity at least 1.5 times the permissible site discharge for at least the first 2m downstream from the orifice.

Above ground on-site detention systems

- 25 The facility must be located where the least possible adjustment to existing ground levels would be required to achieve storage of the necessary volume.
- 26 The calculated storage volume is to be increased by 20% to allow for the growth of the vegetation and for minor variations to the ground level occasioned by the maintenance regime.
- 27 Ponding depth must not exceed 1.2m at any point and must not exceed 0.3m over a minimum width of 1m at the perimeter.
- 28 A childproof fence must be established around the OSD area where ponding depth exceeds 0.3m and where any side of the OSD basin exceeds 15% gradient.
- 29 The proposed structure must be certified by the designing engineer as impermeable and structurally adequate to retain the design volume of water.
- 30 Council will not approve post and sleeper walls and/or earth mounding as a retaining structure for on-site detention storages unless of double wall construction with at least 0.5m width of soil between.
- 31 A minimum of 0.15m freeboard to the top of the basin perimeter is to be provided above the level of the overflow spillway invert.
- 32 Where ponding on driveways/parking areas is considered the maximum ponding depth is to be 0.15m in parking areas and 0.2m in all other trafficked areas; and
- 33 Where ponding on driveways/parking areas is considered, all driveway gradients and gradient transitions must meet the standards of *Australian Standard 2890.1 – 2004 “Off-street car parking”*.

24R.5 DESIGN OF ON-SITE DETENTION SYSTEMS (OSD) (continued)

Controls

Below ground OSD structures

- 34 A minimum of 0.3m soil cover is to be provided where the tank is located under landscaped areas.
- 35 The tank must be structurally designed to withstand all service loads (normal earth, surcharge, traffic and hydrostatic) and to provide a service life of fifty (50) years.
- 36 Internal supporting walls must be minimised to ease maintenance. Typically internal supports should only be considered for spans greater than 3m.
- 37 Excavation for the tank must be checked for impact on the zone of influence on adjacent footings and structures.
- 38 An inspection / access grate measuring 0.6m x 0.9m is to be installed directly over the overflow outlet and must be readily accessible from a point external to the site building(s).
- 39 Where the internal depth of the tank is less than 0.6m, surface grates are to be provided in each corner of the on-site detention tank and all inlet pipes must be connected directly under the grate access to the control outlet of the on-site detention tank. This is to minimise any need to enter the tank for maintenance reasons and to allow for ventilation and remote flushing of the tank floor.
- 40 The base of the tank is to have a minimum 1% grade towards the discharge control pit to ensure proper drainage.
- 41 Fixed step irons must be fitted into the tank where the internal tank depth exceeds 1.2m.
- 42 A child-proof locking system must be employed for surface grates and lids.
- 43 In high water table areas, the tank must be designed to avoid flotation.
- 44 All inlet pipes are to discharge at the tank floor level in order to minimise noise disturbance;
- 45 Rainwater tanks designed for aboveground use must not be utilised for underground OSD purposes; and
- 46 A Ku-ring-gai Council marker plate is to be affixed to the detention tank/basin at the control pit.
- 47 On-site detention tanks must be constructed of concrete insitu, pre-cast or modular or other approved materials in accordance with AS/NZS 3500.3. VERSITANK, AUDRAIN, ATLANTIS modules or equivalent will not be permitted under the driveway.

24R.6 DESIGN OF PROPERTY AND INTER-ALLOTMENT DRAINAGE SYSTEMS

Controls

Design of Property Drainage Systems

The property drainage system is the system of underground pipes, inlet and junction pits, roof gutters, downpipes, swales and associated plumbing within a property that captures and conveys stormwater to on-site management systems (ie, OSD, OSR and/or water quality treatment devices) and to the public drainage system outside the site. The following controls apply to these drainage systems:

- 1 Consideration must be given to the management of all stormwater runoff from:
 - i) roofs, paved areas, driveways, swimming pool surrounds and other impervious areas,
 - ii) areas subject to changes to natural ground level and including excavated or filled areas,
 - iii) areas where the natural or pre-development overland flow regime is disrupted to the potential detriment of an adjoining property,
 - iv) areas where long term ponding of water may occur, and
 - v) areas where existing runoff from up-slope properties is likely to create nuisance to the proposed development.
- 2 The piped property drainage is to capture and convey the 2% AEP storm runoff to the stormwater management/disposal system.

Note: At Council's discretion, higher standards may be adopted if the proposed development is sensitive to damage by stormwater or blockage of the drainage system.
- 3 All stormwater entering the site, including that which exceeds the capacity of the piped drainage system, is to be captured and conveyed overland within the development site, in a controlled manner not exceeding recognised hazard criteria, to the approved stormwater disposal system.

Note: Any proposed concentrated flow onto adjoining properties is only permissible where an easement has been obtained in accordance with the requirements of this DCP (Refer to 24B of this Part).
- 4 No part of the property drainage system is to consist of aerial drainage systems other than vertical downpipes and guttering.
- 5 Underground pipes/plumbing must:
 - i) have a minimum internal diameter of 0.1m,
 - ii) not be located beneath buildings except where:
 - there is no practicable alternative and pipes cannot be routed around the building,
 - the number of pipes underneath the building is minimised,
 - piping underneath buildings is straight and has no junctions,
 - inspection openings are provided at all points of entry and exit under the building, and

24R.6 DESIGN OF PROPERTY AND INTER-ALLOTMENT DRAINAGE SYSTEMS (continued)

Controls

- the design engineer certifies that the system is in accordance with *AS3500.3 – 1998 – National Plumbing and Drainage and the Building Code of Australia*,
- be subject to a hydraulic grade line analysis by a consulting engineer for any development site exceeding 5000m² in area,
- be sewer class piping or better,
- be designed so that no surcharge occurs onto other properties or pipe flows exceed 100l/s,
- have a minimum longitudinal grade of 1% where pipe diameters are up to and including 0.15m or, where larger, a minimum longitudinal grade of 0.5%,
- be compatible with proposed and possible future development in all respects, and
- have the minimum depth of cover from finished ground level to top of pipe as required in accordance with Table 7.1 from *AS3500.3 - 1998 National plumbing and drainage Part 3.2: Stormwater drainage - Acceptable solutions*.

Note: Higher standards should be adopted if the proposed development is sensitive to damage by stormwater or blockage of the drainage system.

- 6 Discharge from subsoil drainage systems must be to a pit located within the property and not directly to the street gutter. The discharge is to be disposed of in a manner that does not affect adjacent properties nor cause erosion or scour of downstream drainage systems.
- 7 In residential developments that consist of more than one (1) dwelling, the private courtyard of each dwelling must contain at least one grated inlet pit.
- 8 Surface inlet pits must:
 - i) be located to catch overland flows experienced during failure of the site drainage system,
 - ii) be provided at all pipe junctions, changes in pipe direction exceeding 45 degrees and at the road boundary (within the property) prior to connection to the public drainage system,
 - iii) be of sufficient size to accept the predicted flow and have dimensions in accordance with the table below:

Depth (mm)	Dimension (mm ²)
< 600	450 x 450
600 – 900	600 x 600
900 – 1200	600 x 900
>1200	900 x 900

24R.6 DESIGN OF PROPERTY AND INTER-ALLOTMENT DRAINAGE SYSTEMS (continued)

Controls

- iv) have step irons inside, where pits are deeper than 1.2m,
 - v) must not be of plastic unless not larger than 0.45 x 0.45m with, not deeper than 0.45m and of heavy duty plastic to manufacturer's specifications, and
 - vi) have grated pit covers that are removable, designed to appropriate loadings (such as traffic) and constructed of galvanised steel or cast iron.
- 9 Heavy duty, grated drains of minimum width 0.2m and minimum depth 0.2m must be provided across driveways at the following locations:
- i) outside the entrance to a garage where the driveway falls towards the garage, or
 - ii) at the front (street) boundary of the property, fully within the property, where the driveway falls towards the street.
- 10 The minimum diameter outlet pipe from any grated surface inlet pit or grated drain provided to capture surface runoff must be 150mm in order to reduce the occurrence of outlet blockage.
- 11 All inlet and outlet pipes from a pit are to be finished flush with the internal wall of the pit. The outlet pipe must be at the same level as the base of the pit to ensure there is no permanent ponding of water in the pit.
- 12 Any existing drainage system on a development site to be utilised must be suitably modified in order to offset any adverse impacts that a proposed development may have on the efficiency of that system.
- 13 Stormwater pipes are to be located outside the drip-line or not less than six (6) metres from the trunk (whichever is greater) of any tree to be retained unless the method of pipe installation is certified by a qualified arborist as not affecting the longevity of the tree to be retained.
- Note:** For small diameter pipes with minimum cover, careful hand excavation of the installation trench with retention across the trench of all roots greater than 25mm diameter, may be an acceptable method.
- Note:** For larger diameter pipes, or for small pipes at excessive depth, installation of pipes by remote thrust boring technique may be an acceptable method. In this case a pipe cover of at least one (1) metre should be provided.
- 14 Drainage works, materials and specifications are to be designed and constructed in accordance with:
- i) Institution of Engineers Australia *Australian Rainfall and Runoff*
 - ii) Australian Standard AS 3500.3 – *2003 National Plumbing and Drainage*; and
 - iii) relevant occupational health and safety requirements.

24R.6 DESIGN OF PROPERTY AND INTER-ALLOTMENT DRAINAGE SYSTEMS (continued)

Controls

Mechanical pump-out systems for basement carpark

Mechanical pump-out drainage is only permissible where gravity drainage cannot be achieved from basement carpark area to the on-site stormwater management system. The following controls apply to mechanical pump-out systems:

- 15 The developer is to demonstrate that gravity drainage from the basement carpark is not possible.
Note: Where gravity drainage is possible from some parts of a basement carpark, only those sections where gravity drainage is not possible are to be drained using a mechanical pump-out system.
- 16 The catchment area being pumped out must consist of not more than the basement carpark itself and the driveway ramp to the basement carpark.
- 17 The catchment area being drained is to be 100m² or less.
- 18 The system must be designed by a competent qualified civil engineer.
- 19 The system must be dual alternating with level switches and activation of dual operation at top water level.
- 20 Each pump must cater to a minimum of 110% of the design flow.
- 21 A description of the pump(s) is to be provided listing the manufacturer, model number and published duty curves.
- 22 An automatic alarm must be installed so that it sounds during pump failure.
- 23 The water pumped from the basement carpark must be directed to the OSD system designed in accordance with the requirements of 24B of this Part.
- 24 The pump wet well is to have a storage capacity of at least the two hour 1% AEP storm runoff and must be checked for adequacy up to the 1% AEP event by a time-area computer model or the mass-curve technique in *Australian Rainfall and Runoff*.
- 25 The noise level from the pump must not, at any time, exceed the ambient sound pressure levels by 5dB(A) at the boundary of the site and must not be audible within any habitable room of an adjoining premises.
- 26 Proposed maintenance is to be described in the submission to Council.

Note: Council may impose a requirement to create a Positive Covenant on the title of the property requiring regular maintenance and reporting to Council of the pump-out system by a plumber or engineer.

24R.6 DESIGN OF PROPERTY AND INTER-ALLOTMENT DRAINAGE SYSTEMS (continued)

Controls

Design Controls for Interallotment Drainage Easements

This section describes the requirements for the design and construction of interallotment drainage systems. In the majority of cases, the developer will be required to construct a pipe in the easement once it is created. In limited circumstances, Council may agree that such a pipe is not necessary – it is important to consult with Council on this matter prior to submission of the development application. Agreement of the owner of the downstream property in this respect will also be required. The following controls apply for the design and location of all easements:

- 27 The easement is to be designed with sufficient regard to:
 - i) proposed pipe diameter within the easement and contributing catchments;
 - ii) significant trees that may be impacted upon by the placement of drainage lines;
 - iii) the structural requirements of pipes and their laying/upkeep;
 - iv) any adjoining structures; and
 - v) the stormwater overland flowpath capacity requirements.
- 28 All overflow from rainfall events on a site must be directed to the interallotment drainage line with the necessary inlet pits and cut-offs
- 29 The interallotment easement must be designed in accordance with the following table unless otherwise approved by Council:

Nominal Pipe Diameter	Minimum Easement Width
150mm	1.0 metres
225mm	1.2 metres
300mm	1.3 metres
375mm	1.4 metres
450mm	1.5 metres
525mm	1.6 metres
600mm	1.6 metres
750mm	1.8 metres
>750mm	metre + nominal pipe diameter

Note: The presence of an on-site stormwater retention, detention or extended detention system at the development site will not be accepted as a justification for reducing the design flowrate through a downstream interallotment drainage system. The capacity of the system within the easement must be sufficient in the event of a blockage failure or overflow of the detention system.

24R.6 DESIGN OF PROPERTY AND INTER-ALLOTMENT DRAINAGE SYSTEMS (continued)

Controls

- 30 The in-ground interallotment drainage system (pipe) must be sufficient to carry:
- i) the 1% AEP uncontrolled stormwater runoff from existing and future hard surfaces on the site, and the additional future design inflows, as determined by the requirements of this section, from all other properties that may benefit from a connection to the system, that adjoin and are uphill from the same associated drainage easement and/or have the benefit of the same associated drainage easement.

Note: Upon application, Council may waive this requirement for Development Types 1-3.

Note: In rare circumstances, in the event that a long-term overland flow path (such as a paved driveway with kerbing) of sufficient capacity for the major flow is secured over the length of the easement, the 1% AEP design requirements may be reduced to a 5% AEP.

- 31 The constructed interallotment drainage system (pipe or channel) is to be wholly contained within the drainage easement created on the title(s) of the affected property or properties.
- 32 Where the drainage line in the private interallotment drainage easements is to be piped, the minimum pipe diameter must not be less than 0.15m and the minimum depth of cover from finished ground level to the top of the pipe is to be in accordance with Table 7.1 of *Australian Standard AS 3500.3.2:1998*.
- 33 If constructed channels are proposed for interallotment drainage systems, then:
- i) the channel must be concrete, stone-pitch or brick lined to form a permanent profile, and
 - ii) a 50% channel blockage factor is to be adopted in the design.
- 34 Stormwater pipes must be located outside the Tree Protection Zone of any tree to be retained unless the method of pipe installation is certified by a qualified arborist as not affecting the longevity of the tree to be retained.
- Note:** For small diameter pipes with minimum cover, careful hand excavation of the installation trench with retention across the trench of all roots greater than 25mm diameter, may be an acceptable method.
- Note:** For larger diameter pipes, or for small pipes at excessive depth, installation of pipes by remote thrust boring technique may be an acceptable method. In this case a pipe cover of at least one (1) metre should be provided.
- 35 An overland flowpath that directs water along the easement must be established to cater for blockage of the in ground interallotment system as far as the discharge point.
- 36 Surface inlet pits must:

24R.6 DESIGN OF PROPERTY AND INTER-ALLOTMENT DRAINAGE SYSTEMS (continued)

Controls

- i) be located to catch overland flows experienced during failure of the site drainage system, into the interallotment drainage line,
- ii) be provided at all pipe junctions, changes in pipe direction exceeding 45 degrees and at the road boundary (within the property) prior to connection to the public drainage system,
- iii) be of sufficient size to accept the predicted flow and have minimum dimensions in accordance with the table below:

Depth (mm)	Dimension (mm ²)
< 600	450 x 450
600 – 900	600 x 600
900 – 1200	600 x 900
>1200	900 x 900

- iv) have step irons inside, where pits are deeper than 1.2m,
 - v) have pit covers that are removable, designed to appropriate loadings and constructed of galvanised steel or cast iron.
- 37 Drainage works, materials and specifications must be designed and constructed in accordance with:
- i) Institution of Engineers Australia *Australian Rainfall and Runoff*,
 - ii) Australian Standard AS 3500 3.2 – 1998 National Plumbing and Drainage, Part 3 Stormwater Drainage,
 - iii) the relevant occupational health and safety requirements, and
 - iv) any other relevant controls in this DCP.
- 38 Where it is found that an existing Council owned channel/pipe is present on site that is not within an easement, a suitable easement is to be created over the drain in favour of Council, at no cost to the Council, or else the easement moved accordingly at no cost to Council.
- 39 Where an easement benefits one or more private properties, that easement must not also be created to the benefit of Council.

24R.7 FLOOD STUDY REQUIREMENTS

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 and seepage.

The flood study must be undertaken by a suitably qualified and experienced stormwater or hydraulic engineer. It must conform to the principles set out in *Australian Rainfall and Runoff* and the *NSW Floodplain Management Manual* and must include the following information:

Calculations and supporting information

- 1 A plan of the contributing catchment area and rationale for area determination must be submitted.
- 2 Rationale for time of concentration calculations must be discussed.
- 3 A hydrologic model is required to assess the flow discharge arriving at the site in the 1% AEP event, based on the following:
 - i) for catchment areas less than 3 Ha, a rational method assessment is allowed.
 - ii) for catchment areas greater than 3 Ha, an appropriate runoff routing computer model is to be used (e.g DRAINS, ILSAX etc).
- 4 Sufficient survey is to be obtained to accurately define the flow limits and profiles, which may extend onto adjoining properties.
- 5 A hydraulic model is required to assess the impact of the flow discharges through the pre-developed and post-developed site.
 - i) for flow rates of 2m³/s with no backwater effects, the Mannings Equation may be used.
 - ii) for flow rates greater than 2m³/s and/or with backwater effects, HEC-RAS or another suitable model is to be used.
- 6 Where an enclosed drainage system exists in the catchment studied (and is to be included in the analysis), the overland flow rate is to be determined as occurring during the greater of:
 - i) the 1:100 year event with the enclosed system operating at a maximum of 50% capacity (due to inlet controlled systems and blockage factors), or
 - ii) the 1:5 year event with the enclosed system fully blocked.

24R.7 FLOOD STUDY REQUIREMENTS (continued)

Controls

Information to be included in submission

- 7 All hydrological and hydraulic calculations undertaken to quantify the design flood standard and derive the flood levels together with the catchment map and any other data used in the calculations, as required above.
- 8 A scale plan view of the determined flood zone must be provided at the same scale as the site survey for:
 - i) The pre-developed site. This may be overlaid on the existing site survey plan and the centreline of the watercourse or drainage depression together with all existing structures and impediments to flow must be shown on this detail, and
 - ii) The post-developed site. This is to be overlaid on a plan, at the same scale as the submitted architectural plans, showing the footprint of all proposed structures in relation to the determined flood zone. The centreline chainages of the watercourse or drainage depression, together with all proposed structures and impediments to flow, must be shown on this detail.
- 9 A minimum of three 1:50 scale cross-sections taken at right angles to the drainage system, showing both the pre-developed and post-developed flow sections with all levels to AHD, drawn at the following chainages:
 - i) at the upstream property boundary;
 - ii) where the existing and proposed development is closest to the drainage line;
 - iii) at the downstream extent of the development work; and
 - iv) other cross-sections as needed if other parts of the system affect the site.

Note: Cross-sections must show existing and proposed levels, top water levels, hydraulic data, flood extents and critical proposed development levels such as floor levels.
- 10 A longitudinal section (at vertical scale 1:50, horizontal scale to that of plan view) of the drainage system through the property showing existing and proposed levels, flood levels, hydraulic data and all changes in grade.
- 11 The conclusion of the report is to have a signed declaration by the engineer stating:

"I have examined the site, existing improvements and proposed development. In accordance with accepted engineering practice, I have undertaken a flood study of the adjacent drainage system and can confirm the accuracy of my calculated results. I declare that the proposed development will be safeguarded from flooding and flood damage associated with the design flood standard as defined in Part 24 of the *Ku-ring-gai DCP* and will not adversely affect any other structures or properties.

24R.7 FLOOD STUDY REQUIREMENTS (continued)

Controls

- 12 The study must be submitted in a flood report form which includes an introduction and reference to the plans for the proposed development, methodology adopted and a written explanation/ conclusion for findings of the study, together with all supporting information. The study must nominate floor levels for the proposed development, with regard to Council freeboard requirements.

Note : Please consult Council's website for flood studies which have been completed

24R.7 FLOOD STUDY REQUIREMENTS (continued)

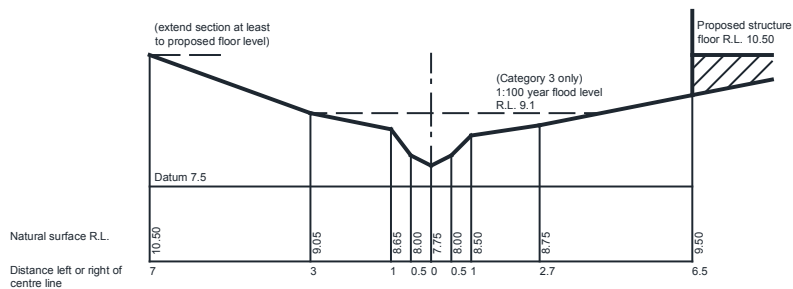
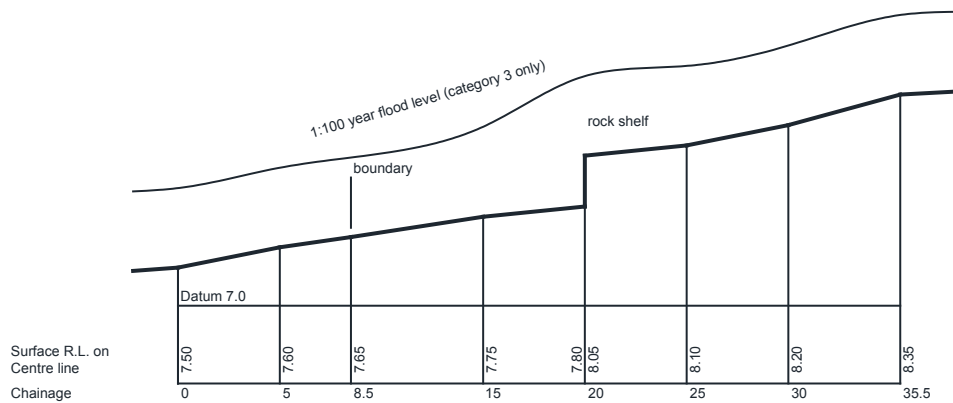
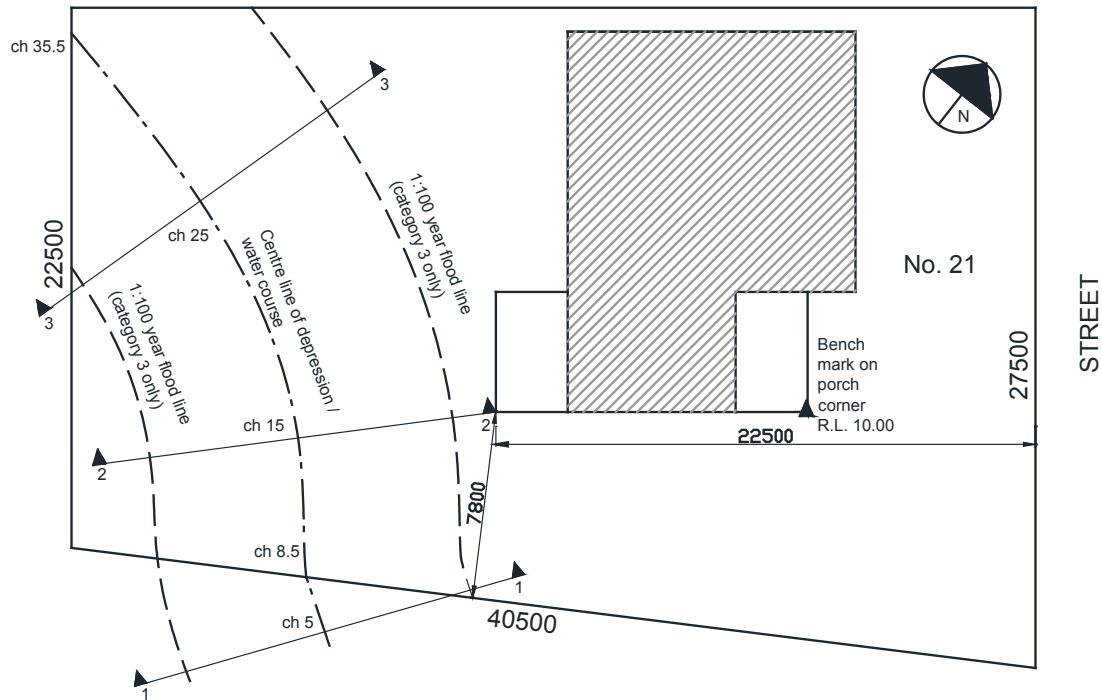


Figure 24R.8-1:
Typical Survey Information

24R.8 TERMS OF POSITIVE COVENANTS AND RESTRICTIONS ON USE

Controls

24R.8.1 Terms for On-site Detention

Terms of positive covenant referred to in the plan

- 1 The proprietor of the burdened lot covenants with the Council in respect of any System (as later defined) constructed on the burdened lot to:
 - i) permit stormwater to be temporarily detained by the System;
 - ii) regularly keep the System clean and free from grass clippings, silt, rubbish, debris and the like;
 - iii) maintain the System to ensure a maximum outflow from the System and a minimum pondage in accordance with plans duly approved by the Principal Certifying Authority;
 - iv) ensure that the System at all times includes an overflow to direct any excess flow to the downstream drainage System;
 - v) maintain, repair and replace the System or any part of it due to deterioration or damage without delay so that it functions in a safe and efficient manner;
 - vi) comply with the terms of any written notice issued by the Council in respect of the requirements of the Positive Covenant within the time stated in the notice;
 - vii) permit the Council to enter upon the burdened lot or any part of it with all necessary materials and equipment at all reasonable times and on reasonable notice (but at any time and without notice in the case of an emergency);
 - to view the state of repair of the System;
 - to ascertain whether or not there has been any breach of the terms of this Positive Covenant;
 - to execute works on the burdened lot for compliance with the requirements of this Positive Covenant;
 - viii) indemnify and keep indemnified the Council from and against all claims, demands, actions, suits, causes of action, sums of money, compensation, damages, costs and expenses which the Council or any other person may suffer as a result of any malfunction or non-operation of the System or any failure of the proprietor to comply with the terms of the Positive Covenant.
- 2 The Council will have the following additional powers:
 - i) in the event that the proprietor fails to comply with the terms of any written notice issued by the Council as set out above or in the event of an emergency, the Council or its authorised agent may enter the burdened lot with all necessary materials and equipment at all reasonable times and on reasonable notice (but at any time and without notice in the case of an emergency) and carry out any work which the Council in its discretion considers reasonable to comply with the said notice referred to in Part 1(vi) above or to alleviate the emergency.

24R.8 TERMS OF POSITIVE COVENANTS AND RESTRICTIONS ON USE (continued)

Controls

- ii) the Council may recover from the proprietor as a liquidated debt in a court of competent jurisdiction;
 - any expense reasonably incurred by it in exercising its powers under sub-paragraph (i) hereof,
 - legal costs on an indemnity basis for issue of the said notices and recovery of the said costs and expenses together with the costs and expenses of registration of a covenant charge pursuant to Section 88F(4) of the *Conveyancing Act, 1919* or providing any certificate required pursuant to Section 88G of the Act or obtaining any injunction pursuant to Section 88H of the Act.

In this Positive Covenant, unless inconsistent with the context,

“System” means in relation the burdened lot the stormwater drainage detention basin or tank constructed or to be constructed on the burdened lot in accordance with the requirements of the Council including all ancillary, gutters, downpipes, pipes, drains, orifice plates, trench barriers, walls, earth banks, kerbs, pits, grates, tanks, basins and other surfaces designed to temporarily detain and control stormwater located on any part of the burdened lot.

“Proprietor” includes the registered proprietor of the burdened lot from time to time and all of his heirs, executors, assigns and successors in title to the burdened lot and where there are two or more registered proprietors of the burdened lot the terms of this Positive Covenant will bind all those registered proprietors jointly and severally.

“Council” means the Ku-ring-gai Council or its successor.

Terms of restriction on the use of land referred to in the plan

Unless inconsistent with the context words used herein have the same meaning as those ascribed to them in the Positive Covenant referred to in the Plan.

The proprietor of the burdened lot covenants with the Council is not to:

- 3 allow any obstruction or interference of any kind to be erected, placed, created or performed so as to inhibit the flow of water to and from the System;
- 4 except in accordance with the written approval of the Council allow any building, erection or structure to be constructed or allowed to remain constructed or placed on the System;
- 5 carry out or allow to be carried out any change of land profile or earthworks on the System;
- 6 carry out or allow to be carried out any alterations to the System including surface levels, controlled outflows, grates, pipes, orifice plate, mesh screen or any other materials or elements thereof outside those normally required for the formation, maintenance and proper function of the System.

24R.8 TERMS OF POSITIVE COVENANTS AND RESTRICTIONS ON USE (continued)

Name of authority empowered to release, vary or modify any positive covenant or restrictions on the use of land referred to in the plan:

Ku-ring-gai Council

Manager, Development Assessment Services

Ku-ring-gai Council

24R.8 TERMS OF POSITIVE COVENANTS AND RESTRICTIONS ON USE (continued)

Controls

24R.8.2 Terms for On-site Retention

Terms of positive covenant referred to in the plan

- 1 The proprietor of the burdened lot covenants with the Council in respect of any System (as later defined) constructed on the burdened lot to:
 - i) permit stormwater to be retained and re-used by the System;
 - ii) regularly keep the System clean and free from grass clippings, silt, rubbish, debris and the like;
 - iii) maintain the System to ensure a maximum outflow from the System and a minimum pondage in accordance with plans duly approved by the Principal Certifying Authority;
 - iv) ensure that the System at all times includes an overflow to direct any excess flow to the downstream drainage System;
 - v) maintain, repair and replace the System or any part of it due to deterioration or damage without delay so that it functions in a safe and efficient manner;
 - vi) comply with the terms of any written notice issued by the Council in respect of the requirements of the Positive Covenant within the time stated in the notice;
 - vii) permit the Council to enter upon the burdened lot or any part of it with all necessary materials and equipment at all reasonable times and on reasonable notice (but at any time and without notice in the case of an emergency)
 - to view the state of repair of the System;
 - to ascertain whether or not there has been any breach of the terms of this Positive Covenant;
 - to execute works on the burdened lot for compliance with the requirements of this Positive Covenant
 - viii) indemnify and keep indemnified the Council from and against all claims, demands, actions, suits, causes of action, sums of money, compensation, damages, costs and expenses which the Council or any other person may suffer as a result of any malfunction or non-operation of the System or any failure of the proprietor to comply with the terms of the Positive Covenant.
- 2 The Council will have the following powers:
 - i) in the event that the proprietor fails to comply with the terms of any written notice issued by the Council as set out above or in the event of an emergency, the Council or its authorised agent may enter the burdened lot with all necessary materials and equipment at all reasonable times and on reasonable notice (but at any time and without notice in the case of an emergency) and carry out any work which the Council in its discretion considers reasonable to comply with the said notice referred to in Part 1(vi) above or to alleviate the emergency.

24R.8 TERMS OF POSITIVE COVENANTS AND RESTRICTIONS ON USE (continued)

Controls

- ii) the Council may recover from the proprietor as a liquidated debt in a court of competent jurisdiction;
- iii) any expense reasonably incurred by it in exercising its powers under sub-paragraph (i) hereof,
- iv) legal costs on an indemnity basis for issue of the said notices and recovery of the said costs and expenses together with the costs and expenses of registration of a covenant charge pursuant to Section 88F(4) of the Conveyancing Act, 1919 or providing any certificate required pursuant to Section 88G of the Act or obtaining any injunction pursuant to Section 88H of the Act.

3 In this Positive Covenant unless inconsistent with the context,

“System” means in relation the burdened lot the stormwater retention and re-use tank or other device constructed or to be constructed on the burdened lot in accordance with the requirements of the Council including all ancillary, gutters, leaf gutter guards, downpipes, pipes, drains, filter, pump, delivery plumbing, trench barriers, walls, earth banks, kerbs, pits, grates, tanks, basins and other surfaces designed to retain and re-use and control stormwater located on any part of the burdened lot.

“Proprietor” includes the registered proprietor of the burdened lot from time to time and all of his heirs, executors, assigns and successors in title to the burdened lot and where there are two or more registered proprietors of the burdened lot the terms of this Positive Covenant are to bind all those registered proprietors jointly and severally.

“Council” means the Ku-ring-gai Council or its successor.

Terms of restriction on the use of land referred to in the plan

4 The proprietor of the burdened lot covenants with the Council not to:

- i) allow any obstruction or interference of any kind to be erected, placed, created or performed so as to inhibit the flow of water to and from the System;
- ii) except in accordance with the written approval of the Council allow any building, erection or structure to be constructed or allowed to remain constructed or placed on the System;
- iii) carry out or allow to be carried out any change of land profile or earthworks on the System;
- iv) carry out or allow to be carried out any alterations to the System including surface levels, controlled outflows, grates, pipes, filter, pump, delivery plumbing or any other materials or elements thereof outside those normally required for the formation, maintenance and proper function of the System;
- v) unless inconsistent with the context words used herein have the same meaning as those ascribed to them in the Positive Covenant referred to in the Plan.

24R.8 TERMS OF POSITIVE COVENANTS AND RESTRICTIONS ON USE (continued)

Covenant referred to in the Plan.

Name of authority empowered to release, vary or modify any positive covenant or restrictions on the use of land referred to in the plan

Ku-ring-gai Council

Manager, Development Assessment Services

Ku-ring-gai Council

24R.8 TERMS OF POSITIVE COVENANTS AND RESTRICTIONS ON USE (continued)

Controls

24R.8.3 Terms for Water Quality Measures

Terms of positive covenant referred to in the plan for maintenance of water quality measures

- 1 The Registered Proprietor will at the Register Proprietor's own expense well and sufficiently maintain and keep in good and substantial repair and working order the water quality measures (Stormwater cartridges) on the lot in accordance with the system approved by Ku-ring-gai Council (herein after called "the system") which exists from time to time on the land.
- 2 The maintenance shall include the checking of the condition of the stormwater cartridges every 6 months and maintaining a logbook of these periodic checks.
- 3 The Registered Proprietor shall permit officers of Ku-ring-gai Council, having given two days' notice, to enter the land and to view the logbook and the condition of the stormwater cartridges on two occasions per year.
- 4 Where the Registered Proprietor of the burdened lot fails to maintain the system in accordance with the above and fails to comply with any written request of Ku-ring-gai Council within such reasonable time as nominated in said respect, the Registered Proprietor shall permit Ku-ring-gai Council by its servants or agents to carry out any works it reasonably considers necessary to reinstate satisfactory performance of the system and the Registered Proprietor shall pay on demand to Ku-ring-gai Council any reasonable costs incurred by Ku-ring-gai Council in undertaking such works.
- 5 The term "Registered Proprietor" shall include the Registered Proprietor of the land from time to time, and all the Registered Proprietor's heirs, executors, assigns and successors in title to the land and where there are two or more registered proprietors of the land the terms of this covenant shall bind all those registered proprietors jointly and severally.

Name of the body empowered to release, vary or modify the terms of positive covenant referred to

Ku-ring-gai Council

Manager, Development Assessment Services

Ku-ring-gai Council

24R.8 TERMS OF POSITIVE COVENANTS AND RESTRICTIONS ON USE (continued)

Controls

24R.8.4 Positive Covenants to be Applied Under Section 88E of the Conveyancing Act 1919

Positive covenant for construction over Council's easement

- 1 The Registered Proprietor will at his/her own expense remove the [structure as shown on Site Plan which is annexed hereto and marked with the letter "A"] ("the structure") at their own expense if requested by Council for the purpose of accessing the easement by notice in writing given to the Registered Proprietor by Ku-ring-gai Council.
- 2 In the event that the Registered Proprietor of the burdened lot fails to maintain the structure in accordance with the above and fails to comply with any written request of the Ku-ring-gai Council within such reasonable time as nominated in said request, the Registered Proprietor shall meet any reasonable costs incurred by Ku-ring-gai Council in carrying out works necessary to reinstate satisfactory performance of the easement.
- 3 The term "Registered Proprietor" shall include the Registered Proprietor of the land from time to time, and all the Registered Proprietor's heirs, executors, assigns and successors in title to the land and where there are two or more registered proprietors of the land the terms of this covenant shall bind all those registered proprietors jointly and severally.

"Council" means the Ku-ring-gai Council or its successor.

Name of authority empowered to release, vary or modify all of the easements and covenant referred to in the above mentioned plan

Ku-ring-gai Council

Manager, Development Assessment Services

Ku-ring-gai Council

24R.8 TERMS OF POSITIVE COVENANTS AND RESTRICTIONS ON USE (continued)

Controls

24R.8.5 Restriction-on-use on the Title of the Subject Property Under Section 88B of the Conveyancing Act 1919

Terms of restriction on use of land for site affected by overland flow

- 1 The Proprietor of the burdened lot covenants with the Council are not to:
 - a) allow the placement of any structures, walls, fences, fill or other items which may impede the 100 year ARI flood,
 - b) except in accordance with the written approval of the Council, allow any structures, walls, fences, fill or other items to be constructed or allowed to remain constructed or placed in position that may impede the 100 year ARI flood;

“Council” means the Ku-ring-gai Council or its successor.

Name of authority empowered to release, vary or modify the restriction on the use of land

Ku-ring-gai Council

Manager, Development Assessment Services

Ku-ring-gai Council

24R.8 TERMS OF POSITIVE COVENANTS AND RESTRICTIONS ON USE (continued)

Controls

24R.8.6 Positive Covenant for Turntable

- 1 The registered proprietor for the time being of the property agrees, in the event of a mechanical breakdown malfunctioning or failure ("failure") of the mechanical turntable to be erected on the land pursuant to Development Consent granted by Ku-ring-gai Council on vehicle turntable ("the device"), to take all such action as is necessary to ensure that the failure is corrected and remedied within seven (7) days of the first occurrence of the failure.
- 2 The registered proprietor for the time being of the property agrees to indemnify and keep indemnified Ku-ring-gai Council its members, officers and employees (collectively "Council") from and against:
 - a) all and any claims, demands, liabilities, losses, damages, costs, expenses, actions and proceedings whatsoever and howsoever arising made by either the registered proprietor or any third person in connection with or arising out of the construction use maintenance non-maintenance repair or non-repair of the devices; and
 - b) all and any losses, damages, costs and expenses (including, without limitation, reasonable lawyers' fees) whatsoever and howsoever incurred by Council in connection with or arising out of the construction use maintenance non-maintenance repair or non-repair of the devices.

"Council" means the Ku-ring-gai Council or its successor.

Name of authority empowered to release, vary or modify the restriction on the use of land

Ku-ring-gai Council

Manager, Development Assessment Services

Ku-ring-gai Council

24R.8 TERMS OF POSITIVE COVENANTS AND RESTRICTIONS ON USE (continued)

Controls

24R.8.7 Terms of Easement for Waste Collection

- 1 Full and free right for Ku-ring-gai Council its servants, agents, contractors and all persons authorised by Ku-ring-gai Council to go, pass and repass over the whole of the land hereinbefore described as the servient tenement at all times with or without vehicles for the purpose of collecting and removing garbage and refuse from the servient tenement and for purposes incidental thereto PROVIDED ALWAYS that nothing herein contained shall entitle any person exercising the aforesaid rights to enter any building private open space courtyard except to the extent necessary to gain access to garbage receptacles located therein in positions approved by Ku-ring-gai Council or to drive any motor vehicle onto any part of the servient tenement which has not apparently been constructed or provided for the purpose of a carriageway or parking area for vehicles.
- 2 The rights hereby granted may be exercised by Ku-ring-gai Council, its servants, agents, contractors and all persons authorised by Ku-ring-gai Council to enter the servient tenement without being liable for damage which may be occasioned to the servient tenement or any improvements thereon including any paving, driveways, footpaths, lawns, gardens, fences, walls, buildings or to the property of any person therein or thereon otherwise than by reason of the negligence of Ku-ring-gai Council.
- 3 Without limiting the generality of and notwithstanding anything hereinbefore contained if any carriageway or parking area and/or the adjacent land supporting the same is damaged by reason of the movement thereon of any vehicle being used in connection with the collection of garbage from the servient tenement, neither Ku-ring-gai Council its servants, agents, contractors nor any person authorised by Ku-ring-gai Council shall be liable in respect thereof. Ku-ring-gai Council its servants, agents, contractors and all persons authorised by it to exercise the rights hereby granted shall be indemnified and be kept indemnified by the owner of the servient tenement its successors and assigns against all actions, suits, causes of action or suits, claims, demands, proceedings, costs, charges, damages or expenses whatsoever which may be brought or made, instituted or claimed against and from them or any of them by the Owner or any occupier of the servient tenement or any part thereof or by any other person in respect of any loss or injury sustained or threatened or damages suffered or feared by any such person whether in property or person as a consequence of any act or thing done or omitted by any person whilst upon the servient tenement for the purpose of collecting garbage from the servient tenement or for a purpose incidental thereto except where such loss, injury or damages result from the negligence of Ku-ring-gai Council its servants, agents, contractors or of any person authorised by Ku-ring-gai Council as aforesaid.
- 4 Nothing herein contained shall oblige Ku-ring-gai Council to have garbage collected from points within the servient tenement or shall prevent Ku-ring-gai Council from discontinuing collection of garbage

from within the servient tenement PROVIDED ALWAYS that if Ku-ring-gai Council discontinues collection of garbage from within the servient tenement Ku-ring-gai Council and the registered proprietor for the time being of the servient tenement shall respectively have the same rights and obligations with regard to the removal of garbage from the servient tenement as they would have had if this instrument had not been executed.

Name of person or authority empowered to release, vary or modify the easement referred to in the above mentioned plan

Ku-ring-gai Council

Manager, Development Assessment Services

Ku-ring-gai Council

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24R.9 References

24R.9 OSD Exemption Map