

Section 5 STORMWATER

		<i>Page</i>
5.1	Introduction.....	5 - 2
5.2	Approved Discharge Points.....	5 - 4
5.3	Design Standards.....	5 - 7
5.4	Flooding.....	5 - 9
5.5	Overland Flow Paths.....	5 - 11
5.6	Auckland Regional Council	5 - 12
5.7	Stormwater Quality	5 - 14
5.8	Catchpits.....	5 - 15
5.9	Stormwater Detention and Re-use Tanks	5 - 17
5.10	Kerb Discharges.....	5 - 19
5.11	Soakage.....	5 - 20
5.12	Syphons.....	5 - 21
5.13	Watercourses.....	5 - 22
5.14	Groundwater Levels.....	5 - 24
5.15	On-Site Stormwater Management.....	5 - 25
5.16	Stormwater Treatment	5 - 27
5.17	Backflow Prevention	5 - 29

5.1 Introduction

Definition

Stormwater is defined as rainwater which has landed either on the ground, a roof or other impervious area.

Objectives of Stormwater Disposal

The objective of a stormwater drainage system is to regulate natural runoff and to minimise the effects of stormwater on people, the environment and property. This is achieved by providing: a primary system of pipes and watercourses; and a secondary system of overland flow paths, together with natural or designed detention areas to minimise peak discharges and impacts downstream.

Stormwater Disposal Systems

Stormwater is disposed of by means of several common systems: separated stormwater systems, combined sewers, and ground soakage. Careful management of stormwater is needed in all cases.

- **Separated Stormwater Systems**

Stormwater systems (public and private pipes and open watercourses) are available in many parts of the City. Proposed discharges to the public system and watercourses must be appropriately controlled.

- **Combined Sewers**

Combined sewers are common in older parts of the City, and there are special requirements for discharge to these. Combined sewers carry wastewater along with stormwater after periods of rainfall.

- **Ground Soakage**

Soakage disposal is generally based in volcanic areas where the subsurface geological formation absorbs water. Defined Soakage areas are displayed in the Ground Aquifer Study (GAS) completed as part of the Integrated Catchment Study (ICS) filed at Metrowater. These designated soakage areas are indicative only and should only be used as a guide. Soakage will not generally be considered outside these areas.

Water Sensitive Urban Environment Practices

To minimise the effects of contaminated stormwater runoff draining into water environments such as aquifers, watercourses and harbours, Auckland City Council and Metrowater are committed to Water Sensitive Urban Environment practices. Developments in the Residential 8 zones (where the impervious area is greater than 60 %) and in soakage areas, are required to provide treatment devices. These systems are operated and maintained by land-owners.

Key Documents

- Key documents and web page links relating to stormwater are listed below
- On-Site Stormwater Design Manual 2002 [Auckland City Council]
On-site stormwater management manual
 - The Manual for Development Contribution Rebate Programme for Rainwater Tanks 2006 [Auckland City Council]
Development contribution stormwater rebate
 - Building Act 2004
<http://www.tenancy.govt.nz/blc-building-act>
 - Building Regulations 1992 (and Amendments) (esp. § E1)
Building Code Compliance Documents - Department of Building and Housing
 - Resource Management Act 1991 (and Amendments) (esp. § 76 (2a), 106)
Resource Management Act 1991 No 69 (as at 01 January 2008), Public Act – New Zealand Legislation
 - District Plan (Isthmus Section) (esp. § 5D.6) [Auckland City Council]
 - <http://www.aucklandcity.govt.nz/council/documents/district/default.asp>
 - NZS 4404 Land Development and Subdivision Engineering 2004
<http://shop.standards.co.nz/>
 - Technical Publication 10: Design Guideline Manual: Stormwater Treatment Devices 2003 [Auckland Regional Council]
Technical publications 1-50
 - Technical Publication 108: Guidelines for Stormwater Runoff Modelling in the Auckland Region 1999 [Auckland Regional Council]
Technical publications 101-150
 - Technical Publication 124: Low Impact Design Manual for the Auckland Region 2000 [Auckland Regional Council]
Technical publications 101-150
 - Watercourse Guidelines 2003 [Auckland City Council]
 - <http://www.aucklandcity.govt.nz/council/documents/watercourse/docs/guidelines.pdf>
 - Model Rainstorms [Auckland City Council] [Hard copy only]
 - Flood Hazards (from Flood Hazard Mapping) refer AMIS/GIS or contact Metrowater – Records to view hard copies of FHM reports. Refer Appendix O Index FHM reports.
 - Operative Auckland Regional Plan: Coastal 2004 [Auckland Regional Council]
Auckland Regional Plan: Coastal - maps
 - Proposed Auckland Regional Plan: Air, Land and Water 2004 (amended to incorporate decisions and submissions) [Auckland Regional Council]
Proposed Auckland Regional Plan: Air, Land and Water
Until this Plan is operative, it must be consulted in conjunction with:
 - Transitional Regional Plan 1991 [Auckland Regional Council] [Hard copy only]
 - Auckland Regional Plan: Sediment Control 2001
Auckland Regional Plan: Sediment Control
 - Soakage Design Manual 2003 [Auckland City Council]
<http://www.aucklandcity.govt.nz/council/documents/soakage/docs/intro.pdf>
 - AMIS/GIS-based Asset Records: Public Drainage Maps [Auckland City Council]
[Hard copy available or electronic copies available through ACC Data Services]
 - Auckland City Council Draft Bylaws 2008
Part 6 – Construction, Part 13 - Environmental Protection and Part 18 - Stormwater Management
 - [http://www.aucklandcity.govt.nz/council/documents/bylaw/Global Aquifer Study](http://www.aucklandcity.govt.nz/council/documents/bylaw/Global%20Aquifer%20Study)

5.2 Approved Discharge Points

Refer also to:

- Sub-section 5.8 *Catchpits*;
- Sub-section 5.10 *Kerb Discharges*;
- Sub-section 5.11 *Soakage*;
- Sub-section 5.13 *Watercourses*.

All development must discharge stormwater to 'an approved outlet'. The options available to a particular development may be determined from any one of, or all of the following: the public drainage plans, a site visit, private drainage records, discussions with Development Engineers at Auckland City Environments (ACE).

Policy

Approval

The potential discharge point(s) may be subject to certain requirements before formal approval is given. This may include further investigation work by the applicant to meet these requirements. Details of these requirements are discussed in the relevant sections of this manual.

Subdivisions

A Subdivision Consent will refer to discharge as 'an approved outlet'. The type of disposal system and/or outlet must be clearly indicated in the Consent conditions.

Approved Disposal Methods

All requirements must be met and the site must be fully serviced prior to approval of discharge points. Disposal methods, in preferred order, are:

1. Private soakage (for defined Soakage areas);
2. Direct connection to the public stormwater system (or extension);
3. Discharge to a watercourse (public or private);
4. Direct connection to overflow pipe that connects to a separated stormwater line (downstream of overflow location and connect to the overflow pipe). The separated stormwater which an overflow discharges to should not connect back into a combined line downstream of the overflow point;
5. Coastal discharge (through private line or public line);
6. Connection to the Combined line (through detention tank);
7. Kerb discharge to separated non-soakage stormwater system [subject to specific Metrowater and ACC Transport approval]

Systems Not Allowing Stormwater Discharge

Stormwater must never be discharged into the following:

- A wastewater only system;
- An area with insufficient soakage (refer to Auckland City Council's Soakage Design Manual);
- A road drainage system connected to a soakage or combined system;
- Direct to a road catchpit. A connection may be made to a catchpit lead, provided a saddle or "y" connection is installed at the connection point, subject to the asset owner's approval. Refer to 5.8 diagram *Typical Stormwater Discharge Points*.
- No private connection shall be made to catchpit leads less than 225 mm diameter.

Disposal Options

There is limited potential for development if there are no soakage or stormwater disposal options available. In some circumstances development is not possible until a suitable system becomes available.

5.2 (cont) Approved Discharge Points

Public Soakage System
No private discharges are permitted into: a public soakage system; or, public pipes connected to public soak-holes, as private on-site soakage must be utilised.

Key Documents

- Operative Auckland Regional Plan: Coastal 2004 [Auckland Regional Council]
- Proposed Auckland Regional Plan: Air, Land and Water 2004 (amended to incorporate decisions and submissions) [Auckland Regional Council]
Until this Plan is operative, it must be consulted in conjunction with:
- Transitional Regional Plan 1991 [Auckland Regional Council]
[Hard copy only]
- Soakage Design Manual 2003 [Auckland City Council]
- AMIS/GIS-based Asset Records: Public Drainage Maps

Diagrams Typical Stormwater Discharge Points
Extension of the public stormwater system is required unless:

- Approved soakage is available;
- Direct connection can be made to an existing public system or watercourse, as set out in the following table.

The information in the table below shall be read in conjunction with the information on the diagram following. For details on requirements for subdivisions and multi-unit development, refer to Section 2 *Development*, sub-section 2.2 *Applications* and sub-section 2.7 *Additional Dwellings*.

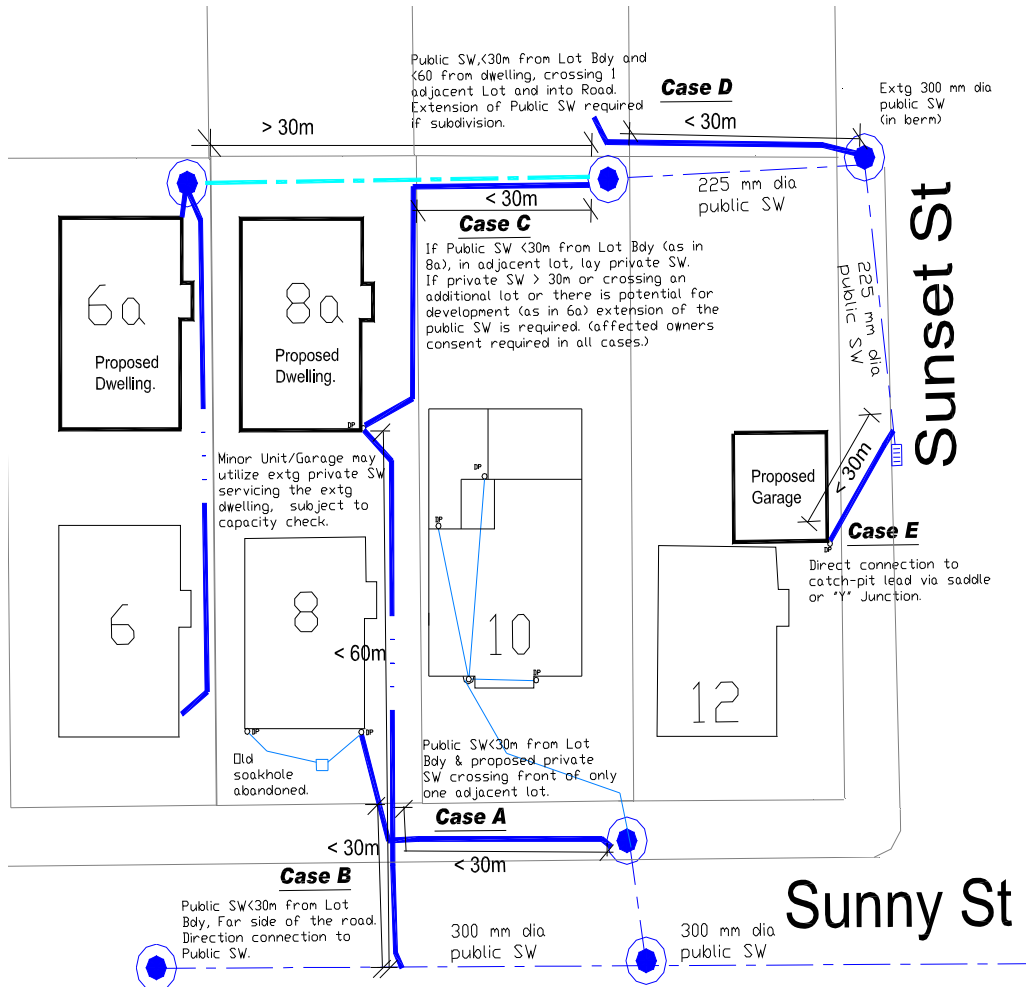
Case	Description	Direct Connection	Note
A	Pipe on same side of road	Required. Private drain must extend <30m from the lot boundary and only cross one adjacent lot frontage	Extend public line if warranted by nearby development potential or multi-unit development or subdivision
B	Pipe on far side of road	Required – depending on road, services and development <30m from the lot boundary and or <60m from the nearest edge of the building footprint	Extend public line if warranted by nearby development potential or multi-unit development or subdivision and road opening notice for work in the road reserve.
C	Pipe through adjacent property	Public extension required if >30m from lot boundary or >60m from building as in 6a or for subdivision or multi-unit development. Private drainage can only cross into adjacent lot	Neighbour’s permission required. Extend public line if warranted by nearby development potential or multi-unit development or subdivision
D	Pipe through adjacent property and road	Public extension required if >30m from lot boundary, >60m from building or for subdivision. Private drainage can only cross into one adjacent lot.	Through neighbour's land (with neighbours’ permission) and road opening notice for work in the road reserve.
E	Catchpit on same side of road only	Connection required to catchpit lead. Connection must be < 30m from the lot boundary.	Only connection to Catchpit lead permitted. Consider capacity of receiving stormwater system, may need to extend the public drain.

5.2 (cont) **Approved Discharge Points**

Diagrams
(cont)

Typical Stormwater Discharge Points

This diagram is to be referred to as a guide only. Prior to lodgement of application, applicants should first discuss the proposal with ACE. Approval of variations to these guidelines is at the discretion of Development Engineering (DE).



5.3 Design Standards

Policy

Refer also to:

- Sub-section 5.6 *Auckland Regional Council*;
- Appendix C, *Rainfall Chart for Albert Park*.

Public stormwater drainage must be designed to the minimum standards outlined below.

Minimum Requirements

The public stormwater system must be designed for Maximum Probable Development (MPD) of the entire upstream catchment and in accordance with the NZS 4404 Land Development and Subdivision Engineering 2004 or TP108 Guidelines for Stormwater Runoff Modelling in the Auckland Region 1999. Effects on downstream systems must be shown to be acceptable. The system must be designed to collect surface water from all areas, including lots, roads, right-of-ways and reserves.

Minimum Diameters

New public stormwater pipes must have a minimum diameter of 225mm irrespective of whether a lesser diameter pipe would provide for MPD design flows.

Primary Systems

The primary system (including inlets) must pass peak design flow without activating any secondary flow path or surcharging the system. Primary (piped) systems must be designed as follows:

- **Residential Zones**
The 10% Annual Exceedance Probability (AEP) if acceptable overland flow paths are available, otherwise the 2% AEP;
- **Areas Covered by the District Plan's Central Area Section**
The 5% AEP if acceptable overland flow paths are available, otherwise the 2% AEP
- **Newmarket Business Zone** (within the area bounded by George St, Carlton Gore Rd, Park Rd, Mountain Rd, Secombes Rd, Gillies Ave, Clovernook (including the extension to Gillies Ave), Broadway, St Marks Rd, the railway line and Sarawia St) the 5% AEP if acceptable overland flow paths are available, otherwise the 2% AEP.
- **Other Business Zones**
The 10% AEP if acceptable overland flow paths are available, otherwise the 2% AEP - refer to Appendix B, *Stormwater Design Standards for Business Areas*;

Secondary Systems

Secondary systems (including culverts, bridges and overland flow paths) must be designed for the 2% AEP in all zones. Where possible overland flow paths must be along public roads or otherwise denoted by Consent Notice on all newly consented subdivision titles for the affected lots. Overland flow paths should not have any construction within them to impair flow potential.

5.3 (cont) Design Standards

Policy (cont)

Risk of Blockage to Primary System

Where no overland flow path is available and the primary pipe system is designed for the 2% AEP, and inlet capacity should be sized appropriately to minimise the risk of blockage.

Roughness Coefficient

The Colebrook-White Coefficient must be: $K=0.6\text{mm}$ (or as otherwise agreed with the Engineer).

Reticulation Layout

Manholes and pipelines must be located to minimise interference with future building as follows:

- **All Zones:** within common access ways;
- **Residential Zones:** within the front, rear and side yards;
- **Business Zones:** adjacent to road frontage boundaries.

Public drains must connect, start or terminate only at manholes, except in the following cases:

- Catchpit leads of 225mm diameter may be saddled to drains of 600mm diameter and larger where there is no convenient manhole;
- As otherwise approved by Metrowater or Auckland City Council

Service Connections

Service Connections must be constructed as required on all new public stormwater drains at the time the public stormwater drain is laid. The length of pipe from the flexible joint to the Y junction or saddle connection to the public line is considered a service connection. *Refer 12908/225.*

Key Documents

- Technical Publication (TP) 108: Guidelines for Stormwater Runoff Modelling in the Auckland Region 1999 [Auckland Regional Council]
- NZS 4404 Land development and Subdivision Engineering 2004
- Technical Publication 124: Low Impact Design Manual for the Auckland Region 2000 [Auckland Regional Council]
- Watercourse Guidelines 2003 [Auckland City Council]
- Technical Publication 10: Design Guideline Manual: Stormwater Treatment Devices 2003 [Auckland Regional Council]
- Model Rainstorms [Auckland City Council] [Hard copy only]
- Flood Hazards (from Flood Hazard Mapping (FHM)) refer AMIS/GIS or specific FHM reports held by Auckland City Council or Metrowater.

Runoff Coefficients

Stormwater Runoff Coefficients

Refer also to Appendix C, *Rainfall Chart for Albert Park.*

Zoning (as per the District plan)	5% & 10% AEP	2% AEP
Open Space (1-5)	0.30	0.60
Residential 1	0.45	0.70
Residential 2a	0.50	0.75
Residential 2b, 3a, 3b, 4, 5	0.55	0.75
Residential 6a, 6b	0.65	0.80
Residential 7 & 8	0.60	0.60
All impervious areas	0.90	0.90

5.4 Flooding

Refer also to:

- Section 2: *Development*, sub-section 2.6 *Subdivisions*;
- Section 3: *Drainage*, sub-section 3.5 *Catchment Management Plans*;
- Sub-section 5.3: *Design Standards*;
- Sub-section 5.5: *Overland Flow Paths*;
- Section 7: *Standard Drawings*, 12908/243 and 12908/244;
- Appendix A: *Flood Risk Reports*;
- Appendix L: *District Plan*, (§ 5D): *Natural Hazards*.
- Appendix O: Integrated Catchment Study (Flood Hazard Maps)

As per the requirements of the District Plan, (§ 5D.6.1): *Natural Hazards*. if AMIS/GIS, a Catchment Management Plan, Flood Hazard Map (FHM) or a site inspection reveals a Flood Hazard Area or Flood Prone Area in any part of a site being developed, this must be properly assessed and reported (regardless of where on the site the development is situated). The review will generally be carried out by the applicant's suitably qualified Engineer preparing a site and development-specific Flood Risk Report. Maintenance of the flood plain or flow path is equally important as building to minimum freeboards. While different situations require different levels of flood risk assessment, how flooding is to be addressed by the proposed development must always be clearly recorded in the Consent application and decision. Flood hazard areas are based on MPD and assume a coastal boundary condition of Mean High Water Springs (MWHS) to calculate the flood level whilst the Highest Astronomical Tide or HAT must also be considered in some coastal areas as this could exceed the flood level. The effect of storm surge to 1 in 50 yr level should be considered when determining floor levels for coastal properties.

Policy

District Plan

The District Plan (§ 5D.6.1): *Natural Hazards*. specifies the required minimum freeboards and levels of protection. Refer to Appendix L, *District Plan*, 5D: *Natural Hazards*. These standard requirements may be varied by a specific Catchment Management Plan. Flood Prone Areas (i.e. Flooding area over and above the Flood Hazard assuming the primary system is blocked) and Flood Hazards are defined in the AMIS/GIS, Catchment Management plans and Flood Hazard Maps.

Building Act 2004

Auckland City Council will not grant a Building Consent for works on land subject to flooding, unless the applicant is the owner and can show that the requirements of § 71-74 can be met. If a Building Consent is granted, a notice under S 71-74 will be registered on the title. Flow paths may also need to be registered on the title in this case and should be defined by survey. The 'land' in this case refers to the building platform (rather than the section generally), and this must be considered when taking into account inaccuracy of the flood extent and secondary hazards (e.g. slippage next to a flood path and possible partial inlet blockage – refer to Section 5.5).

Resource Management Act 1991

Auckland City Council will not grant Subdivision Consent on land subject to flooding unless the developer can show that the requirements of Section 106 can be met. If a subdivision or Land-Use Consent is issued, Consent Notices will be registered on the title. Flow paths may need to be registered on the title in this case and should be defined by survey.

5.4 (cont) Flooding	
Policy	<p>Flood Risk Reports</p> <p>A Flood Risk Report will generally be required in the following situations:</p> <ul style="list-style-type: none"> • When a building consent or a resource consent application proposes a building or obstruction in the flow path or flood plain (this includes decks, fences and carports which may later be closed in); • As part of a Subdivision or relevant Land-Use Consent in a flood- (or overland flow) risk area, or where there is a watercourse or private stormwater drain on the site. • When a building consent or a resource consent application involves habitable floors proposed within the Highest Astronomical Tidal (HAT) flood plain and/or the 2% AEP storm surge level, whichever is greater. <p>Refer to Appendix A, <i>Flood Risk Reports</i>.</p> <p>Building in a Flood Hazard Area</p> <p>Development in a Flood Hazard Area will only be considered if the applicant can demonstrate (utilising Auckland City Councils Integrated Catchment Studies and FHM reports) that the development will not adversely affect any proposed building or any other land or building by:</p> <ul style="list-style-type: none"> • significantly increasing the flood flow; • significantly reducing flood storage in a ponding area; • significantly obstructing flood flow; • creating wastewater flooding; <p>and meets Building and Resource Management Act requirements.</p> <p>Refer to Section 7 <i>Standard Drawings</i>, 12908/243 and 12908/244.</p> <p>Site Visit</p> <p>The Engineer’s site visit (in connection with any Consent or Flood Report) will assess the site’s flood risk regardless of the flood status indicated on any Flood Hazard Map, Catchment Management Plan or AMIS/ GIS.</p> <p>Hillsides</p> <p>Sites on slopes can still be subject to overland flow which has the same effect as flooding. Refer to Section 7 <i>Standard Drawings</i>, 12908/243 and 12908/244.</p>
Key Documents	<ul style="list-style-type: none"> • Building Act 2004 • Building Regulations 1992 (and Amendments) (esp. § E1) • Resource Management Act 1991 (and Amendments) (esp. § 76(2A), 106) • District Plan (Isthmus Section) (esp. § 5D.6) [Auckland City Council] • ACC Bylaw Part 18 - Stormwater Management 2008 (Draft) • Watercourse Guidelines 2003 [Auckland City Council] • Flood Hazards (from Flood Hazard Mapping) refer AMIS/GIS or contact ACE/Metrowater – Records Section to view hard copies of Flood Hazard Mapping reports. • Flood Hazard Mapping Reports [Auckland City Environments or Metrowater] [Hard copy & PDF]

5.5 Overland Flow Paths

Refer also to:

- Section 3 *Drainage*, sub-section 3.5 *Catchment Management Plans*;
- Sub-section 5.3 *Design Standards*;
- Sub-section 5.4 *Flooding*;
- Appendix O *Integrated Catchment Study – Flood Hazard Maps*

Primary systems (for example, piped systems) generally have capacity only for the 10% AEP flow. For flows in excess of 10% AEP, an overland flow path must be maintained. Natural flow paths must always be maintained. Overland flow paths are indicated on the AMIS/GIS based on the results of modelling completed as part of Flood Hazard Mapping.

Policy	<p>Overland Flow Path Identification Overland flow paths are identified on the Flood Hazard Maps. The FHM identifies all predicted overland flow paths and highlights "significant overland flow paths" with a predicted velocity greater than 2m/s and depth greater than 300mm. The Building Code specifies a significant overland flow as a flow path with a depth of at least 100 mm or greater.</p> <p>Clearance All Overland flow paths must be kept clear at all times to allow the unobstructed flow of water.</p> <p>Non-Building Consent Works Works which do not require a Building Consent (for example, landscaping, fences, planting) shall not impede overland flow paths.</p> <p>Registration on Titles The existence of (and restrictions from) overland flow paths may be registered as Consent Notices on the titles of affected land.</p> <p>Site Management Careful management of stormwater on the site (for example, landscaping, placement of driveways) can sometimes be used to control overland flow. All applications potentially affected by overland flow must include proposals for this.</p>
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Key Documents	<ul style="list-style-type: none"> • Building Act 2004 • Building Regulations 1992 (and Amendments) • District Plan (Isthmus Section) (§ 5D.6) [Auckland City Council] • Watercourse Guidelines 2003 [Auckland City Council] • Section 18.2.3 & 18.2.4 ACC Bylaw Part 18 - Stormwater Management 2008 (Draft). • Flood Hazards (from Flood Hazard Mapping) refer AMIS/GIS or contact ACE/Metrowater – Records Section to view hard copies of Flood Hazard Mapping reports. • Flood Hazard Mapping Reports [Auckland City Environments or Metrowater] [Hard copy or PDF]
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5.6 Auckland Regional Council

Across the Auckland region, Auckland Regional Council (ARC) administrates and regulates activities relating to stormwater discharges, works in any watercourse and in the coastal area below mean high water springs.

Policy

Resource Consents

Auckland City Council has applied to the ARC for Resource Consents to authorise the discharge of stormwater from the city's existing stormwater systems. Most of these are still under review by the ARC. Activities not included in these Consents held by Auckland City Council, may still require direct approval from the ARC.

Common Issues

The more common activities for which contact with the ARC is required include:

- Discharge of stormwater from more than 1,000m² of impermeable area to soakage, a watercourse, coastal areas or a stormwater pipe system - refer to the Proposed Auckland Regional Plan: Air, Land and Water (ALW) 2004 Section 5.5.1;
- In-ground soakage disposal systems - refer to the Proposed Auckland Regional Plan: ALW 2004 Section 6.5.19 for permitted activities;
- Any works within a watercourse such as re-shaping, erosion control, piping or diversions - refer to the Proposed Auckland Regional Plan: ALW 2004 Section 7.5 for permitted activities;
- Any works below mean high water springs;
- Any service station development or re-development (regarding oil separators, pollution abatement);
- Earthworks of more than 0.25ha; if in a "Sediment Control Protection Area" If outside a Sediment control area, more than 1.0ha where the land has a slope less than 15 degrees or earthworks not more than 0.25 ha where the land has a slope equal to or greater than 15° - refer to the Auckland Regional Plan Sediment Control 2001 Section 5.4.1.1;
- Discharge of stormwater from industrial or trade premises.

Key Documents

- Resource Management Act 1991 (and Amendments)
- Operative Auckland Regional Plan: Coastal 2004 [Auckland Regional Council]
- Proposed Auckland Regional Plan: Air, Land and Water Plan 2004 (amended to incorporate decisions and submissions) [Auckland Regional Council]
Until this Plan is operative, it must be consulted in conjunction with:
- Transitional Regional Plan 1991 [Auckland Regional Council]
[Hard copy only]
- Auckland Regional Plan: Sediment Control 2001
- Technical Publication 90: Erosion And Sediment Control: Guidelines for Land Disturbing Activities in the Auckland Region 1999 [Auckland Regional Council]

5.6 (cont)

Auckland Regional Council

Key Documents
(cont)

- Auckland Regional Stormwater Project: An Action Plan to Deliver Improved Stormwater Outcomes [Auckland Regional Council]
- Watercourse Guidelines 2003 [Auckland City Council]
- Technical Publication 108: Guidelines for Stormwater runoff modelling in the Auckland Region Part A
- Technical Publication 10: Design Guideline Manual Stormwater Treatment Devices 2003 [Auckland Regional Council]

<p>5.7</p>	<p>Stormwater Quality</p> <p>Refer also to:</p> <ul style="list-style-type: none"> • Sub-section 5.6 <i>Auckland Regional Council</i>; • Sub-section 5.8 <i>Catchpits</i>; • Sub-section 5.15 <i>On-Site Stormwater Management</i>; • Sub-section 5.16 <i>Stormwater Treatment</i> <p>Stormwater discharged to the environment must be of an appropriate quality.</p>
<p>Policy</p>	<p>Stormwater Quality</p> <p>Stormwater quality is especially important for subdivisions, earthworks, industrial and soakage sites, and service stations. In certain situations, the Auckland Regional Council (ARC) may also stipulate requirements.</p> <p>Maintenance of Catchpits</p> <p>All catchpits must have adequate sump depth (as per Standard Drawings 12908/231 to 242), including private catchpits in private driveways. Regular maintenance of these is required as pollutants cling to silt and debris. Auckland City Council § Bylaws prohibit the discharge of silt into the stormwater system. Regular maintenance is especially important in soakage areas, as these systems are especially prone to silt inflow and subsequent reduction in soakage performance which can lead to flooding issues.</p> <p>Control Measures</p> <p>A range of silt and dirt control measures are required on building sites, including wheel washes, spraying and measures to trap run-off.</p> <p>Minimising Discharge of Pollutants</p> <p>The discharge of pollutants can be minimised by ensuring that activities involving pollutants are bunded or under cover. Design features which reduce pollutants in runoff may be used (for example, reducing impermeable area, grass swales). Refer to sub-section 5.15 <i>On-Site Stormwater Management</i>.</p>
<p>Key Documents</p>	<ul style="list-style-type: none"> • District Plan (Isthmus Section) (esp. § 4A-4, Annexure 14) [Auckland City Council] • Bylaw Part 13 Environmental Protection 2008 Draft • Operative Auckland Regional Plan: Coastal 2004 (esp. § 20) [Auckland Regional Council] • Auckland Regional Plan: Sediment Control 2001 Proposed Auckland Regional Plan: Air, Land and Water 2004 (amended to incorporate decisions and submissions) [Auckland Regional Council] <i>Until this Plan is operative, it must be consulted in conjunction with:</i> • Transitional Regional Plan 1991 [Auckland Regional Council] [Hard copy only] • Technical Publication 10: Design Guideline Manual: Stormwater Treatment Devices 2003 [Auckland Regional Council] • Technical Publication 53: The Environmental Impacts of Urban Stormwater Runoff 1995 [Auckland Regional Council] • TA-ARC Stormwater Management Strategy Technical Report 5 [Auckland Regional Council] • Technical Publication 90: Erosion and Sediment Control Guidelines for land distributing activities in the Auckland Region 1999 (parts A & B)

5.8 Catchpits

Refer also to:

- sub-section 5.2 *Approved Discharge Points*;
- sub-section 5.10 *Kerb Discharges*;
- Section 7 *Standard Drawings*, 12908/229 to 12908/242.

Public catchpits are provided to drain the roadway system and for silt retention. The road drainage system is owned and operated by Auckland City Council Transport. Development Engineering (DE) approval is required for any work which affects this system.

Policy

Catchpits draining to combined and stormwater pipe systems

All catchpits draining to combined and stormwater pipes must have half siphons arranged vertically on the catchpit lead, to prevent odours from the combined sewer or stormwater system coming back up the catchpit.

Private Connections

Private connections directly to catchpits are not permitted. Private connections may be approved to a catchpit lead via a "y" junction or approved saddle connection, provided the catchpit is connected to a public Stormwater system and not interconnected with a downstream catchpit. Refer to diagram *Connections to Catchpits*. Private connections shall only be made to catchpit leads 225 mm diameter or greater.

New Private Catchpits

All private catchpits must have silt traps and half siphons.

New Catchpit Designs

All new development requiring public catchpits must use the new catchpit design. Refer to Section 7 *Standard Drawings*, 12908/232 to 12908/240. All new catchpits shall have at least a 225 mm diameter catchpit lead.

Maintenance of Existing Catchpits

Repairs and maintenance on existing public catchpits must be in accordance with standard design. Refer to Section 7 *Standard Drawings*, 12908/231.

Replacement of Existing Catchpits

In the event that an existing public catchpit requires removal or replacement, the replacement catchpit shall be installed as per standard design - shown in Section 7 *Standard Drawings*, 12908/231, or subject to Transport approval as illustrated in Section 7 *Standard Drawings*, 12908/232 to 12908/240.

Mega-pits

Mega-pits can be used if large entry volumes are required. Refer to Section 7 *Standard Drawings*, 12908/242. Note the minimum sump depth shall be 450 mm. Careful consideration is required when sizing the outlet and designing the number of devices draining to the stormwater pipe system or stormwater Soakage system.

New Vehicle Crossings Adjacent to Existing Catchpits

Approval from ACE or Transport is required for proposed vehicle crossings adjacent to existing catchpits where the existing kerb and backing plate is to be removed. Consideration must be given to possible interference with traffic movement, loss of inlet capacity due to the removal of the back entry and possible re-location of the catchpit. All associated costs of catchpit backing plate removal or catchpit re-location will be met by the applicant.

5.8 (cont) Catchpits

Key Documents

- Road Opening Notice [Transport] [Hard copy only]

Diagram

Connections to Catchpit Leads

Section 5.8 and the drawings below show possible connections. Approval from Metrowater, ACE or Transport is required for alternative connection proposals.

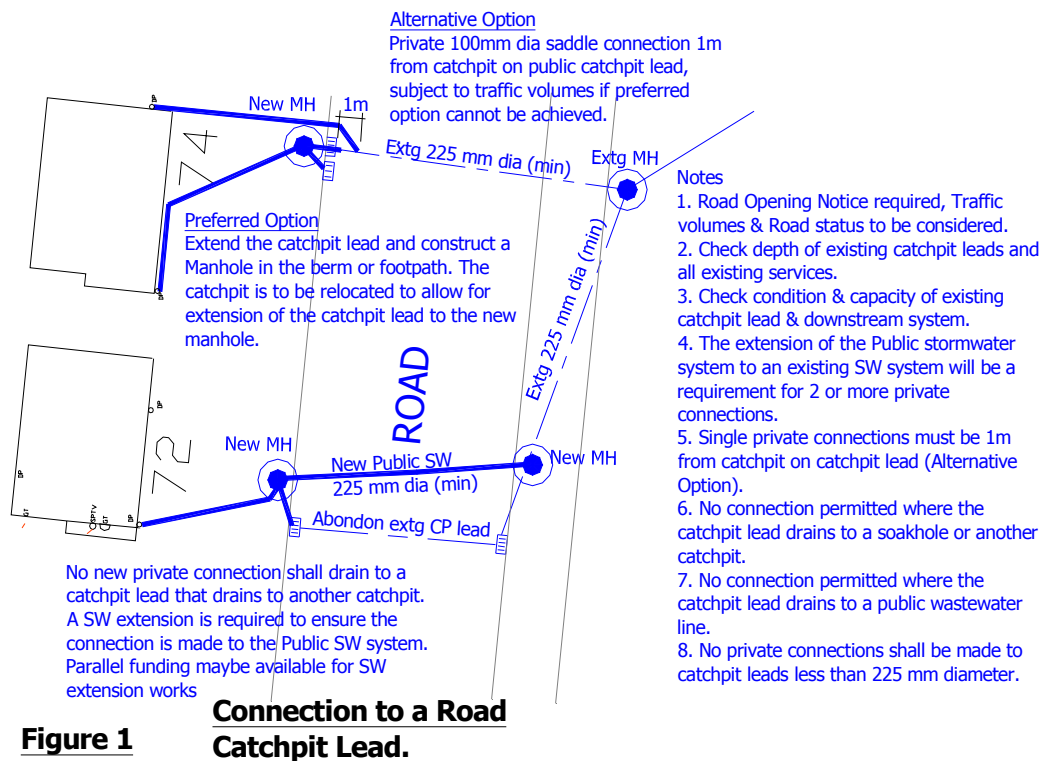


Figure 1

5.9 Stormwater Detention and Re-Use Tanks

Refer also to:

- Section 3 *Drainage*, sub-section 3.15 *Combined Sewers*;
- Section 3 *Drainage*, sub-section 3.17 *Separation of Private Drainage*;
- Sub-section 5.15 *On-Site Stormwater Management*;
- Section 7 *Standard Drawings*, 12908/256 to 12908/259.

On-site stormwater storage devices may be required to reduce the impact of stormwater runoff (quantity) on receiving systems. The installation of stormwater storage devices as part of a site's private drainage system ensures that the rate of stormwater discharge does not increase when the site is developed, maintaining the pre-development flow rate.

The use of 'at-source' stormwater disposal and storage methods for Zone 8 is outlined in the *On-Site Stormwater Management (OSM) Manual*, December 2002.

For all other zones refer to *The Manual for Development Contribution Rebate Programme for Rainwater Tanks* July 2006.

Policy

When Required

Specific areas where stormwater storage devices are required include:

- All new developments in all combined sewer catchments
- Instances of an approved kerb discharge;
- In separated catchments where the development site is more than 1,000m² and there are capacity issues with the downstream stormwater system.
- Where development occurs in Residential 8 areas and site coverage is above 60% (refer to the OSM Manual, Dec 2002)
- Where reduced flow rates are required for soakage system infiltration rates

When Not Required

- If the additional impervious area drained is less than 20m².
- Where calculations show that a storage tank volume of less than 1m³ is needed, then detention is not required.

Rainwater Storage and Re-use Tanks in Residential Zone 8

The On-Site Stormwater Management (OSM) Manual provides design options for stormwater attenuation, re-use and treatment in Residential Zone 8. In situations where the OSM Manual cannot provide specific solutions to a development proposal, the onus is on the developer's Engineer to design a suitable device that adheres to the principals outlined in the OSM Manual. Alternative means of detention storage will be considered only after all options outlined in the OSM Manual have been explored and exhausted.

5.9 (cont) Stormwater Detention and Re-use tanks

Policy
(contd.)

Rainwater Storage and Re-use Tanks in other Zones
The Manual for Development Contribution Rebate Programme for Rainwater Tanks 2006 outlines the design for rainwater storage tanks in all Zones except Zone 8 (covered by the On-site Stormwater Manual).

The manual has been developed to enable Auckland City Council to offer a rainwater tank rebate programme. Applicants paying a “Development Contribution” will be entitled to a rebate once a tank is installed and signed-off by ACE.

The rainwater/re-use tanks provide the following benefits:

- Encourage water conservation/re-use, matching the conservation ethic promoted by Metrowater and Watercare.
- Reduces the discharge load on the public stormwater system by providing stormwater retention for flow attenuation.
- The tanks provide “at source” treatment, where the tank traps sediment, thereby reducing the sediment/contaminant loading on the receiving environment.

A Stormwater detention tank manual is currently being developed to provide guidelines for stormwater detention tank design for all the zones in the city.

Stormwater Detention Tanks in Combined Areas

- Separation of private drainage on-site is required with all existing and proposed stormwater from the site required to pass through the tank(s) where discharge to the combined sewer is proposed;
- Detention is not required where the additional drained impermeable area is less than 20m²;
- Tanks must be sized based on the Stormwater Detention Tank Application Form (available from ACE) or if a Rainwater Reuse Tank is to be used as per the Manual for Development Contribution Rebate Programme for Rainwater Tanks 2006;
- If a site in a combined catchment is being completely redeveloped, the ‘existing’ situation is taken in these calculations as an undeveloped site (that is, C (impervious area coefficient) = 0.3);(Note C=0.3 also applies to separated areas for detention tank sizing).

Stormwater Detention Tank Requirements

- All Detention tanks must be serviceable
- All tanks must meet the operational and maintenance requirements of the OSM manual.

Key Documents

- On-Site Stormwater Design Manual 2002 [Auckland City Council]
- The Manual for Development Contribution Rebate Programme for Rainwater Tanks 2006 [Auckland City Council]

5.10 Kerb Discharges

Refer also to:

- Sub-section 5.2 *Approved Discharge Points*;
- Sub-section 5.8 *Catchpits*;
- Section 7 *Standard Drawings*, 12908/260.
- ACC Transport Kerb Discharge Policy Document

Policy	<p>Permission</p> <p>Kerb discharge will only be considered on a case-by-case basis when:</p> <ul style="list-style-type: none"> • The road drainage is not discharged to a soakage system; • No other means of stormwater disposal (e.g. discharge to a watercourse) is available; • No direct connections to stormwater pipes are available; • The road is served by a separated pipe system which has sufficient downstream capacity; and • The road has no history of flooding. <p>Kerb discharge to other than a public road will generally not be permitted unless: all relevant property owners give written approval; and, where other land (including the public road) will not be adversely affected. Refer ACC Transport Kerb Discharge Policy for a detailed list of requirements.</p> <p>Conditions</p> <p>All new and existing kerb discharges must be approved by ACC Transport Assets and Operations. The following conditions may be applied where kerb discharge is permitted:</p> <ul style="list-style-type: none"> • The applicant is generally required to construct detention tanks to capture peak flows; • Upgrades to the receiving downstream stormwater system may be required. These are subject to ACE Engineering Approval; • The discharge pipe may not exceed 100mm diameter. Refer to Section 7 <i>Standard Drawings</i>, 12908/260. • Where additional flows to an existing kerb discharge is proposed, ACC transport may request the applicant remove the existing kerb discharge and connect to the public stormwater system, if available. • Kerb discharge where the downstream catchpit is a "bubble up" catchpit is not permitted. <p>Public Drainage</p> <p>An extension to the public system may be required if warranted by the magnitude of the development, the distance to the closest public drain, and the surrounding development potential. Approval will be given at the discretion of Development Services (DS) at Metrowater.</p>
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Key Documents	<ul style="list-style-type: none"> • Refer ACC Transport Kerb Discharge Policy for detailed list of requirements for kerb discharge.
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5.11 Soakage

Refer also to:

- Sub-section 5.2: *Approved Discharge Points*;
- Sub-section 5.16: *Stormwater Treatment*.

Defined soakage areas are areas where there are porous soils or where the underlying rock has significant voids, fissures or cracks. In defined soakage areas, each dwelling will dispose of its own stormwater through a private in-ground soakage system, which must be maintained by the property owner. The Auckland City Council Soakage Design Manual 2003 must be referred to for design standards for all soakage systems.

<p>Policy</p>	<p>Testing of Soakage Systems Testing of an existing or proposed soakage system is required if the additional stormwater discharged to it is from 20m² or more of additional roofed or drained paved area.</p> <p>Locating Soakage Development in a designated soakage area is dependent on the developer proving adequate soakage. Failure to find soakage may restrict development. Usage of public soakage systems in the road is not an option. For sites near the boundary of soakage areas, or where the roadway is serviced by a separated system, alternatives may be considered once comprehensive on-site testing has shown that private soakage is impractical.</p> <p>Separate Soakage Systems Each dwelling and each common area access lot requires its own separate soakage system.</p> <p>Non Soakage Areas Soakage will generally not be considered outside the designated soakage areas. Applications to use soakage in these areas must demonstrate that the underlying geology is suitable (in terms of soakage rates and stability). This information will be used to update the soakage maps.</p> <p>Auckland Regional Council Draining of areas larger than 1,000m² and new soakholes deeper than 20m below ground level requires Auckland Regional Council (ARC) approval. All treatment devices installed in soakage systems to service new development as specified by ARC, must be deemed to be private. Auckland City Council declaring such devices public will be entirely at Auckland City Council's discretion.</p> <p>Treatment of Runoff Discharging into a Soakage System All runoff from paved areas exceeding 20m² (Soakage Design Manual, 2003) must be treated before entering the soakage system. All runoff from roof areas must pass through a settling device.</p>
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<p>Key Documents</p>	<ul style="list-style-type: none"> • On-Site Stormwater Design Manual 2002 [Auckland City Council] • Soakage Design Manual 2003 [Auckland City Council] • AMIS/GIS-based Asset Records: Hazards Map: Designated Soakage Areas [Auckland City Council] [Hard copy only]
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5.12 Syphons

Refer also to:

- Sub-section 5.2: *Approved Discharge Points*;
- Sub-section 5.10: *Kerb Discharges*;
- Section 7: *Standard Drawings, 12908/250 and 12908/260*.

Where a site is lower than a potential disposal point, but the building's roof is higher, it may be possible to use a sealed down-pipe drainage system to carry the roof water away from the site. The lower part of the pipe will always hold water up to the level of the discharge point. As more water enters the syphon from the roof, water is discharged at the outlet point.

Policy

Syphon Systems

A syphon system cannot be connected to a ground-level catchpit as the water will exit at the lowest open point of a syphon system.

Marginal Situations

For marginal situations, specific head-loss calculations may be required to ensure flow rates can be achieved and to ensure water does not backflow out of the syphon.

Direct Connections to Stormwater Systems

Where a direct connection to a stormwater system is made by way of a syphon system, a gravity chamber must be installed. Refer to Section 7 *Standard Drawings, 12908/250*. The chamber must be completed prior to connection to the public system to prevent backflow into the private system.

Kerb Discharges

Kerb discharge will only be permitted as a last resort. Refer to sub-section 5.2 *Approved Discharge Points* and 5.10 *Kerb Discharges*.

5.13 Watercourses

Refer also to:

- Sub-section 5.4: *Flooding*;
- Section 7: *Standard Drawings*;
- Appendix A: *Flood Risk Reports*;
- Appendix D: *Watercourses*;
- Appendix H: *Form: Certificate of Construction Aspects of Development Works*.

Watercourses are an important part of the stormwater drainage system. Discharges to watercourses need to minimise erosion and ensure that water quality is maintained and flood risk is controlled. With the exception of five watercourses vested in Auckland City Council's management and control (Meola Creek, Oakley Creek, Motions Creek, Newmarket Stream and Remuera Stream) watercourses (or portions of them) are deemed the responsibility of the owners of the land through which they pass.

Policy

Discharges to Watercourses

Discharge to a watercourse (whether open or privately piped) requires that:

- Neighbour's consent is obtained for any drainage pipes proposed through an adjacent property.
- The site owner has the permission from the owners of the watercourse;
- The watercourse or private pipe has proven capacity for the increased flow (including erosion, entry hydraulics and flooding issues);
- Erosion control is satisfactory (including during construction).

Maintenance of Watercourses

Except where specifically provided for, the responsibility for maintenance of watercourses rests with the property owner(s). No obstructions to the free flow of water may be placed near or in the channel or flood plain. Under the Local Government Act 1974, property owners may be required to remove obstructions. Maintenance must not alter the channel beyond its normal dimensions or increase scouring of the banks.

Auckland Regional Council (ARC)

ARC's consent may be required for some works (for example, piping open watercourses where pipes are ≥ 600 mm diameter and/or piping a length of open watercourse ≥ 20 m or where $\geq 1,000$ m² impermeable area is drained to an open watercourse).

Open Stream Systems

Where natural watercourses are to be incorporated into the stormwater drainage system for a subdivision, they must meet the requirements listed in the *Key Documents* below and in the Appendices. They must be able to contain the 2% AEP MPD flows and allow for future maintenance of the channel.

Piping of Watercourses

Private piping of watercourses is generally discouraged and will not be considered unless the applicant can show that there will be no adverse effects. Adverse effects are defined as increased flooding due to loss of storage, increased flow velocity, loss of habitat and ecological considerations. An application for Engineering Approval is required. Piping an exclusive section of an open watercourse which creates sections of piped and open watercourse is not permitted.

5.13 (cont) Watercourses

Key Documents

- Local Government Act 1974 (and Amendments) (§ 511)
- Local Government Act 2002 (and Amendments)
- Consolidated Draft Bylaw 2008 (§ 18) [Auckland City Council]
- District Plan (Isthmus Section) (esp. § 4.3.2.6, Planning Map 3) [Auckland City Council]
- Proposed Auckland Regional Plan: Air, Land and Water 2004 (amended to incorporate decisions and submissions) [Auckland Regional Council]
Until this Plan is operative, it must be consulted in conjunction with:
- Transitional Regional Plan 1991 [Auckland Regional Council]
[Hard copy only]
- Code of Urban Subdivision and Development 1999 [Auckland City Council]
- Watercourse Guidelines 2003 [Auckland City Council]

5.14 Groundwater Levels	
	<p>Development may impact on groundwater levels and water quality. Groundwater must be considered when designing soakage systems and structures which sit partly below the ground. Seasonal changes in groundwater levels need to be anticipated. Note that Auckland City Council does not keep records of groundwater.</p>
Policy	<p>Quality Groundwater quality must be protected by use of silt traps for catchpits and by maintaining soakage systems. Such private devices are the responsibility of individual property owners. All sub-soil drainage must discharge to a silt trap before discharging to a piped stormwater system.</p> <p>Water Quality maintenance of Groundwater is important as in future areas may be used for water extraction, whilst some areas (e.g. Onehunga) already have water extraction for potable water use. Some private water extractors also use water for non-potable supplies.</p>
Key Documents	<ul style="list-style-type: none"> • Proposed Auckland Regional Plan: Air, Land and Water 2004 (amended to incorporate decisions and submissions) [Auckland Regional Council] <i>Until this Plan is operative, it must be consulted in conjunction with:</i> • Transitional Regional Plan 1991 [Auckland Regional Council] [Hard copy only] • Soakage Design Manual 2003 [Auckland City Council] • ICS GAS Study 2005 [Auckland City Council] held by Metrowater

5.15 On Site Stormwater Management

Refer also to:

- Sub-section 5.6 *Auckland Regional Council*;
- Sub-section 5.7 *Stormwater Quality*;
- Sub section 5.9 *Stormwater Storage Devices*
- Sub-section 5.16 *Stormwater Treatment*.

Population growth is being catered for through Auckland City Council's Growth Strategy which is based on providing for appropriate increased development densities in specific growth locations. The appropriate controls on impervious area limits as defined in the District Plan.

Policy

Applicability

The On-Site Stormwater Management (OSM) Manual (Dec 2002) applies to all Residential 8 Zones, where the proposed impervious area coverage exceeds 60%. All other zones are covered by the Manual for Development Contribution Rebate Programme for Rainwater Tanks (July 2006).

On Site Stormwater Manual – Residential (Zone 8)

The On Site Stormwater Management (OSM) Manual (Dec 2002) sets out acceptable methods and provides design guidelines as well as operation and maintenance procedures for development on private property where the proposed impervious area coverage exceeds 60%, that is, Residential Zones 8a, 8b and 8c. The manual provides an explanation of practices, owner's obligations, general operation and maintenance requirements, device specific operation and maintenance plans.

Typical OSM devices in areas with impermeable surface conditions:

- Rainwater Re-use Tank (above and below ground);
- Stormwater planter (above and below ground).

Typical OSM devices in areas with adequate soakage:

- Filter soakage trench;
- Rain garden;
- Porous paving;
- Rainwater Re-use Tank

OSM Devices requiring site-specific detailed design are:

- Roof gardens (green roof) and eco roofs;
- Roof and gutter detention;
- Detention ponds and Swales – grass, gravel, rock and trench systems.

5.15 (cont.) On-Site Stormwater Management

Rainwater Tanks and Re-Use

Auckland City Council has adopted an “at source” approach to reuse and attenuating stormwater runoff. This approach is outlined in the “Manual For Development Contribution Rebate Programme for Rainwater tanks July 2006’. The use of rainwater tanks will encourage both the sustainable reuse of the water resource, reduce the load on the public stormwater system by attenuating flows and ultimately reduce the sediment/contaminant loading on the receiving environment.

The manual applies to all zones other than Res 8 zones. The manual outlines the following:

- Applicability i.e. can be used for soakage disposal or outlet to the public stormwater system
- Applications required to install a rainwater tank
- Consenting and indicative costs
- Tank sizing and Design Details
- Operation and Maintenance

Consent Requirements

Implementation of an OSM device or Rainwater re-use device will normally be part of an overall development proposal and requires both a Resource Consent (for Subdivision and/or Land-Use) and a Building Consent. A Resource Consent may be required from ARC where:

- The additional impervious area of the proposed development site exceeds 1,000m² and drains to soakage, a watercourse, a coastal area or a piped stormwater system;
- There is not a Consented Catchment Management Plan covering the development site in question;
- Runoff from the site discharges directly to a Marine Environment (below mean high water springs).

Key Documents

- Consolidated Draft Bylaw 2008 Section 18 [Auckland City Council]
- Technical Publication 10: Design Guideline Manual: Stormwater Treatment Devices 2003 [Auckland Regional Council]
- Technical Publication 124: Low Impact Design Manual for the Auckland Region 2000 [Auckland Regional Council]
- Code of Urban Subdivision and Development 1999 [Auckland City Council]
- On-Site Stormwater Design Manual 2002 [Auckland City Council]
- Residential Design Guide 2001 [Auckland City Council]
- Growing our City through Liveable Communities 2050 [Auckland City Council]
- ACC Manual for Development Contribution Rebate Programme For Rainwater tanks.

5.16 Stormwater Treatment

Refer also to:

- Sub-section 5.6: *Auckland Regional Council*;
- Sub-section 5.7: *Stormwater Quality*;
- Sub-section 5.15: *On-Site Stormwater Management*;
- Appendix M: *Stormwater Asset Management Plan: Locations of Treatment Devices*.

Stormwater treatment is a critical component of developing sustainable stormwater disposal systems. To minimise the effects of contaminated stormwater runoff to water environments such as aquifers, watercourses and harbours, Auckland City Council and Metrowater are committed to Water Sensitive Urban Environment practices that ensure development provide stormwater treatment systems and that these systems are adequately operated and maintained by land owners where the device is located.

Policy

Areas Affected

Private stormwater treatment systems are required in the following situations:

- A new impervious paved area is greater than 20m² and drains into soakage. Refer to the Soakage Design Manual;
- Roof areas draining to soakage. Refer to the Soakage Design Manual;
- Stormwater discharges from an additional impervious areas greater than 1,000 m². Where there is not a consented Catchment Management Plan covering the development site in question, a Resource Consent is required from ARC;
- The stormwater pipe discharges to the marine environment below mean high-water springs (a Resource Consent is required from ARC);
- The stormwater pipe discharges within Coastal Management Areas as per the Isthmus District Plan (a Resource Consent is required from Auckland City Council);
- Where specified or required in Auckland City Council's Catchment Management Plans.

Private Stormwater Treatment Devices

Typical private stormwater treatment devices include:

- Sand filters;
- Wetland ponds;
- Filter soakage trench;
- Rain garden;
- Porous paving;
- Swales;
- Storage/ Re-Use tanks.

Catchments in Non-Soakage Areas

Some catchments in non-soakage areas have existing and proposed public stormwater treatment devices, such as wetland ponds (Ellerslie: Waatarua Catchment) or large storage tanks (Motions Catchment). The applicant must check the location of the public stormwater devices in relation to the subject site and confirm whether an individual stormwater treatment system is required. Refer Appendix M, *Stormwater Asset Management Plan: Locations of Treatment Devices*.

5.16 (cont) Stormwater Treatment

Policy (cont)

Ownership

All private stormwater treatment devices must be privately owned and must be sited on private land. ACC may at its discretion approve public treatment systems where there is considerable public benefit, that is, stormwater treatment is available for stormwater runoff from properties outside of the immediate development site or from public land. Prior to vesting such assets, a comprehensive Net Present Value (NPV) analysis must be submitted to Metrowater. Following due consultation, Metrowater may agree to a one-off contribution for operation and maintenance of the asset for the extent of its economic life.

Subdivisions

All new stormwater treatment devices proposed to treat carriageway runoff from 'roads to vest' must be approved by Transport Division if the road is taken over as a 'public road' by Auckland City Council. It is at Transport Division's discretion to accept or reject any treatment devices associated with any public roads. ACE will consult with Transport Division prior to subdivision or land use approval.

All stormwater treatment devices in private right-of-ways or common access lots must be private structures located within private land, owned by lot owners. Maintenance and repair of the structure is the lot owner's responsibility. The location of these structures must be registered on the title of a lot by way of an easement, and a Consent Notice must be attached to the title, advising of operational and maintenance responsibilities. The stormwater treatment device must be built in conjunction with the road, right-of-way, or common access lot construction.

Where lots require individual stormwater treatment devices, a Consent Notice must be registered on the title indicating that stormwater treatment devices will be required as part of the site's future development.

Operation and Maintenance Requirements

Section 11 of the On-Site Stormwater Management Manual, details requirements for operation and maintenance including:

- Explanation of practices;
- Owner(s)' obligations;
- General operation and maintenance requirements;
- Device specific operation and maintenance plans.

Key Documents

- Draft Consolidated Bylaw 2008 Section 18 [Auckland City Council]
- Technical Publication 10: Design Guideline Manual: Stormwater Treatment Devices 2003 [Auckland Regional Council]
- Technical Publication 124: Low Impact Design Manual for the Auckland Region 2000 [Auckland Regional Council]
- On-Site Stormwater Design Manual 2002 [Auckland City Council]
- Residential Design Guide 2001 [Auckland City Council]
- Soakage Design Manual 2003 [Auckland City Council]
- ACC Manual for Development Contribution Rebate Programme For Rainwater tanks.

5.17 Backflow Prevention	
	<p>Refer also to:</p> <ul style="list-style-type: none"> Section 6 <i>Water Supply</i>, sub-section 6.25 <i>Backflow Prevention</i>. <p>Backflow or cross-connection contamination of the potable water supply must be avoided.</p>
Policy	<p>Prevention of Backflow All installations where there is potential for stormwater to be drawn back into the public water supply must ensure that backflow is prevented. Specific fittings are required.</p> <p>Rainwater Tanks Backflow prevention must be included in any design for tanks which will hold rainwater for later non-potable use.</p>
Key Documents	<ul style="list-style-type: none"> Building Act 2004 Building Regulations 1992 (and Amendments) Water Supplies Protection Regulations 1961 (and Amendments) (esp. § 3, 4, 5, 9, 17) On-Site Stormwater Design Manual 2002 [Auckland City Council] Backflow Prevention Code Of Practice [Metrowater]