

Private Stormwater Code

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Objective

To provide designers, builders and the general public with a guide of Council's requirements for the disposal of private stormwater. The requirements will prevent damage, nuisance and risk to both Council and private property by controlling the flow of stormwater from private properties.

Amendments

Version 1

Minute No: 281/1992
Meeting Date: 21 July, 1992
Effective: Oct 1992 to February 2013

Version 2

Notes:

- Code finalised March 2018.
- Comprehensive DCP (adopted 28 May 2018) requires developments to comply with the code

Key changes:

- Promoting infiltration
- Clarifying/amending on-site detention requirements
- Specifying stormwater management requirements for new dwellings

Policy Statement

- As per document following –

PRIVATE STORMWATER CODE

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1.0 Introduction

This Code outlines Council's objectives and requirements for the disposal of private stormwater within the City of Randwick.

It is based largely on the methodologies and data provided in "Australian Rainfall and Run-off" Volume I & II (Institution of Engineers, Australia, 1987).

It may be necessary to confer with the Council's officers should further information be required. Applicants should also seek professional advice where necessary.

1.1 Objectives

- To provide designers, developers, builders and the general public with a guide to Council's requirements for the disposal of private stormwater.
- To prevent damage to both Council and private property and to prevent nuisance and risk to the public, by controlling the disposal of stormwater from private properties.
- To reduce the impact of new development on Council's stormwater system and prevent flooding.
- To direct stormwater back into the ground through infiltration where possible.

1.2 Definitions

- *Average Recurrence Interval* - The Average Recurrence Interval (ARI) is a measure of the rarity of a rainfall event. It is defined as "The average, or expected, value of the periods between exceedances of a given rainfall total accumulated over a given duration."

A 5 year ARI storm refers to a storm with a frequency of once in 5 years (1 in 5 year storm event). For more information on storm frequencies please refer to the Bureau of Meteorology website.

- *Stormwater runoff* – All rainwater falling on a property or passing through a property which does not evaporate or become absorbed into the ground.

2.0 Stormwater management requirements for developments

2.1 General requirements

Stormwater runoff from a site should be directed either:

- To Council's kerb and gutter or underground drainage system by gravity; AND/OR
- Through a private drainage easement(s) to Council's kerb and gutter (or underground drainage system); AND/OR
- To a suitably designed and sized infiltration area.

Consideration may be given to the use of pumps or a charged system if the above three options are not viable for the site conditions.

All stormwater drainage systems must be designed and constructed to satisfy the relevant requirements in the Building Code of Australia and Australian Standard AS 3500.3:2003 (Plumbing and Drainage – Stormwater Design).

Section 3.2 details the additional requirements for new single dwelling houses; and section 3.3 details the additional requirements for new developments other than single dwelling houses.

Submissions to Council

Development Applications shall include sufficient information to enable Council's officers to determine suitable drainage conditions for the development.

The following information is required to be submitted with the development application:

- A site plan indicating:
 - The kerb line in front (and to the rear) of the property and the location of any drainage pits in proximity to the property.
 - The existing vehicular access/es.
 - An outline of existing and proposed impervious areas including dwellings, garages, sheds, paths, driveways and swimming pools.
 - Any stormwater easements in the vicinity of the site
 - The scale used on all drawings.
- A table showing:
 - The site area.
 - The existing impervious area.
 - The post-development impervious area.
- A concept drainage plan showing:
 - How stormwater will be managed
 - The approximate location of any onsite detention or infiltration areas

Detailed drainage plans are not generally required when a development application is lodged. Rather, conditions will be included in the approval detailing site drainage requirements.

2.2 Requirements for new single dwelling houses

Council requires most new dwelling houses to provide an infiltration area to direct some runoff back into the ground. The conditions included in the development approval will specify the site drainage requirements.

The information below is provided to assist drainage designers in satisfying the conditions of consent.

Summary of requirements

New dwelling houses are required to provide stormwater drainage systems in general accordance with the following requirements:

- i) Roof stormwater must be directed to a suitably designed and constructed rainwater tank, as required in the relevant BASIX Certificate for the dwelling,
- ii) The overflow from the rainwater tank and other surface stormwater must be directed to a sediment/silt arrestor pit (refer to section 4.3) which drains to a suitably designed infiltration area having a minimum base area of 5m² (refer to figure 1 below).
- iii) A stormwater overflow pipe (located a minimum 50mm above the outlet to the infiltration area) is to be provided from the sediment/silt arrestor pit to drain to Council's kerb and gutter or underground drainage system.

If rock is located within 300mm of the base of the proposed infiltration area, the infiltration area is not required and stormwater is to be discharged directly to the kerb and gutter (or underground drainage system) via a sediment/silt arrestor pit.

- iv) Any rainwater tank overflow/stormwater runoff which cannot be managed in accordance with the above requirements (due to topographical constraints such as the site falling away from the street), shall be discharged either:

- a. Through private drainage easements to Council's kerb and gutter (or underground drainage system);

OR

- b. To a separate suitably sized infiltration area. Given that the infiltration system will not have an overflow to the street, geotechnical investigation will be required to confirm the suitability of the site for infiltration and the system must be designed by a professional engineer. As a guide, the system should be sized based on a minimum requirement of 1 m² of infiltration area (together with 1 m³ of storage volume) for every 20 m² of

roof/impervious area draining to the infiltration area.

Refer to Section 3.2 for more information on infiltration systems

Consideration may be given to the use of pumps or a charged system if options a and b are not viable. Refer to section 3.3.

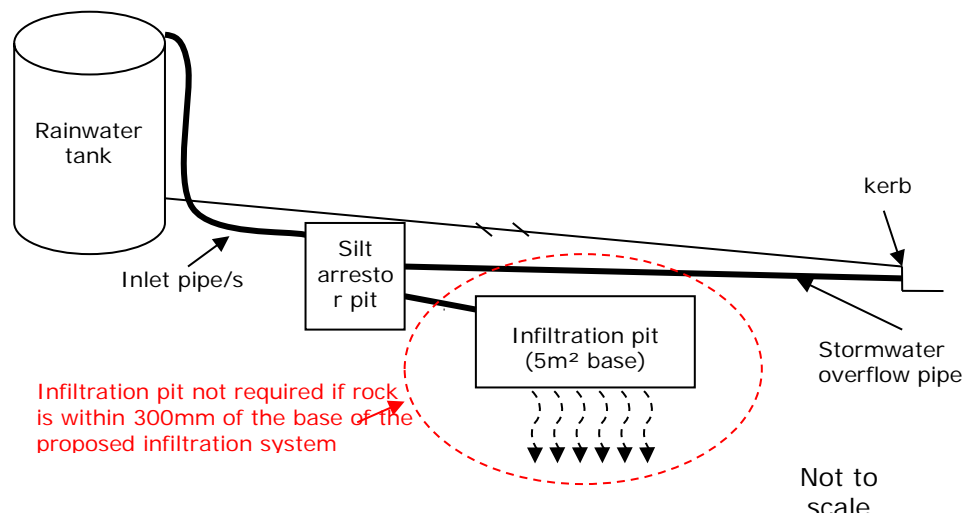


Figure 1: Stormwater discharge into a 5 m² base infiltration area with overflow to the kerb and gutter

Guidelines for design of a 5m² base infiltration pit

- The infiltration area shall have a minimum 300 mm of soil cover (600 mm where the pit is located under a garden/landscaped area).
- The infiltration area shall be suitably setback from structures and boundaries (refer to section 3.2)
- A minimum base infiltration area of 5 m² shall be provided with a suitable means of dispersing stormwater over the area of infiltration.
- The outlet from the silt arrestor pit to the infiltration area shall be at least 50 mm below the outlet from the silt arrestor pit to the kerb and gutter.

Submission requirements

Development Application

Development Applications shall include concept drainage plans with sufficient information to enable Council's officers to determine suitable drainage conditions for the development. Refer to section 2.1 for more information.

Construction Certificate

Detailed drainage plans with levels reduced to Australian Height Datum (AHD), shall be prepared by a suitably qualified professional prior to the issue of a construction certificate.

The drainage plans must demonstrate compliance with the Building Code of Australia, Australian Standard AS3500.3:2003 (Plumbing and Drainage - Stormwater Drainage) and the relevant conditions of the development approval.

Post construction

Upon completion of the construction works, certification shall be obtained from a suitably qualified and experienced professional confirming that the design and construction of the stormwater drainage system complies with the Building Code of Australia, Australian Standard 3500.3:2003 (Plumbing & Drainage - Stormwater Drainage) and the conditions of the development approval.

2.3 Requirements for developments other than single dwelling houses

To reduce the impact of new development on Council's stormwater system and prevent flooding, Council requires most developments to limit the rate of stormwater discharge from the site (permissible site discharge). The most effective way of reducing discharge from the site is to provide infiltration systems to direct flows back into the ground. Another option is to provide on-site detention.

On-site detention systems do not reduce the total amount of stormwater being discharged from the site (unless they incorporate infiltration); however, they attenuate flows to reduce the peak flow rate.

Where a development site is located at or near the bottom of a catchment, there may be minimal benefit in attenuating flows from a site. Consequently, development sites located

along the coast line typically have higher permissible site discharge rates than sites located at the top of a catchment. The map in Appendix A shows the rainfall intensities that should be used to determine the permissible site discharge for the different areas.

As noted above, Council does not generally require detailed drainage plans to be submitted with a development application. Rather, conditions will be included in the approval detailing site drainage requirements. The information below is provided to assist drainage designers in satisfying the conditions of consent.

Summary of requirements

On-site detention

- Should stormwater be discharged to Council's drainage system, on-site detention is required to ensure that the maximum discharge from the site for all storms up to the 1 in 20 year storm does not exceed the permissible site discharge for the site.
- An overland escape route or overflow system must be provided from the detention system to Council's street drainage system for all storms up to the 1 in 100 year storm event. If the overland escape route is not available, the onsite detention system shall be sized to accommodate the 1 in 100 year storm.

Refer to Section 3.1 for more information on on-site detention design.

Note: Rainwater tanks are not detention systems.

Infiltration

- Should stormwater be discharged to an infiltration system, the infiltration area shall be sized for all storm events up to the 1 in 20 year storm event with provision for a formal overland flow path to Council's Street drainage system.
- Should no formal overland escape route be provided for storms greater than the 1 in 20 design storm, the infiltration system shall be sized for the 1 in 100 year storm event.

Refer to Section 3.2 for more information on infiltration systems

Alternative systems

Should topographical constraints restrict stormwater being discharged by gravity to the Council's street drainage system and ground conditions preclude construction of an infiltration pit (i.e. rock and/or a high water table be present on the site), the owner/applicant should attempt to obtain a private drainage easement to dispose of stormwater to Council's stormwater drainage system. If this is not possible, consideration may be given to the use of pumps and/or a charged system.

Refer to Section 3.3 for more information on pump-outs and charged system design.

Submission requirements

Development Application

Development Applications shall include concept drainage plans with sufficient information to enable Council's officers to determine suitable drainage conditions for the development. Refer to section 2.1 for more information.

Construction Certificate

Engineering calculations and plans with levels reduced to Australian Height Datum in relation to site drainage shall be prepared by a suitably qualified Hydraulic Engineer prior to a construction certificate being issued for the development. The drawings and details shall demonstrate compliance with the relevant conditions of development consent and include the following information:

- A detailed drainage design supported by a catchment area plan (at a scale of 1:100), and drainage calculations prepared in general accordance with the Institution of Engineers publication, Australian Rainfall and Run-off, 1987 edition.
- A layout of the proposed drainage system including pipe sizes, type, grade, length, invert levels, dimensions, types of all drainage pits and the connection into Council's stormwater system.
- The separate catchment areas within the site draining to each collection point or surface pit, classified into the following categories:

- Roof areas
- Paved areas
- Grassed areas
- Garden areas

Note: Where buildings abut higher buildings and their roofs are "flushed in" to the higher wall, the area contributing must be taken as: the projected roof area of the lower building, plus one half of the area of the vertical wall abutting, for the purpose of determining the discharge from the lower roof.

- Proposed finished surface levels and grades of car parks, internal driveways and access aisles which are to be related to Council's design alignment levels.
- The details of any special features that will affect the drainage design, such as the nature of the soil on the site and/or the presence of rock etc.

Post construction

The following documentation will be required upon completion of the construction works:

- A works-as-executed drainage plan prepared by a registered surveyor and approved by a suitably qualified and experienced hydraulic consultant/engineer. The works-as-executed plan must include the following details (as applicable):
 - The location of any detention basin/s with finished surface levels;
 - Finished site contours at 0.2 metre intervals;
 - Volume of storage available in any detention areas;
 - The location, diameter, gradient and material (i.e. PVC, RC etc) of all stormwater pipes;
 - The orifice size/s (if applicable);
 - Details of any infiltration/absorption systems; and
 - Details of any pumping systems installed (including wet well volumes).
- Certification from a suitably qualified and experienced Hydraulic Engineer, which confirms that the design and

construction of the stormwater drainage system complies with the Building Code of Australia, Australian Standard AS3500.3:2003 (Plumbing & Drainage- Stormwater Drainage) and conditions of development consent.

- If the drainage system includes an on-site detention or infiltration system, a "restriction on the use of land" and "positive covenant" (under section 88E of the Conveyancing Act 1919) shall be placed on the title of the subject property to ensure that the onsite detention/infiltration system is maintained and that no works which could affect the design function of the detention/infiltration system are undertaken without the prior consent (in writing) from Council.

A copy of Council's standard wording/layout for the restriction and positive covenant is contained in Appendix D.

2.4 Additional controls

The following additional controls apply to all developments:

Above ground water storage

- The maximum depth of ponding in any above ground detention areas (and/or infiltration systems with above ground storage) shall be as follows:
 - 150mm in uncovered open car parking areas (with an isolated maximum depth of 200mm permissible at the low point pit within the detention area). Note: Above ground storage of stormwater is not permitted within basement car parks
 - 300mm in landscaped areas (where child proof fencing is not provided around the outside of the detention area and sides slopes are steeper than 1 in 10)
 - 600mm in landscaped areas where the side slopes of the detention area have a maximum grade of 1 in 10

- 1200mm in landscaped areas where a safety fence is provided around the outside of the detention area

- Above ground stormwater detention areas (and/or infiltration systems with above ground storage) must be suitably signposted where required, warning people of the maximum flood level.
- Mulch or bark is not to be used in areas with above ground storage.
- The floor level of all habitable, retail, commercial and storage areas located adjacent to any detention area or overflow route shall be a minimum of 0.3 metre above the maximum water level for the 1 in 100 year storm. Alternatively a permanent water proof barrier 0.3 metre high is to be constructed around such areas.
- A 'V' drain (or equally effective provisions) are to be provided to the perimeter of the property, where necessary, to direct all stormwater to the onsite stormwater management system.

Location of detention/infiltration systems

- Onsite detention/infiltration systems shall be located in areas accessible by all residents (i.e. in a multi-unit housing development, the onsite detention system shall be within common property).

Construction site water management

- Adequate provision must be made to collect and discharge stormwater during construction of the building. Written approval from Council is required to be obtained in relation to any proposed temporary discharge of stormwater, seepage water and/or groundwater from a construction site into Council's drainage system, in accordance with the requirements of Section 138 of the Roads Act 1993.

Seepage water

- Sub-soil drainage (from site seepage & planter boxes etc) must not be

discharged directly or indirectly to Council's street gutter.

- Any sub-soil drainage must be restricted from entering the basement areas of the building and the stormwater drainage system, by waterproofing and tanking the basement areas of the building.
- Sub-soil drainage may:
 - be discharged via infiltration subject to the hydraulic consultant/engineer being satisfied that:
 - i. the site and soil conditions are suitable; and
 - ii. the seepage is able to be fully managed within the site, without causing a nuisance to any premises; and
 - iii. the seepage does not drain or discharge (directly or indirectly) to the street gutter;

OR

- be connected directly to Council's underground drainage system (but only with the prior written approval of Council, as required under the Roads Act 1993).

Note: Subsoil drainage does not include groundwater flows

Maintenance of stormwater systems

- The stormwater system must be maintained to ensure the efficient operation of the system.

Water quality

- Applicants are responsible for ensuring that the water quality is suitable for the proposed method of discharge.

3.1 Stormwater Management Systems

3.2 On-site detention systems

Council requires that most areas in the City of Randwick provide on-site stormwater detention and/or infiltration for new developments. The map in Appendix A shows the areas that require onsite detention and/or infiltration and the appropriate Rainfall Intensity that is to be used in each area to determine the relevant Permissible Site Discharge.

The design of on-site detention systems involves the following steps:

- 1) Calculating the permissible (maximum) site discharge rate
- 2) Calculating the required volume of storage
- 3) Calculating the required Orifice size
- 4) Selecting the most appropriate method of detention

Note: Section 3.1 is not applicable to single dwelling houses

Permissible Site Discharge

The City of Randwick has many different catchments. These catchments have different abilities to accommodate stormwater flows under intense rainfall conditions.

The map in Appendix A provides the rainfall Intensities that are to be used for determining the Permissible (Maximum) Site Discharge.

$$PSD = \frac{C \cdot I \cdot A}{3,600} \text{ l/s}$$

Where PSD = Permissible Site Discharge (l/s)

C = Co-efficient of Run-off (use AR & R, 1987 method. The pervious area run-off co-efficient for Randwick City is 0.6054)

A = Site Area (m²)

I = Rainfall Intensity (mm/hr) from Appendix A or B.

Maximum rate of discharge to kerb and gutter

In addition to the above requirements, the maximum discharge rate to Council's kerb and gutter in all areas must not exceed 25

litres/second for the critical 20 year annual recurrence interval design storm.

If the discharge rate exceeds 25 litres/second, stormwater must be discharged directly into Council's underground drainage system via a pit or drain. Alternatively, additional on-site detention may be required (including in areas that would otherwise not require detention) to ensure that this maximum discharge rate is not exceeded.

Summary:

- In areas that require on site detention (refer to the map in Appendix A):
 - If the calculated PSD is less than 25 l/s, the maximum rate of discharge to the kerb and gutter must be limited to the PSD.
 - If the calculated PSD is greater than 25 l/s, the maximum rate of discharge to the kerb and gutter is 25 l/s.
- In all other areas:
 - The maximum discharge rate to Council's kerb and gutter must not exceed 25 litres/second for the critical 20 year annual recurrence interval design storm.

Volume of Storage

Once the permissible site discharge (PSD) has been determined, the required volume of storage can be calculated using the Mass Curve Technique detailed in Technical Note 1, Chapter 14 of Australian Rainfall and Run-off, 1987.

Stormwater runoff in excess of the PSD for all storms up to the 20 year ARI storm is to be retained on the site for gradual release to Council's stormwater system.

An overland escape route or overflow system (to Council's street drainage system) must be provided for storms having an average recurrence interval of 100 years, or, alternatively the stormwater detention (and/or infiltration) system is to be designed to accommodate the 100 year ARI storm.

Rainfall intensity figures are contained in Appendix B.

Note: Rainwater tanks are not detention systems as they do not have a constant

outflow. Consequently, rainwater tanks cannot be used to meet the on-site detention requirements

Orifice Design

Outflow from the storage area is normally controlled by an orifice located in the outlet structure. This orifice shall be protected by a suitable screen or some other method to prevent clogging with debris.

The size of the orifice is critical as it controls the operation of the detention area. The cross-sectional area of the orifice is calculated as follows:

$$A_o = \frac{Q}{C_d \times \sqrt{2gh}} \text{ m}^2$$

Where Q	= Permissible Site Discharge (m ³ /s)
A _o	= Cross Sectional Area of Orifice (m ²)
C _d	= Discharge Co-efficient = 0.6
g	= Acceleration Due to Gravity = 9.8m/s ²
h	= Head of Water (m) above the orifice, i.e. the vertical distance from the centre of the orifice to the maximum storage level.

If the detention area incorporates infiltration, the permissible site discharge may be adjusted to incorporate the infiltration rate determined by the geotechnical engineer.

Types of Detention Systems

Stormwater detention can be achieved by various methods. These include:

- *Below ground Detention Systems*
These systems utilise below ground storage areas. Storage tanks, pipes and infiltration trenches are all methods of below ground storage.
- *Above ground Detention Systems*
These systems utilise kerbs or mounds to create temporary storage areas above ground. Mulch or bark is not to be used in areas where above ground storage of water is permitted.
- *Combined above and below ground storage systems*

These systems utilise a combination of both storage types with part of the total storage volume held below ground and part above ground

Where possible any detention tanks should have an open base to infiltrate stormwater into the ground. However; infiltration should not be used if ground water and/or any rock stratum is within 2.0 metres of the base of the tank.

3.2 Infiltration systems

On an undeveloped site, rain will largely infiltrate back onto the ground with only a portion being discharged from the site as stormwater runoff. When a site is developed, the impermeable surfaces typically increase stormwater runoff. To offset the impacts of development and reduce the amount of water being discharged from a site, Council encourages the use of infiltration for all types of developments.

However; infiltration is not appropriate on all sites, and care must be taken when designing infiltration systems to ensure that the system will function correctly and not adversely impact adjoining structures.

Site suitability

The design and construction of any infiltration areas must be appropriate having regard to the site and ground characteristics.

Infiltration is generally not appropriate if the site is underlain by rock and/or a water table within 2 metres of the base of the infiltration area, or the ground conditions comprise low permeability soils such as clay.

Location

Generally, infiltration areas should be located a minimum of 3.0 metres from any structures and 2.1 metres from the adjacent side and rear boundaries.

It may be possible to locate an infiltration system closer than 3.0 metres from a structure if a structural engineer or other suitably qualified person certifies that the infiltration area will not adversely affect the structure.

A minimum of 300mm of soil cover (600mm where the pit is located under a garden/landscaped area) shall be provided over the infiltration area.

System design

Single dwelling houses

As detailed in section 2.2, new dwelling houses are required to provide an infiltration area having a minimum base area of 5m² with an overflow to the street.

Single dwelling houses (and alterations and additions) with no overflow to the street

On sites where it is proposed to use infiltration to manage stormwater and there is no overland flow from the infiltration area to the street, geotechnical investigation will be required to confirm the suitability of the site for infiltration and the infiltration system must be designed by a professional engineer. As a guide, the system should be sized based on a minimum requirement of 1 m² of infiltration area (together with 1 m³ of storage volume) for every 20 m² of roof/impervious area draining to the infiltration area.

Other development types

For all other development types, geotechnical investigation is required to be carried out to determine the suitability of the site for infiltration (i.e. the underlying ground conditions and depth to water table) as well as the applicable infiltration rate of the soil. *Note: A factor of safety of 2 shall be applied to the soil permeability determined through geotechnical testing.*

Once the infiltration rate of the soil is known, the infiltration system should be designed by a suitability qualified engineer in accordance with the following requirements:

- The infiltration area shall be sized for all storm events up to the 1 in 20 year storm event with provision for a formal overland flow path to Council's Street drainage system.
- Should no formal overland escape route be provided for storms greater than the 1 in 20 design storm, the infiltration system shall be sized for the 1 in 100 year storm event.

Determination of the required cumulative storage in the infiltration system should be

calculated using the mass curve technique as detailed in section 3.1, with the permissible site discharge (PSD) being replaced with the effective infiltration rate for the proposed system (in litres/second).

Other requirements

All stormwater must be taken through a sediment silt arrestor pit prior to discharge into an infiltration system.

It is the applicant's responsibility to ensure that stormwater quality is appropriate for infiltration. Contaminated stormwater should not be directed into infiltration systems.

3.3 Alternative systems

Pump out systems or charged systems should only be considered when:

- Typographical constraints restrict stormwater being discharged by gravity to the Council's drainage system; AND
- Ground conditions preclude construction of an infiltration pit (i.e. rock and/or a high water table are present on the site); AND
- The owner/applicant is unable to obtain a private drainage easement to dispose of the stormwater to Council's stormwater drainage system.

Pump-out systems

Pump-out systems must be designed by a suitably qualified and experienced hydraulic consultant/engineer in general accordance with the following requirements:

- The system must include two pumps connected in parallel (with each pump being capable of discharging at the required discharge rate)
- The system shall be connected to a control board so that each pump will operate alternatively
- The pump wet well shall be sized for the 1 in 100 year, 2 hour storm assuming both pumps are not working.

Any pump out water must pass through a stilling pit prior to being discharged by gravity to the kerb and gutter.

Pump systems must be regularly checked and maintained

Charged systems

Should a charged system be required to drain any portion of the site, the charged system must be designed with suitable clear-outs/inspection points at pipe bends and junctions.

The maximum head permitted in charged systems is 1 metre.

4.0 Design of drainage components

All stormwater drainage system components must satisfy the relevant requirements in the Building Code of Australia and Australian Standard AS 3500.3:2003 (Plumbing and Drainage – Stormwater Design).

4.1 Stormwater pits

Stormwater pits on private property should comply with the following requirements (unless otherwise specified in the conditions of development approval).

- The minimum sizes for stormwater pits shall be determined based on the size of the pipes and the depth to the invert of the pipes.

The following table summaries the minimum pit sizes required:

Minimum pit size	Depth to Invert	Pipe diameter
450mm x 450mm	Up to 600mm	150mm to 300mm
600mm x 600mm	600mm to 1.0m	Up to 300mm
750mm x 900mm	Over 1.0m	Over 300mm

- Pits greater than 1.0 metre depth are to have step irons.
- The walls of pits are to be 225mm thick brickwork or 150mm thick reinforced concrete for pits:

- Greater than 600mm deep.
 - Located in trafficable areas.
- Precast pits are acceptable provided that they comply with the relevant Australian Standards.
- All pits should be streamlined to half pipe height with a minimum 1% fall towards the outlet.
- A childproof and corrosion resistant fastening system shall be installed on access grates over pits/trenches where water is permitted to be temporarily stored.
- For rodding purposes, pits are to be constructed at every second pipe bend where that pipe originates from a surface inlet pit.

4.2 Stormwater pipes

Generally all internal pipelines must be capable of discharging a 1 in 20 year storm flow. However the minimum pipe size for pipes that accept stormwater from a surface inlet pit must be 150mm diameter. The site must be graded to direct any surplus run-off (i.e. above the 1 in 20 year storm) to the proposed drainage (detention/infiltration) system.

4.3 Sediment/silt arrestor pits

Sediment/silt arrestor pits are to be provided within the site prior to stormwater being discharged from the site or into any infiltration areas. The sediment/silt arrestor pits are to be constructed in general accordance with the following requirements:

- The base of the pit located a minimum 300mm under the invert level of the outlet pipe.
- A minimum of 4 x 90 mm diameter weep holes located in the walls of the pit at the floor level with a suitable geotextile material with a high filtration rating located over the weep holes.

- A heavy-duty grate located over the pit with a child proof and corrosion resistant fastening system.
- A galvanised heavy-duty screen located over the outlet pipe
- The inlet pipeline located on the side of the pit so that the stormwater will discharge across the face of the screen.
- A sign adjacent to the pit stating that: "This sediment/silt arrestor pit shall be regularly inspected and cleaned."

Note: Sketch details of a standard sediment/silt arrestor pit are provided in Appendix C

5.0 Works on council land

The written approval of Council is required to be obtained in relation to all drainage and infrastructure works which are located externally from the site within a road reserve/public place, in accordance with the requirements of the Roads Act 1993. Detailed plans and specifications of the proposed works are to be submitted to and approved by Council prior to commencing any works within the road reserve/public place.

Any new kerb inlet pits (constructed within Council's road reserve) are to be constructed generally in accordance with Council's standard detail for the design of kerb inlet pits (drawing number SD6 which is available from Council).

With the exception of the site discharge pipe, all new pipelines constructed within council's road reserve shall be minimum 375 mm diameter, spigot and socket rubber ringed jointed, steel reinforced concrete pipeline (RRRCP).

Site discharge pipelines shall cross the verge at an angle no less than 45 degrees to the kerb line.

If connecting to Council's underground drainage system, a reflux valve shall be provided (within the site) over the pipeline discharging from the site to ensure that stormwater from Council drainage system does not surcharge back into the site stormwater system.

6.0 Easements

6.1 Construction adjacent to drainage easements

In general, building over Council's drainage easements is prohibited.

Where a building is to be located adjacent to a Council easement and/or pipe, all footings shall be:

- Founded on rock, OR;
- Extended below a 30 degree line taken from the level of the pipe invert at the edge of the drainage reserve/easement (angle of repose).

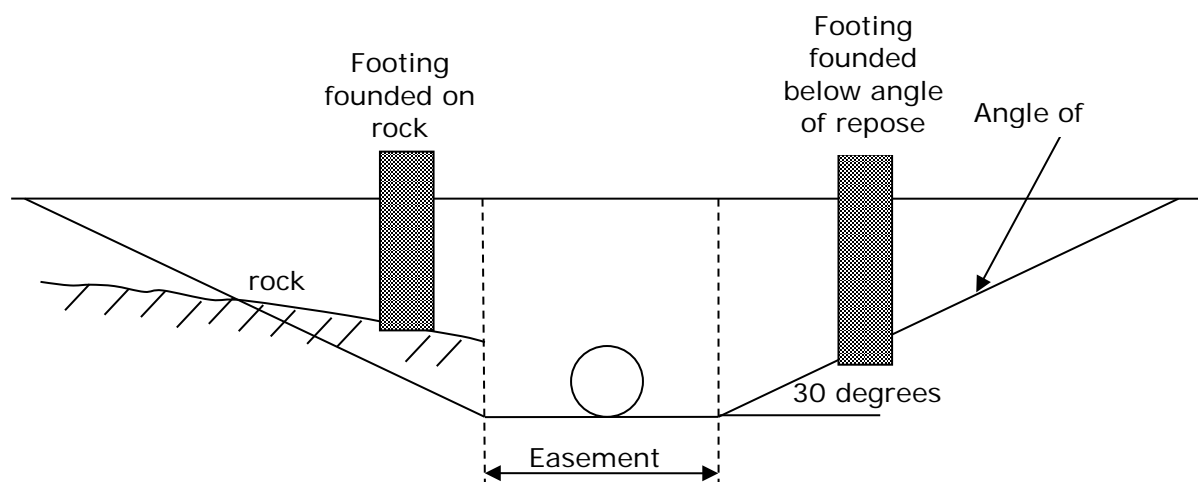
6.3 Private (inter-allotment) drainage easements

Where the natural ground level does not permit drainage by gravity to the street gutter, it may be necessary to obtain a drainage easement through an adjoining private property or properties, to discharge the run-off from the site by gravity.

Inter-allotment drainage easements shall have the following minimum widths:

Pipeline diameter	Easement width
≤ 300mm	1.0 m
301 to 374 mm	1.5 m
≥375mm	2.5 m

Easements shall be free from any building encroachments, including eaves and footings and shall contain a single pipe only.



Figures 2: Construction adjacent to drainage easements

Where an easement and/or pipeline benefits a party other than Council, applicants are required to refer to the terms of the easement and liaise directly with the relevant party to determine the requirements for construction over and/or adjacent to the easement.

6.2 Relocation of drainage easements

In some situations, a development may necessitate alterations to Council's drainage system. Council will only permit pipelines/easements to be relocated when the hydraulic performance of the system will not be compromised and adjoining properties are not adversely affected.

7.0 Discharge of stormwater to drainage systems not owned by Council

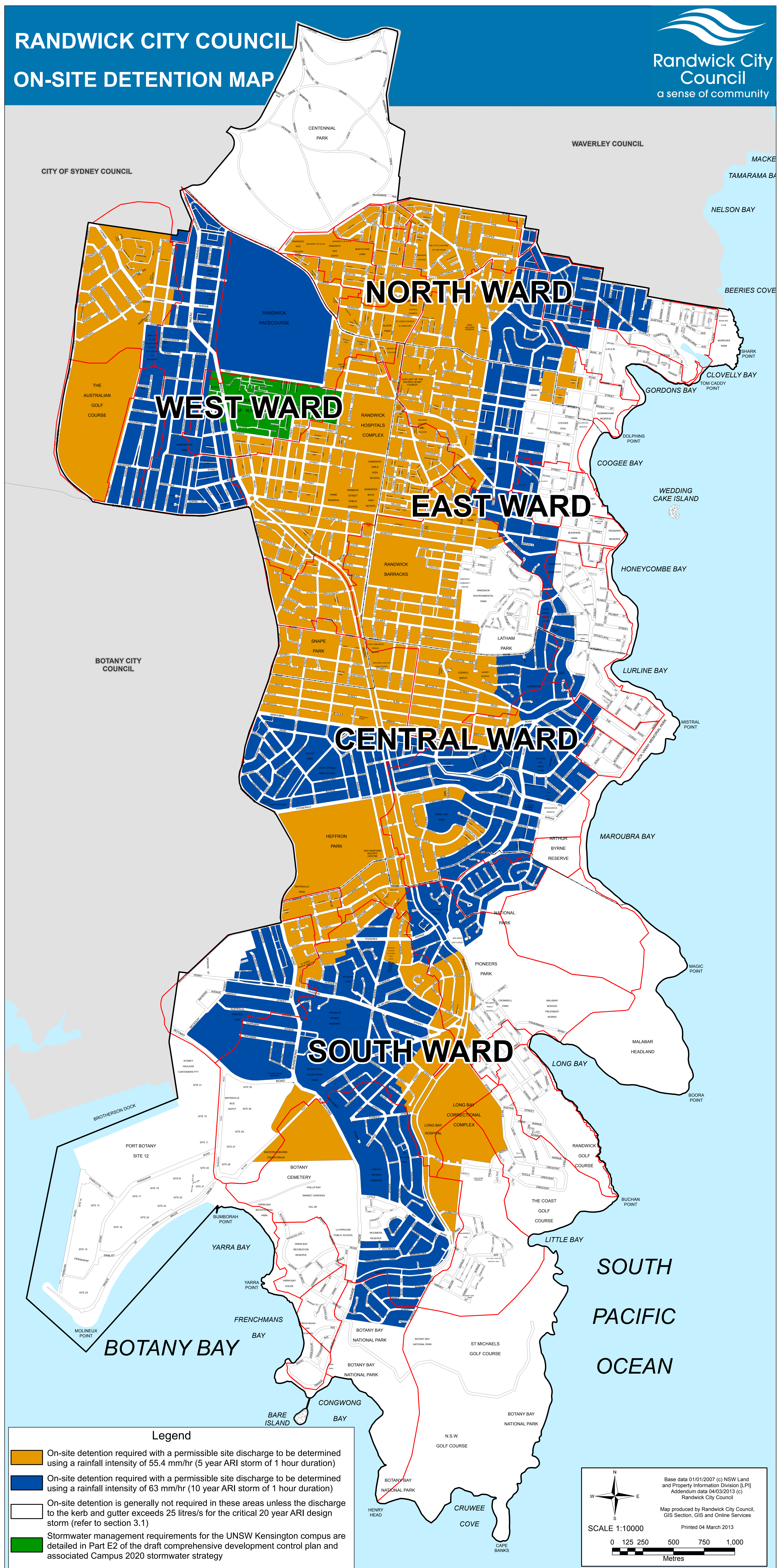
Approval must be obtained from the relevant authority if the applicant wishes to discharge stormwater to a system not owned by Council.

Appendix A: On-site detention map

RANDWICK CITY COUNCIL ON-SITE DETENTION MAP



Randwick City Council
a sense of community



Appendix B: Intensity-Frequency-Duration Table

Rainfall Intensity in mm/hr for various durations and storm recurrence intervals

	STORM ANNUAL RECURRENCE INTERVAL						
DURATION (HOURS)	1 YEAR	2 YEARS	5 YEARS	10 YEARS	20 YEARS	50 YEARS	100 YEARS
0.08	106.00	134.00	168.00	187.00	213.00	246.00	271.00
0.10	98.80	126.00	158.00	176.00	200.00	231.00	254.00
0.17	80.90	103.00	131.00	146.00	167.00	193.00	214.00
0.33	59.50	76.50	98.20	111.00	127.00	149.00	165.00
0.50	48.50	62.60	81.00	91.60	106.00	124.00	138.00
0.67	41.50	53.70	69.80	79.10	91.50	107.00	120.00
0.83	36.50	47.30	61.60	70.00	81.00	95.80	106.00
1.00	32.80	42.40	55.40	63.00	72.90	86.10	96.00
1.17	29.80	38.40	50.60	57.40	66.60	78.60	87.70
2.00	21.00	27.30	35.70	40.70	47.20	55.80	62.30
3.00	16.00	20.70	27.10	30.90	35.90	42.40	47.30
6.00	9.96	12.90	16.80	19.20	22.20	26.10	29.20
12.00	6.30	8.14	10.60	12.00	13.90	16.40	18.30
24.00	4.09	5.29	6.87	7.79	9.00	10.60	11.80
48.00	2.65	3.42	4.44	5.03	5.81	6.83	7.61
72.00	1.98	2.55	3.31	3.74	4.31	5.06	5.64

Appendix D: Standard wording for restriction and positive covenant

All new developments requiring on-site detention are required to place a positive covenant and restriction to user on the title of the property.

Often, new developments requiring onsite detention will also be submitting a plan of subdivision (strata or Torrens) and thus the restriction to user and positive covenant would be placed on the title of the property via an 88B instrument. The location of the on-site stormwater detention system should be shown on the plan of subdivision.

However, if subdivision plans are not being lodged, the restriction to user and positive covenant may be attached to the title of the property using forms 13 RPA and 13PC (available from the land and property information website).

The following pages provide standard wording for:

- An 88B instrument; and
- Annexures to forms 13PC and 13RPA.

Standard wording for 88B instrument

Instrument setting out terms of Easements, Positive Covenants and Restrictions on the Use of Land intended to be created pursuant to Section 88B of the Conveyancing Act (1919).

Plan: Plan of subdivision of Lot in DP
Cover by strata certificate No. SS.....

Full name and address of the owner of the land:
.....
.....
.....

Part 1 (Creation)

No. of Item shown in the intention panel on the plan	Identity of easement, restriction or positive covenant to be created and referred to in the plan	Burdened lot(s) or parcel(s)	Benefited lot(s), bodies or Prescribed Authorities:
1	Restriction on the Use of Land		Randwick City Council
2	Positive Covenant		Randwick City Council
3			
4			

Part 2 (Terms)

Item 1 - Terms of the Restriction numbered 1 in the plan

There shall be no erection of any buildings or structures nor the carrying out of any works on or over the land and/or structure described as "on-site stormwater detention system" that may adversely affect the design function of the system. The on-site stormwater detention system includes all ancillary gutters, pipes, drains, walls, kerbs, pits, trenches, grates, chambers, basins and surfaces designed to temporarily detain stormwater as shown on the plans approved by the Certifying Authority, Drainage Plan No _____ by _____ (hereinafter called "the system").

Works in this context shall be taken to mean the excavation or replacement of soil or landscape material upon this detention system that may affect the design function of the said area, or any variation to the size or shape of the "on-site stormwater detention system".

The name of the person empowered to release, vary or modify the Restriction numbered 1 on the plan – Randwick City Council

Plan: Plan of subdivision of Lot in DP
Cover by strata certificate No. SS.....

Item 2 - Terms of the Positive Covenant numbered 2 on the plan

1. The registered proprietors of the lot(s) burdened will in respect to the system described in the Restriction firstly referred to in this instrument:
 - a. Permit stormwater to be temporarily detained by the system.
 - b. Keep the system clean and free from silt, rubbish and debris.
 - c. Maintain, renew and repair the system so that it functions in a safe and efficient manner, and in doing so complete the same within the time and in the manner specified in written notice issued by the Council.
 - d. Carry out the matters referred to in paragraphs (b) and (c) at the proprietor's expense.
 - e. Not make any alterations to the detention facility or elements thereof without prior consent in writing of the Council.
 - f. Permit the Council or its authorised agents from time to time upon giving reasonable notice (but at any time without notice in the case of an emergency) to enter and inspect the land for compliance with the requirements of this clause.
 - g. Comply with the terms of any written notice issued by the Council in respect to the requirements of this Clause within the time stated in the notice.
2. In the event of the proprietor/s failing to comply with the terms of any written notice served in respect of the matters in Clause 1 above, the Council or it's authorised agents may enter with all necessary equipment and carry out any work required to ensure the safe, efficient operation of the system and recover from the proprietor the cost of carrying out the work, and if necessary, recover the amount due by legal proceedings (including legal costs and fees) and entry of a covenant charge on the lots burdened under section 88F of the Conveyancing Act, 1919. In carrying out any work under the Clause, the Council shall take reasonable precautions to ensure that the land is disturbed as little as possible.
3. In this Covenant "Council" means **Randwick City Council**

The name of the person empowered to release, vary or modify the Positive Covenant numbered 2 on the plan – Randwick City Council

Plan:

Plan of subdivision of Lot in DP
Cover by strata certificate No. SS.....

Item 3 - Terms of the numbered 3 on the plan

INSERT ANY OTHER POSITIVE COVENANTS, EASEMENTS, RIGHTS OF ACCESS, RESTRICTIONS ETC THAT ARE REQUIRED AS ADDITIONAL ITEMS (REFER TO CONDITIONS OF DEVELOPMENT APPROVAL)

Signed in my presence by

.....
(Name of Proprietor)

.....
(Signature of Proprietor)

who are personally known to me:

.....
(Name of Witness)

.....
(Signature of Witness)

.....
(Address of Witness)

OR

The Common Seal of Pty Ltd
ACN_____ was hereunto affixed by
authority of the Board of Directors in the presence of:

*affix
common
seal here*

.....
Secretary

.....
Director

Consent of Mortgagee:

Approved by Randwick City Council

.....
Authorised Officer

Annexure to 'Positive Covenant'
(Form 13PC)

Terms of the Positive Covenant

1. The registered proprietors (herein called the proprietor) of the land burdened will in respect to the "on-site infiltration system" (hereafter called 'the system'):-

(Note: The on-site stormwater detention/infiltration system includes all ancillary gutters, pipes, drains, walls, kerbs, pits, trenches, grates, chambers, basins and surfaces designed to temporarily detain/infiltrate stormwater as shown on _____ by _____ (dated _____))

- h. Permit stormwater to be temporarily stored by the system.
 - i. Keep the system clean and free from silt, rubbish and debris.
 - j. Maintain, renew and repair the system so that it functions in a safe and efficient manner, and in doing so complete the same within the time and in the manner specified in written notice issued by the Council.
 - k. Carry out the matters referred to in paragraphs (b) and (c) at the proprietor's expense.
 - l. Not make any alterations to the detention/infiltration facility or elements thereof without prior consent in writing of the Council.
 - m. Permit the Council or its authorised agents from time to time upon giving reasonable notice (but at any time without notice in the case of an emergency) to enter and inspect the land for compliance with the requirements of this clause.
 - n. Comply with the terms of any written notice issued by the Council in respect to the requirements of this Clause within the time stated in the notice.
2. In the event of the proprietor/s failing to comply the terms of any written notice served in respect of the matters in Clause 1 above, the Council or its authorised agents may enter with all necessary equipment and carry out any work required to ensure the safe, efficient operation of the system and recover from the proprietor the cost of carrying out the work, and if necessary, recover the amount due by legal proceedings (including legal costs and fees) and entry of a covenant charge on the lots burdened under section 88F of the Conveyancing Act, 1919. In carrying out any work under the Clause, the Council shall take reasonable precautions to ensure that the land is disturbed as little as possible.
3. In this Covenant "Council" means **Randwick City Council**

The name of the person empowered to release, vary or modify the Positive Covenant referred to –
Randwick City Council

Signature of Registered proprietor:

.....
Registered Proprietor

Approved by Randwick City Council:

.....
Authorised Officer

***Annexure to 'Restriction on the Use of Land By a Prescribed Authority'
(Form 13RPA)***

Terms of the Restriction

There shall be no erection of any buildings or structures nor the carrying out of any works on or over the land and/or structure described as "on-site stormwater detention/infiltration system" that may adversely affect the design function of the system. The on-site stormwater detention/infiltration system includes all ancillary gutters, pipes, drains, walls, kerbs, pits, trenches, grates, chambers, basins and surfaces designed to temporarily detain/ infiltrate stormwater as shown on Drainage Plan No. _____ by _____ (dated _____).

Works in this context shall be taken to mean the excavation or replacement of soil or landscape material upon this detention system that may affect the design function of the said area, or any variation to the size or shape of the "on-site stormwater detention/infiltration system".

The name of the person empowered to release, vary or modify the Restriction on Use referred to –
Randwick City Council

Signature of Registered proprietor:
Registered Proprietor

Approved by Randwick City Council:
Authorised Officer