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Development Control Plan 2014

Part: 8.2

Stormwater and Floodplain Management

Translation

ENGLISH

If you do not understand this document please come to Ryde Civic Centre, 1 Devlin Street, Ryde Monday to Friday 8.30am to 4.30pm or telephone the Telephone and Interpreting Service on 131 450 and ask an interpreter to contact the City of Ryde for you on 9952 8222.

ARABIC

إذا تعذر عليك فهم محتويات هذه الوثيقة، نرجو الحضور إلى مركز بلدية رايد Ryde Civic Centre على العنوان: 1 Devlin Street, Ryde من الاثنين إلى الجمعة بين الساعة 8.30 صباحاً والساعة 4.30 بعد الظهر، أو الاتصال بمكتب خدمات الترجمة على الرقم 131 450 لكي تطلب من أحد المترجمين الاتصال بمجلس مدينة رايد، على الرقم 9952 8222، نيابةً عنك.

ARMENIAN

Եթէ այս գրութիւնը չէք հասկնար, խնդրեմ եկէք՝ Ռայտ Սիվիք Սենթըր, 1 Տեվին փողոց, Ռայտ, (Ryde Civic Centre, 1 Delvin Street, Ryde) երկուշաբթիէն Ուրբաթ կա. ժամը 8.30 – կէ. ժամը 4.30, կամ հեռաձայնեցէք Հեռաձայնի եւ Թարգմանութեան Սպասարկութեան՝ 131 450, եւ խնդրեցէք որ թարգմանիչ մը Ռայտ Քաղաքապետարանին հետ կապ հաստատէ Ձեզի համար, հեռաձայնելով՝ 9952 8222 թիւին։

CHINESE

如果您看不懂本文，請在周一至周五上午 8 時 30 分至下午 4 時 30 分前往 Ryde 市政中心詢問 (Ryde Civic Centre, 地址: 1 Devlin Street, Ryde)。你也可以打電話至電話傳譯服務中心，電話號碼是: 131 450。接通後你可以要求一位傳譯員爲你打如下電話和 Ryde 市政廳聯繫，電話是: 9952 8222。

FARSI

اگر این مدرک یا تمی فهمید لطفاً از 8.30 صبح تا 4.30 بعد از ظهر دوشنبه تا جمعه به مرکز شهرداری رایید، Ryde Civic Centre, 1 Devlin Street, مراجعه کنید یا به سرویس مترجم تلفنی شماره 131 450 تلفن بزنید و از یک مترجم بخواهید که از طرف شما با شهرداری رایید شماره 9952 8222 تلفن بزند.

ITALIAN

Se non capite il presente documento, siete pregati di rivolgervi al Ryde Civic Centre al n. 1 di Devlin Street, Ryde, dalle 8.30 alle 16.30, dal lunedì al venerdì; oppure potete chiamare il Telephone Translating and Interpreting Service al 131 450 e chiedere all'interprete di contattare a vostro nome il Municipio di Ryde presso il 9952 8222.

KOREAN

이 문서가 무슨 의미인지 모르실 경우에는 1 Devlin Street, Ryde 에 있는 Ryde Civic Centre 로 오시거나 (월 – 금, 오전 8:30 – 오후 4:30), 전화 131 450 번으로 전화 통역 서비스에 연락하셔서 통역사에게 여러분 대신 Ryde 시청에 전화 9952 8222 번으로 연락을 부탁하십시오.

Amend. No.	Date approved	Effective date	Subject of amendment
1	26 May 2015	3 June 2015	Content of DCP revised and consolidation with 8.6 Floodplain Management

Contents

1.0 Introduction

This Part shall be read in conjunction with Council's Stormwater and Floodplain Management Technical Manual and Water Sensitive Urban Design Guidelines. The Technical Manual and Guidelines have been created to provide additional detailed information to assist in the implementation of the objectives of City of Ryde Development Control Plan 2014 ("DCP") and must therefore be read in conjunction with the DCP. For the avoidance of doubt, the Technical Manual and Guidelines form part of the DCP.

1.1 Land to which this Part applies

This Part applies to all land within the City of Ryde. A section of the document has specific relevance to flood effected areas.

1.2 Purpose

The purpose of this Part is to guide development with respect to:-

- the management of stormwater runoff in terms of drainage and
- land susceptible to flooding or overland flow within the City of Ryde

1.3 Objectives

The overall objectives of this Part and associated Technical Manual are as follows;

- To ensure that the collection and conveyance of stormwater from development is undertaken in a safe manner without adverse impact to property or public safety and does not adversely impact downstream conditions.
- To minimise or prevent degradation of the environment from stormwater drainage systems, by implementing water sensitive urban design (WSUD) principals.
- To ensure that development is designed with consideration for overland flows and/ or flooding that may potentially occur during large storm events, so as to minimising property damage and maintain public health and safety

1.4 Document Structure

This document has four sections which cover the components of managing stormwater drainage, flooding/overland flow when undertaking development in the City of Ryde.

An outline of these sections is as follows:

Section 1: Introduction	An introduction to the intent of the DCP, its structure and application to development proposals.
Section 2: Stormwater Drainage	Describes the requirements for stormwater drainage, in terms of collecting and controlling stormwater runoff to an approved point of discharge.
Section 3: Water Sensitive Urban Design	Describes requirements to ensure that the design of a stormwater drainage system integrates whole water cycle management considerations.
Section 4: Flooding and overland flow	Describes the requirements for development on land susceptible to significant overland flows or flooding during large storm events.

1.5 Relationship with other Plans and Manuals/Guides

This Part supplements and gives guidance to the objectives and controls of Ryde Local Environmental Plan 2014 (RLEP 2014).

This part is to be read in conjunction with:

- Stormwater and Floodplain Management Technical Manual
- Water Sensitive Urban Design Guidelines
- Eastwood and Terrys Creek Floodplain Risk Management Plan and Study (2009)
- Macquarie Park Floodplain Risk Management Plan and Study (2011)
- City of Ryde - Water Sensitive Urban Design Vegetation Selection Guide
- Floodplain Development Manual 2005

1.6 Dictionary

In regards to the definition of terms used in this Part refer to Councils DCP 2014 Part 10 Dictionary.

2.0 STORMWATER DRAINAGE

2.1 Drainage Principals

Development affects the natural drainage patterns of land. It is critical then that development affecting the existing stormwater runoff regime is undertaken in a manner that does not negatively impact on neighbouring properties, the public drainage network or increase the threat to public safety.

This section seeks to ensure that the management of stormwater from development is not detrimental to downstream areas and does not burden the public drainage network.

The following subsections address the principles of drainage system design associated with achieving Council's objectives for stormwater management. These are;

- Section 2.2 – Property Drainage i.e. Stormwater management on the property
- Section 2.3 – Stormwater Discharge from Property i.e. Means of stormwater discharge from the property.
- Section 2.4 – Community Stormwater Management i.e. Control of stormwater discharge to the public drainage system.

2.2 Property Drainage

OBJECTIVE

1. To ensure the collection and conveyance of stormwater runoff on property is undertaken in a manner to preserve the amenity of the land, prevent damage to property and without jeopardising public safety.

CONTROLS

Property drainage systems are to be designed to collect and convey stormwater runoff from the property so as to prevent damage to private property (the subject site as well as neighbouring property), reduce long term ponding and to improve the amenity of the site after storm events or during periods of rainfall. All of the following needs to be implemented:-

a. Stormwater runoff draining from impervious/ hardstand areas must be collected and conveyed via pipe or an engineered open channel to a discharge point in accordance with this Part and the Stormwater and Floodplain Management Technical Manual

b. Stormwater runoff from soft landscaping or turfed areas should be conveyed to a discharge point in accordance with this Part and the Councils *Stormwater* and Floodplain Management *Technical Manual* or otherwise dealt with in a manner to mimic state of nature conditions and avoid long-term ponding.

c. The property drainage network must be designed with sufficient capacity to safely convey stormwater run-off generated from design storm events listed in the *Stormwater* and Floodplain Management *Technical Manual*.

d. Stormwater runoff, including overland flows entering the site from upstream properties, must be managed to provide fail-safe protection to buildings, properties and persons either on private property or in the public domain.

e. Where a multi dwelling housing development is proposed on a site that consolidates two or more lots and any adjoining upslope properties do not have the benefit of a drainage easement, the development must be designed to potentially accommodate a new drainage easement benefitting upstream properties.

f. The design and location of all drainage components must be visually unobtrusive and integrated with site landscaping to ensure they do not detract from the streetscape appearance of the development.

NOTE: Information to be submitted with a Development Application

- All development which affects the impervious footprint of the site or changes to landform, must demonstrate by way of a conceptual plan prepared in accordance with Section 3 of the Stormwater and Floodplain Management Technical Manual, the proposed means of the collection and conveyance of stormwater from the site, so as to demonstrate that stormwater management satisfies this Part.
- Development which is intended to utilise the existing drainage system, must submit documentation prepared by a suitably qualified person, demonstrating that the existing system is compliant with the Ryde DCP controls or otherwise detail the means to rectify the system to make it comply.

2.3 Stormwater Discharge from Property

Property drainage systems should ideally implement a gravity fed stormwater management system, which will eventually direct stormwater runoff to the lowest point of the site. Ideally the property drainage system should then seek to discharge to the public drainage network, comprised of either public drainage infrastructure (kerb and gutter, stormwater channels) or natural watercourses (streams and creeks).

OBJECTIVE

1. To ensure that the discharge of a stormwater runoff from property is undertaken in a controlled and sustainable manner that is not detrimental to downstream areas.

NOTE: *Schedule 1 Overview of Discharge points* provides guidance as to selecting an appropriate stormwater discharge point.

2.3.1 Preferred Discharge Point – Public Drainage Network or Natural Watercourse

The following controls only apply to property drainage systems which are to discharge to the public drainage network or natural watercourse.

CONTROLS

a. Stormwater runoff from property must be directed to either public drainage infrastructure, a natural watercourse or public reserve under gravity feed wherever possible, with the point of connection designed in accordance with Section 1.4.1 of the *Stormwater Technical Manual*.
b. Stormwater discharge from multi-residential dwellings, commercial, retail and industrial development on sites greater than 1000m^2 and within 30 metres of in-ground public drainage infrastructure, must extend this drainage infrastructure to the site, so as to enable a direct connection be made to this infrastructure.

c. For sites that fall to a public reserve and are within 30m. of public drainage infrastructure, a direct connection to this must be made and will require the extension of the infrastructure to the site, unless an exemption is granted by Council after consideration of the scope of development relative to the cost of the exercise as well as construction logistics and affectation to the reserve.

NOTE: If to achieve the above controls it is necessary for a property to drain over a neighbouring property, it will be necessary for a private drainage easement to be acquired (see 2.3.2 Private Drainage Easements)

2.3.2 Private Drainage Easements

The term "easement" refers to a portion of land on a property in which a separate person/ party (not the owner) has a right to utilise for a specific purpose, such as for the purpose of drainage. To obtain a drainage easement typically warrants an offer of compensation to the property owner burdened by the easement.

CONTROLS

a. Where development is to utilise an existing private drainage easement to drain, proof of the right to drain through the easement and clarification of the infrastructure in the easement (or works required to accomplish this) must be presented prior to consent to ensure the means of drainage is viable.

b. Where a new private drainage easement must be established to legally convey stormwater runoff through a downstream property to a preferred discharge point, a private drainage easement must be obtained. Refer to Section 1.6 of the *Stormwater Technical Manual* in relation to this process.

NOTE: Where the subject property falls towards private property, there is great potential for stormwater runoff to impact downstream lots. To safely convey stormwater runoff a drainage easement is required so as to enable the legal right to drain stormwater over the downstream property. Should exemption be granted for the need to acquire a new easement, the requirements of alternative discharge points are as specified in Section 2.3.3.

2.3.3 Alternative Discharge Points

It is acknowledged that the process of acquiring an easement can be costly in terms of time and money, and is an onerous exercise for minor development. For some types of minor development alternate discharge points maybe considered.

Table 2.3.below specifies the conditions of exemption from having to establish a private drainage easement for given development types.

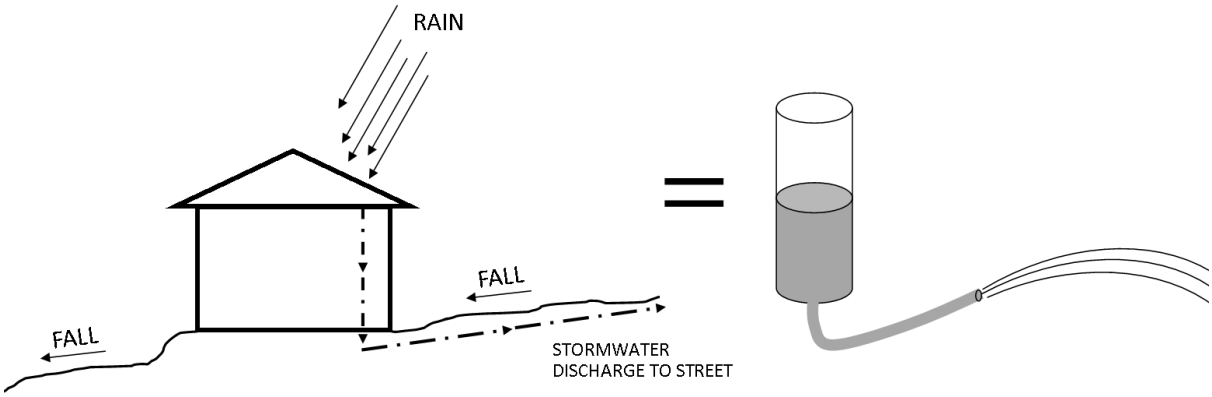
DEVELOPMENT TYPE	CONDITIONS OF EXEMPTION
Residential - Alterations and additions	• Residential alterations and additions will not require the acquisition of a drainage easement unless 75% of the permissible building footprint is altered, in which case the development will be considered as a new dwelling.
Residential - New Dwellings/ Dual	• An attempt must be made to acquire a drainage easement through the site. • Evidence must be provided that a formal request, with

Occupancies	monetary offer, has been undertaken to acquire an easement through the downstream property(ies). • The request must include a reasonable monetary offer of compensation. • Exemption from having to acquire an easement and the utilisation of an alternative means of stormwater disposal will be considered provided that a written refusal from the downstream property owner(s) be provided OR evidence by way of a Statutory Declaration that more than 3 attempts has been made to contact the owner, yet they have not responded to the request. • This process is detailed in Section 1.6 of the *Stormwater Technical Manual*.
Institutional Development (Schools) AND landscaped/ rural lots	• Where the lowest portion of development is distanced more than 100m from the downstream property, alternative discharge points may be considered.
Commercial, Industrial AND Multi-residential development.	• None. The scope of development is such that a private drainage easement must be obtained.

TABLE 2.3 – Conditions of exemption from having to acquire a private drainage easement.

2.3.3.1 Alternative Discharge Points– Charged or siphonic systems Control

Charged or siphonic systems operate by the weight of water in the drainage system, pushing water against gravity to the point of discharge. A simplified view of a charged system is as below.



Use of a charged/ siphonic system for drainage of low level properties is not an ideal solution for the following reasons;

- The system is unable to drain areas below the point of discharge.
- Failure of the system (e.g. due to blockage, large storm events, etc) will result in stormwater runoff going downhill, away from the discharge point. This may be adverse for properties downstream.
- Piping of stormwater runoff against the natural fall of the land may redirect stormwater runoff outside the natural catchment area. This can exacerbate flooding impacts in the receiving catchment.
- The system has higher maintenance requirements in comparison to a typical drainage stormwater system.

CONTROLS

a. The use of charged or siphonic system as a primary means to drain a development will not be permitted unless the development satisfies the conditions for exemption from having to acquire a private drainage easement in Table 2.3.

NOTE: The use of charged systems for directing stormwater runoff to onsite detention or rainwater storage tanks is acceptable provided the failure mode of the system is accounted for (e.g. any stormwater flows surcharging from the piped system can be directed to the discharge point by grading the land, structures or channels).

b. All components of the charged/ siphonic systems must comply with the design requirements stated in Section 1.3.6 of the *Stormwater and Floodplain Management Technical Manual*.

c. Charged drainage systems must be designed so as to not extend beyond the boundaries of the property.

d. Titles of encumbrance must be placed on all charged/siphonic systems to ensure these drainage systems are maintained and will operate as designed.

2.3.3.2 Alternative Discharge Point – Absorption/ onsite disposal systems

The use of absorption /onsite disposal systems generally involve discharging stormwater runoff to a large trench/ pit below ground level, to facilitate stormwater flows to infiltrate into the soil or mimic natural stormwater runoff in locations where the system is intended to surcharge.

Absorption or infiltration pits are not an ideal solution for drainage as they can have the following impacts.

- A majority of the Ryde Council area have soil conditions unsuitable for this type of system in that they have low infiltration rates (meaning they are poor at absorbing stormwater) and areas at risk of slope instability.
- Absorption systems have limited ability to accommodate stormwater runoff from large storm events and will disperse these flows over the downstream area.
- Absorption systems alter groundwater conditions which can cause structural issues in adjoining buildings and result in nuisance seepage flows downstream, days after a storm event.

For these reasons, drainage to such systems should be used sparingly.

CONTROLS

a. Absorption/ onsite disposal system will only be permitted as a primary means to drain development unless the development satisfies the conditions for exemption

from having to acquire a private drainage easement stated in the Table 2.3 OR where the development falls to a Park/ Reserve and discharge to public drainage infrastructure cannot be undertaken or an exemption from doing so has been granted by Council.

b. The design of the absorption system must comply with the design requirements stated in Section 1.3.5 of the *Stormwater Technical Manual*.

c. The use of absorption and onsite dispersal systems is not permitted in locations marked by Council as being classified as "High Risk" in terms of slope stability.

d. The use of a absorption/ onsite disposal system on sites located in lower risk slope stability areas (classed as M1, M2 and M3a by Council) may be permitted, subject to the submission of a geotechnical report demonstrating that the proposed absorption system can be implemented without deleterious impacts.

e. Absorption systems can be used where the impervious site coverage does not exceed 35% of the site. Site coverage ratios of up to 40% may be permitted provided an onsite detention system (OSD) is incorporated prior to the discharge point. For sites located in an OSD exempt area as marked on the "Ryde Catchment Map" – Appendix 4 of the Stormwater and Floodplain Management Technical Manual, an equivalent sized rainwater tank surplus to BASIX requirements will be required.

f. Absorption systems must be located as far as practical from structures downstream, providing a minimum 5 m. clearance from downstream boundaries and 3 m. clearance from structures or hardstand areas. For onsite dispersal systems, this may be reduced to 2 m. clearance from a boundary which backs onto a public reserve.

g. Titles of encumbrance must be placed on the absorption system to ensure it is maintained and will operate as designed.

2.3.3.3 Alternative Discharge Point – Pump / Sump systems

Pump/ sump systems are a mechanical means to convey stormwater runoff to a suitable discharge point. It is the least preferred of the alternative systems for the following reasons;

- Pumps are reliant on electrical power to operate, which typically fails during a storm event.
- As they rely on an external energy source, they are not an environmentally sustainable form of development.
- It has a finite and limited rate in the disposal of stormwater.
- Such systems are difficult to cater for failure of the system as sumps are usually located in the lowest point in the site, typically in a basement garage.
- Requires ongoing maintenance to function up to the design specifications.

Accordingly pumps are suitable only to drain seepage or minor amounts of stormwater runoff to basement parking areas.

CONTROLS

a. Pump/ sump systems are permitted only for the disposal of stormwater runoff in basement level car parks and driveways leading to those areas.

b. The design of pump/ sump systems must be in accordance with Section 1.3.7 of the *Stormwater Technical Manual*.

c. Charged or rising mains from the pump system must not extend beyond the boundary of the site.

d. Titles of encumbrance must be placed on the pump/ sump system to ensure it is maintained and will operate as designed.

2.4 Community Stormwater Management

Development in the City of Ryde Council area has experienced significant growth in the last half-century and correspondingly the volume and rate of stormwater runoff from developed areas to the public drainage network have escalated over this time. This has been exacerbated by flooding issues throughout the area and placed a greater burden on the public drainage network. The following aerial images demonstrate the scale of development the area has undergone.

Ryde 1943

Ryde 2012

To counter the effects of development, Council has adopted an onsite detention policy which seeks to reduce the *rate* of stormwater runoff discharged to the public drainage network from development, consistent with the pre-developed, state of nature conditions of the catchment area.

Onsite detention (OSD) is a component of the property drainage system which *restricts* the rate of runoff from the site, mimicking state-of-nature conditions. As the rate of water exiting the system is less than the rate of watering entering, OSD systems require rainwater storage to buffer rainwater flows.

OBJECTIVE

1. To ensure that the collective impact of stormwater runoff from development to the public drainage network and waterways, in terms of environmental impacts and capacity to convey stormwater, is minimised or prevented wherever possible.

CONTROLS

a. Onsite stormwater detention must be incorporated in the property stormwater drainage system for all development unless the development can satisfy a condition of exemption as listed in Section 1.4.1 of the *Stormwater and Floodplain Management Technical Manual*.

b. The design of the onsite detention component must comply with the requirements specified in Section 1.4 of the *Stormwater and Floodplain Management Technical Manual.*

c. All stormwater runoff from impermeable areas must be routed through the onsite detention system where possible. Where this cannot be readily achieved, the design of the onsite detention must be revised to compensate for the uncontrolled discharge utilising the method stated in the *Stormwater Technical Manual*.

d. Below ground onsite detention system storages located at the front of the site must be located under driveway and vehicle access ramps where possible.

e. Titles of encumbrance must be placed on all on-site detention systems.

3.0 WATER SENSITIVE URBAN DESIGN

3.1 General

Water Sensitive Urban Design (WSUD) is an element of stormwater management which seeks to reduce the environmental impact of drainage systems and integrate water cycle management and promote onsite reuse to reduce development impacts.

Traditional stormwater drainage system design sought to dispose of stormwater from a property as efficiently, fast and as cost effective as possible. Such approaches can be detrimental to the receiving waterways. This practise was also contrary to sustainable development practises by not recognising water as a valuable resource.

3.2 WSUD – Where does it apply

It is acknowledged that the pro-active implementation of WSUD principals may not be practical or cost effective for smaller development. With this in mind, the following controls only apply to;

- Development on land located in a mixed use business zone or industrial zone if the development is greater than 1,500 m^2 in gross floor area. This will include residential flat buildings and mixed use developments
- Development on land for SP2 Infrastructure such as schools, hospitals and other institutions, greater than 1,500 m^2 floor area.
- Above-ground carparks accommodating more than 50 carspaces.
- Land subdivisions resulting in the creation of 5 or more lots.

OBJECTIVES

1. To ensure that the quality of stormwater discharged to the public drainage network as a result of development is such that it will not be detrimental to receiving waters.

2. To encourage stormwater treatment and water capture measures which can integrate into the landscape so as improve the visual amenity, aid the natural environment and enhance public space areas.

3. To reduce potable water demand via the reuse of stormwater runoff.

3.3 WSUD Controls

3.3.1 Stormwater Quality

CONTROLS

a. All development applicable under this section must prepare a Water Sensitive Urban Design Strategy Plan (WSUD Strategy Plan) which is to contain, but is not limited to, the following items plus be in accordance with Council's document, "*Water Sensitive Urban Design Guidelines".*

- Stormwater Management plan of the site and proposed development marked with constraints and opportunities.
- Details of the treatment methodology for achieving the stormwater quality targets specified in control (b) with due consideration for the constraints and opportunities of the site noted above. All measures must be located on the property.
- Describe how the treatment methodology will integrate with the urban design.
- An analysis of non-potable water demand for the proposed development.

b. WSUD measures incorporated into the development must satisfy the following pollutant target controls;

WSUD Stormwater Quality Performance Targets

Gross Pollutants	90%
Total Suspended Solids	85%
Total Phosphorus	60%
Total Nitrogen	45%

c. All treatments are to be located inside the confines of the property.

3.3.2 Water harvesting and reuse

Water supply can vary with weather conditions and therefore can be considered a finite and valuable resource. Accordingly the ability to implement water reuse facilities should be sought wherever possible.

CONTROLS

a. All development applicable under this section that does not require a BASIX certificate, must provide a rainwater tank to meet greater than the 50% of non-potable water demand.

b. Water use within open space areas of the development (for uses such as irrigation, ponds and water features, etc) must be supplied from sources other than potable water. This may include rainwater storage tanks or treated grey-water, to meet 80% of the water use demand.

4.0 FLOODING AND OVERLAND FLOW

4.1 General

In accordance with the City of Ryde LEP 2014 and the NSW Floodplain Development Manual (2005), Council is required to consider the impacts of flooding and overland flow in the assessment of development in flood affected areas. The primary objective of State policy is:

> *"to reduce the impact of flooding and flood liability on individual owners and occupiers of flood prone property, and to reduce private and public losses resulting from floods, utilising ecologically positive methods wherever possible."*

The following section seeks to ensure development and future occupants are appropriately protected from the impacts of stormwater inundation on land identified as being **flood affected** as defined under LEP 2014 clause *6.3 Flood planning*.

i.e.

(a) land identified as "Flood Planning Area" on the Flood Planning Map, within Ryde LEP 2014 and

(b) other land at or below the flood planning level.

4.2 Flood Risk and Development

Development requirements and controls under this section are based on:-

- the exposure to flood risk (i.e. type of development and land use) and
- the level of flood risk (flood hazard) within flood affected areas.

4.2.1 Development and Land Use Categories

Development types have been separated into the following categories based on the ramifications of such development to flood risk that a property is exposed to.

- Landform Development (retaining walls, fencing, swimming pools)
- Carparking Areas (Any development where parking is a component for consideration)
- Concessional Development (residential alterations and additions, minor works or change of use)
- Residential Development
- Retail, Commercial & Industrial Development
- Recreation & Non-urban Development
- Sensitive Uses & Facilities
- Critical Uses & Facilities

Criteria of development types are listed in Schedule 2 of this Part and the controls listed in Section 4.4 are to be applied relative to these categories.

4.2.2 Flood Risk (flood hazard) within flood affected areas

In accordance with the NSW Floodplain Development Manual, flood levels are determined from the 100yr ARI (Annual Recurrence Interval) storm event.

Council has identified locations subject to flooding and major overland flows, based on the catchment data and historical records and is in the process of mapping flood affectation

throughout the area. For areas where this has been completed, site specific flood information can be obtained and must be utilised when developing the property. It is advised to contact Council in regards to clarifying whether flood information is available.

In locations where flood level information is not available from Council, flood risk levels specific to the site will need to be estimated. For minor development, it is acknowledged the cost of obtaining this information is relatively high in comparison to the cost of works. As such, Council has implemented provisions to be undertaken in the design of the development and preparation of the Flood Impact Statement for concessional development.

The level of flood risk is basically a product of flood depth and the velocity of flow and can be categorised as follows.

High Flood Risk	Areas where there is a potentially catastrophic damage to property, risk to life, evacuation problems or where development would significantly or adversely alter flood behaviour. Most development is restricted in these locations.
Medium Flood Risk	Areas whereby there would be potential flood damage or public safety is a concern but could be addressed by the application using appropriate measures.
Low Flood Risk	Land within the floodplain (i.e. within the extent of the probable maximum flood) but not identified as either High Flood Risk, Medium Flood Risk Precinct or as an Overland Flow Precinct.
Overland Flow Precinct	Areas identified as Overland Flow Precincts are distant from watercourses where shallow inundation (relative to major flooding) occurs following heavy rain. Typically the depth of inundation will be less than 0.3 m to 0.5 m but more than 0.1 m to 0.2 m in a 100 year ARI event.

Localised overland flows attributed to stormwater runoff on the site itself must be taken into consideration. Minor overland flow depths may typically be around 50mm to 100mm and, whilst they do not present great risk to development, must meet the minimum development control requirements to ensure there is adequate protection from any stormwater inundation.

4.3 Terms and definitions

Terms and references used in this Section are defined as follows:-

freeboard – An additional level difference applied above the flood level, and is considered a factor of safety to account for any debris or unaccounted changes in the landform which may affect flood levels. For development which is suspended above flood waters and major overland flows, the freeboard is to be taken from the underside of the structure.

- *Habitable* – Floor areas which are furnished or provide dry storage of goods. Inundation of these areas would result in a great loss of amenity and property damage to the development.
- *Non-Habitable* – Enclosed or partially open floor area which is not the above.
- *ARI* – Average Recurrence Interval, represents flood magnitude and potential likelihood.
- *PMF* – Probable Maximum Flood, the largest flood that could conceivably occur at a particular location.

4.4 Flood Affected Objectives and Controls

OBJECTIVES

1. To ensure that development on land affected by flooding and overland flow is undertaken in a manner which provides for the safety of occupants of that development as well as minimise damage to private property, during such flooding events.
2. To ensure essential services and land uses are designed with respect to potential flooding and overland flow risks.
3. To ensure development does not exacerbate flooding on other properties.
4. To ensure flood protection measures are sympathetic to the streetscape and relationship of the building to the street, do not have other adverse environmental impacts

4.4.1 Development in the Flood Planning Area

CONTROLS

a. For all development that is flood affected, a Flood Impact Statement must be submitted to Council. The Flood Impact Statement is to be prepared in accordance with Section 2.2 of the *Stormwater and Floodplain Management Technical Manual* and is required to address the various controls related to the following development types.

4.4.2 Carparking Areas

Carparking is typically located in areas either exposed to the weather or in below ground areas at risk of flooding. Accordingly the potential for property damage is great, not only to vehicles but also floating vehicles carried by overland flows, and jeopardise public safety.

CONTROLS

a. To minimise property damage, the following finished surface levels must be attained for new parking areas;

- For open parking areas, no less than the 100yr ARI flood level.

- For enclosed parking areas, the parking area must be no less than the 100yr ARI flood level plus 150mm freeboard.

- Basement parking or parking at levels below the adjacent flood levels, a bunded crest at the estimated PMF (probable maximum flood) level prior to descent into the parking area, must be provided such that inundation of the area is prevented.

- For new parking areas associated with concessional development, parking areas are to be elevated to habitable floor level.

b. New parking areas must not divert overland flow or reduce flood storage such to adversely impact the surrounding area.

c. Large open parking areas (greater than 10 carspaces) must provide adequate restraints or barriers to prevent vehicles leaving the site up to the 100yr ARI flood event.

d. The utilisation of existing parking areas must not result in the increased risk to property damage or threat to public safety.

4.4.3 Landform Development

Alterations to the landform, which includes the addition of retaining walls and fences, in the regions of floodwaters and major overland flows can have adverse impacts for neighbouring properties in terms of higher floor levels or diverted flows.

CONTROLS

a. For landform development exposed to Low Risk and above Flood Risk Category (or where this is not known, the indicative extent of inundation on Councils mapping system) the following must occur
   i. Fences are permeable, open or otherwise a frangible structure, such to permit the conveyance of floodwaters below the 100yr ARI flood event. In the event the flood level is unknown, 200mm above ground level is to be adopted.
   ii. The face of retaining walls, pools or garden beds aligned towards overland flows are no greater than 200mm in height, unless it can be demonstrated such a structure will not have an adverse impact to the surrounding area by way of a Flood Impact Statement.

4.4.4 Concessional Development

The scale of this type development is minor i.e. it does not greatly extend the life of the development or structure to be retained.

Development under this category includes;

- Alteration and additions to a single residential or dual occupancy dwelling. This does not apply to major alterations which would effectively result in a new dwelling.
- Change of use for an industrial/ commercial/ retail floor area which does not result in increased risk of property damage or jeopardise public safety.

- Construction of a non-habitable outbuilding associated with single residential or dual occupancy development.

CONTROLS

a. Concessional development must not, jeopardise the degree of protection from inundation afforded by existing development on the site nor increase the risk to public safety.

b. Floor levels of *habitable* and *non-habitable* areas must comply with the freeboard requirements as stated in Table 2.1 of the *Stormwater Technical Manual.* Where flood level information cannot be obtained from Council or otherwise, *habitable* floor levels must provide a freeboard above the natural ground level no less than the maximum pre-developed equivalent OR coinciding with the existing habitable floor level within the existing footprint, subject to consideration of the Flood Impact Statement under the concessional provisions for this component (Floor Levels).

c. Extension of the existing building footprint which is exposed to flood waters, or if the extent of flooding is unknown, must be designed and constructed such to allow for the passage of overland flow underneath the structure.

d. Development must not divert major overland flows or reduce flood storage such to adversely impact the neighbouring property or surrounding area. The submitted Flood Impact Statement must give consideration that the development does not;
   i. Reduce the pre-developed level of flood storage.
   ii. Increase flood levels or velocities such to adversely impact adjoining dwellings.

4.4.5 Residential

The following controls relate to all new residential development (including secondary dwellings such as granny flats).

CONTROLS

a. Residential development on land subject to flood risk categorised as high will not be permitted unless it can be clearly demonstrated that development under this section can be undertaken on the land without jeopardising public safety and access, property damage or adverse ramifications of the pre-developed flood regime by means of a Flood Impact Statement.

NOTE: The relevant environmental instrument LEP 2014 identifies development permissible with consent in various zones in the LGA. Notwithstanding, constraints specific to individual sites, may preclude Council granting consent for certain forms of development on all or part of a site.

b. Floor levels of habitable and non-habitable areas must comply with the freeboard requirements as stated in Table 2.1 of the Stormwater Technical Manual.

c. New structures subject to flooding and overland flow (excluding those sites located in Overland Flow Precincts) must be designed and constructed to withstand the anticipated hydrostatic forces. For all parts of the development potentially exposed to floodwater, below the minimum freeboard requirement, the development structure must:
   i. be constructed of flood compatible building components in accordance with the Stormwater and Floodplain Management Technical Manual.

ii. A structural engineer must certify that the completed works are designed and capable of withstanding forces subject to forces of floodwater, debris, buoyancy forces anticipated by the 100yr ARI flood event.

d. Development must not divert major overland flows or reduce flood storage such to adversely impact the neighbouring property or surrounding area. It must be demonstrated the development does not;
   i. Reduce the pre-developed level of flood storage.
   ii. Increase flood levels or velocities such to adversely impact adjoining dwellings.

e. If the development under this development type category involves subdivision of the land, it must be demonstrated that any potential development of this newly created allotment can comply with the controls under this section.

f. A restrictive covenant must be placed on the title of the land to ensure there are no further significant works and alterations to the landform or development are undertaken without the approval of Council such to impact on flooding.

4.4.6 Commercial or Industrial

The following controls relate to all new commercial or industrial development.

CONTROLS

a. Commercial development on land subject to flood risk categorised as high will not be permitted unless it can be clearly demonstrated that development under this section can be undertaken on the land without jeopardising public safety and access, property damage or adverse ramifications of the pre-developed flood regime by means of a Flood Impact Statement.

NOTE: The relevant environmental instrument LEP 2014 identifies development permissible with consent in various zones in the LGA. Notwithstanding, constraints specific to individual sites, may preclude Council granting consent for certain forms of development on all or part of a site.

b. Floor levels of *habitable* and *non-habitable* areas must comply with the freeboard requirements as stated in Table 2.1 of the *Stormwater Technical Manual.* If these levels cannot be practically achieved for the entire floor area (E.g. for reasons of accessibility from a public space) then a lesser level may be considered subject to consideration of the extent or scale of property damage and risk to public safety.

c. New structures subject to flood waters and major overland flows (excluding those sites located in Overland Flow Precincts) must be designed and constructed to withstand the anticipated hydrostatic forces. For all parts of the development potentially exposed to floodwater, below the minimum freeboard requirement, the development structure must:
   i. be constructed of flood compatible building components in accordance with the Stormwater Technical Manual.
   ii. A structural engineer must certify that the completed works are designed and capable of withstanding forces subject to forces of floodwater, debris, buoyancy forces anticipated by the 100yr ARI flood event.

d. Development must not adversely impact the existing flood regime in terms of diverting major overland flows or reduce flood storage such to adversely impact

the surrounding area. The submitted Flood Impact Statement must demonstrate the development does not;

i. Reduce the pre-developed level of flood storage.
ii. Increase flood levels or velocities such to adversely impact adjoining dwellings.

e. All goods and materials must be stored at the minimum *habitable* floor level, complying with the freeboard requirements as stated in Table 2.1 of the *Stormwater Technical Manual*, unless the site is located in an Overland Flow Precinct in which case this may be reduced to 500mm above the adjoining ground level. Exemptions from this may be considered if it can be demonstrated in the Flood Impact Statement, that the materials will not adversely impact the surrounding environment or can be damaged if subject to stormwater inundation.

f. If the development under this development type category involves subdivision of the land, it must be demonstrated that potential development of this newly created allotment can comply with controls under this section.

g. A restrictive covenant must be placed on the title of the land to ensure there are no further significant works and alterations to the landform or development are undertaken without the approval of Council such to impact on floodwaters.

4.4.7 Recreation and Non-Urban

The following controls relate to development of land intended for recreational and non-urban purposes. Examples of this include sports fields, parks, etc.

CONTROLS

a. Floor levels of *habitable* and *non-habitable* areas must comply with the freeboard requirements as stated in Table 2.1 of the *Stormwater Technical Manual.* If these levels cannot be practically achieved for the entire floor area (E.g. for reasons of accessibility from a public space) then a lesser level may be considered subject to consideration of the extent or scale of property damage and risk to public safety.

b. New structures subject to flood waters and major overland flows (excluding those sites located in Overland Flow Precincts) must be designed and constructed to withstand the anticipated hydrostatic forces. For all parts of the development potentially exposed to floodwater, below the minimum freeboard requirement, the development structure must:

i. be constructed of flood compatible building components in accordance with the Stormwater and Floodplain Management Technical Manual.
ii. A structural engineer must certify that the completed works are designed and capable of withstanding forces subject to forces of floodwater, debris, buoyancy forces anticipated by the 100yr ARI flood event.

c. Development must not adversely impact the existing flood regime in terms of diverting major overland flows or reduce flood storage such to adversely impact the surrounding area. The submitted Flood Impact Statement must give consideration that the development does not;

i. Reduce the pre-developed level of flood storage.
ii. Increase flood levels or velocities such to adversely impact adjoining dwellings.

d. Development located on large lots subject to full inundation must demonstrate that adequate refuge is provided for all occupants above the PMF (probable maximum flood) event. This is to ensure that public safety is maintained.

e. All goods and materials must be stored at the minimum *Habitable* floor level, complying with the freeboard requirements as stated in Table 2.1 of the *Stormwater Technical Manual*, unless the site is located in an Overland Flow Precinct in which case this may be reduced to 500mm above the adjoining ground level. Exemptions from this may be considered if it can be demonstrated in the Flood Impact Statement, that the materials will not adversely impact the surrounding environment or can be damaged if subject to stormwater inundation.

4.4.8 Sensitive Uses and Facilities

The following controls relate to development of land intended for use by the community and which, if it were to be disabled, would impose a great detriment to the community in returning to normal operations after a flood event. Examples of this include educational establishments, residential care facilities, fuel stations, public utility buildings, etc.

CONTROLS

a. Development categorised as "Sensitive Uses and Facilities" as per Schedule 2 subject to flood risk categorised as MEDIUM or HIGH will not be permitted.

NOTE: The relevant environmental instrument LEP 2014 identifies development permissible with consent in various zones in the LGA. Notwithstanding, constraints specific to individual sites, may preclude Council granting consent for certain forms of development on all or part of a site.

b. All floor levels must be no lower than the PMF level. Exemption from this may be considered, subject to consideration of the extent or scale of impact to the community that would occur in the event the structure is inundated.

c. New structures subject to flood waters and major overland flows must be designed and constructed to withstand the anticipated hydrostatic forces. For all parts of the development potentially exposed to floodwater up to the PMF event, the development structure must:
   i. be constructed of flood compatible building components in accordance with the Stormwater Technical Manual.
   ii. A structural engineer must certify that the completed works are designed and capable of withstanding forces subject to forces of floodwater, debris, buoyancy forces anticipated by the PMF flood event.

d. Development must not adversely impact the existing flood regime in terms of diverting major overland flows or reduce flood storage such to adversely impact the surrounding area. The submitted Flood Impact Statement must demonstrate the development does not;
   i. Reduce the pre-developed level of flood storage.
   ii. Increase flood levels or velocities such to adversely impact adjoining dwellings.

4.4.9 Critical Uses and Facilities

CONTROLS

a. Development categorised as "Critical Uses and Facilities" as per Schedule 2 will not be permitted on land subject to major overland flows and floodwaters, excluding lots identified as Overland Flow Precincts.

NOTE: The relevant environmental instrument LEP 2014 identify development permissible with consent in various zones in the LGA. Notwithstanding, constraints specific to individual sites, may preclude Council granting consent for certain forms of development on all or part of a site.

Schedule 1 Overview of Preferred Discharge points

Downstream Area	Comment
Street frontage (kerb and gutter) 	The discharge of stormwater to public drainage infrastructure in the roadway area (kerb & gutter, kerb inlet pit, Council drainage pipe) is ideal as this public asset is managed to safely direct stormwater from developed areas to receiving waters with minimal environmental impact. It is the preferred point of discharge and should be sought in all cases. Refer to Section 2.3.2 (Preferred Discharge Point – Public Drainage Network or Natural Waterway).
Council Drainage Pipe or Channel in lowest region of property. 	The discharge of stormwater to public drainage infrastructure (Council drainage pipe) located on the property is accepted as this public asset is managed to safely direct stormwater from developed areas to receiving waters with minimal environmental impact. The manner of connection warrants an inspection by Council however it is the preferred point of discharge and should be sought in all cases. Refer to Section 2.3.2 (Preferred Discharge Point – Public Drainage Network or Natural Waterway).
Natural Waterway 	Natural waterways are considered part of the public drainage network as they convey stormwater runoff from developed areas to receiving water. Discharging to a natural waterway is acceptable however needs to be undertaken with care to preserve the natural riparian environment of that

	waterway. Refer to Section 2.3.2 (Preferred Discharge Point – Public Drainage Network or Natural Waterway).
Public Nature Reserve or Park  	Where the property falls to a Park or Reserve, stormwater discharge should seek to connect to public drainage infrastructure if this is in proximity to the site. Otherwise the manner of discharge to a Park or Reserve, whilst presenting low potential for property damage, can have consequences for the environment of that area. Where there is public drainage infrastructure in the Reserve, Council is unable to grant a private drainage easement to discharge stormwater runoff over public reserves, due to the classification of the land. The applicant will be required to extend this infrastructure to the site in order to drain to it. If this does not exist or is onerous for the scope of works, alternative means of stormwater discharge may be considered. Refer to Section 2.3.2 (Preferred Discharge Point – Public Drainage Network or Natural Waterway) prior to considering alternative means of stormwater disposal.
Private Property  	Where the site falls towards private property, this obviously presents the greatest potential for adverse impacts to the neighbouring property. It is preferable that stormwater runoff from the upstream property be piped over the neighbouring property to a preferred discharge point. This will however require an easement. It is acknowledged that this exercise is onerous for small scale development and so an exemption from having to acquire a drainage easement may be applicable for certain situations. Refer to Section 2.3.1 (Private Drainage Easements) prior to considering alternative means of stormwater disposal.

Schedule 2 – Flooding and Overland Flow Development Categories

Residential Development

Development which permits a place of residence or temporary occupation for the general public. A majority of this is represented by single residential properties and thereby there is potential that the stormwater inundation or flooding could pose a danger to public safety and property damage. In most cases, the lower scope of works presents less opportunity for flood protection and there is greater repercussion to occupants resulting from flood events.

Residential works involving alterations and additions to an existing dwelling, refer to "Concessional Development".

Retail, Commercial & Industrial Development

Development which is typically providing goods for sale or supply and other services. For such development, there is typically low exposure to personal safety (staff and patrons per square metre of the site is low) however there is a greater proportion for damage to property in terms of materials and goods.

It is acknowledged that most development in this category would be more tolerant of inundation due to the nature of the business, particularly for industrial applications.

Recreation & Non-urban Development

This is comprised development normally exposed to the elements and is therefore present a considerably reduced potential for damage to private property.

Sensitive Uses & Facilities

Development accommodating services or facilities which are essential to evacuation during periods of flooding or if effected would unreasonable affect the ability of the community to return to normal activities after flood events.

Critical Uses & Facilities

Emergency services facilities, administration building or public administration building that may provide an important contribution to the notification or evacuation of the community during flood events.

Concessional Development

Concessional development refers to minor works or change of use that does not considerably extend the serviceable life of the structure on site any further than, say, 25 years.

- Additions to an existing dwelling (unless in Councils opinion the extent of alteration is such that the dwelling is effectively a new dwelling)
- The construction of a non-habitable outbuilding; or
- Rebuilt dwellings which substantially reduce the extent of flood risks compared with the existing situation.

Landform Development

Works not included in the above categories however involve minor alterations to the landform and have potential to affect the path of overland flow or conveyance of flood waters.

NOTE: Refer to table 1 overleaf for example types of development for each of the above categories.

CRITICAL USES AND FACILITIES	SENSITIVE USES AND FACILITIES	RESIDENTIAL
Emergency services facilities; administration building or public administration building that may provide an important contribution to the notification or evacuation of the community during flood events (e.g. SES headquarters and Police Stations); Hospitals.	Community facility; telecommunications facility; Institutions; Educational establishments; Liquid fuel depot; Public utility undertaking (including electricity generating works and utility installations) which are essential to evacuation during periods of flood or if affected would unreasonably affect the ability of the com- munity to return to normal activities after flood events, residential care facility, school and seniors housing.	Attached dwelling, backpackers' accommodation; bed and breakfast accommodation; boarding house; caravan park (with permanent occupants); child care centre; dual occupancy; dwelling; dwelling house; exhibition home; group home; home-based child care centre; home business; home industry; home occupancy; home occupation (sex services); hostel; hotel or motel accommodation; moveable dwelling; multi dwelling housing; neighbourhood shop; permanent group home; residential accommodation; residential flat building; secondary dwelling; semi detached
COMMERCIAL OR INDUSTRIAL	**RECREATION AND NON - URBAN**	**CONCESSSIONAL**
Air transport facility; airport; amusement centre; brothel; bulky goods premises; business premises; caravan park; community facility (other than critical and sensitive uses and facilities); correctional centre; crematorium; depot; entertainment facility; exhibition village; food and drink premises; freight transport facility; function centre; funeral chapel; funeral home; hazardous industry; hazardous storage establishment; health care professional; health consulting rooms; health services facility; heavy industry; heliport; highway service centre; industrial retail outlet; industry; liquid fuel depot;	Animal boarding or training establishment; biosolid waste application; biosolids treatment facility; boat launching ramp; boat repair facility; boat shed; caravan park (with non- permanent occupants); charter and tourism boating facility; environmental facility; environmental protection works; extensive agriculture; extractive industry; information and education facility; horticulture; kiosk; landscape and garden supplies; marina; mine; mining; moveable dwelling; port facilities; public utility undertaking (other than critical uses or facilities); recreation area; recreation	Alterations and additions to freestanding/ dual occupancy residential dwellings. Work sheds, non-habitable outbuildings, Change of use of office/ industrial space.

Table 1 - Example types of development under Flooding and Overland Flow Categories listed in this Section.

NOTE: Not all land uses listed are permitted in all land use zones within Ryde LEP 2014

City of Ryde
Civic Centre
1 Devlin Street
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