# Part 4 – Stormwater Drainage

## 4.0 Introduction

This Manual sets out the basic design principles for drainage of stormwater.

## 4.1 General

All lots shall be provided with a means of stormwater drainage at or within the lot boundary.

Where the property in question already has a connection to a public stormwater system then that connection can continue to be used, but the discharge through this connection shall be limited to the discharge rates from the pre-developed site and any excess discharge rate (e.g. overland flow) created shall be dealt with by the development to the pre-development disposal rates. Developers should be familiar with the MPDC Stormwater Management Bylaw.

In some cases a new connection to a public stormwater system may be approved by Council. In those cases the design of the new stormwater system shall conform with the MPDC Development Manual requirements.

In all cases where stormwater is to be disposed through on-site soakage then the developer will find that the MPDC Soakage Design Procedures and Guidelines (known as the Soakage Guideline) provides a useful reference guide. This guideline is to assist designers to provide a soakage system that will deal with the calculated stormwater discharge rates. It also allows for convenient maintenance of the soakage system so that there can be confidence that it will continue to work effectively for the long term.

In cases where connection to a public stormwater system is not available and ground soakage is not adequate then an alternative system may be approved. Council opinion is that 'wet pond' type detention dams should be avoided

The design intention is to incorporate natural environment-based systems within new works. A natural environment-focused stormwater system may include features such as groundwater recharge, overland flow, open drains, and storm peak mitigation through dams, lake and wetland systems. Key objectives are:

1. Optimise the amount of stormwater entering the piped drainage system;
2. Facilitate groundwater recharge;
3. Cover the immediate needs as well as those of foreseeable future developments;
4. Avoid detrimental effects on downstream properties;
5. Build infrastructure to minimise lifecycle maintenance costs.

Where stormwater is designed to flow into existing drainage systems, there shall be no increase in peak discharge flow rates from the construction of the subdivision or development.

Where a stormwater system is proposed for the collection and discharge of stormwater within the land being developed, it shall also have capacity to deal with drainage from the entire catchment upstream of the development site.

Stormwater proposals must take into account the requirements of Council's current stormwater discharge consents from the regional Council. All proposals must be consistent with the conditions of these consents including requirements for low impact design principles, stormwater management devices and best practicable options.

Where the discharge is to an existing Council pipe network it is Council's responsibility to assess compliance for all new connections to its pipe network. It will require the same conditions as applying to any new municipal stormwater system diversion or discharge activities.

In particular it will require that the new diversion or discharge does not increase peak discharge rates to receiving waters above that which would occur at the time of the application for Council's current discharge consents – unless it is demonstrated that there shall be no adverse effects on the environment or downstream properties as a result of such increase. Acceptance will also be subject to compliance with the requirements for connections to the municipal stormwater system.

Where the new stormwater will discharge to other than an existing Council pipe network, the subdivider or developer is required to obtain appropriate resource consents for discharge for the work from the regional council in the Developer's name. Evidence of this is required before the subdivision can be approved.

If Council is to take over the finished system, it will need to add the discharge to its own consent at the time of transfer. The consent must therefore specifically state that the work will comply with the requirements for a new municipal discharge as set out in Council's Comprehensive Storm Water Discharge Consent (refer to Section 4.2 below).

Secondary flow paths shall be provided and must be able to cater for a minimum of a 1 in 100 year return period storm. Secondary flow paths within the development must be protected by an easement registered against the titles affected.

Where secondary flow paths are not feasible the piped system must cater for a minimum of a 1 in 100 year return period storm. This shall also ensure that the peak flow rate from the developed site does not exceed the 100 year pre-development peak flow rate.

Where disposal is to ground soakage with no available secondary flow path, the soakage system must cater for a 1 in 100 year return period storm.

## 4.2 MPDC Stormwater Management Bylaw

The intention of stormwater management bylaws is to manage stormwater within the Matamata-Piako District so as to protect people, property and the environment by minimising the impact of flooding, erosion and environmental pollution.

Stormwater management bylaws are in addition to controls on stormwater imposed by the Waikato Regional Council and the Matamata-Piako District Council under the Resource Management Act 1991, the Building Act 2004, or any other Act, Regulation or Bylaw.

Designers should be familiar with the Council's stormwater management bylaws in their entirety. A copy of the relevant bylaws can be found on Council's website.

## 4.3 Variations: Stormwater Drainage

The management of stormwater has a functional role in the urban and rural environments. It also has important cultural, aesthetic and environmental implications. The core design principles, context and site analysis are important components of establishing an appropriate design response and rationale for the stormwater management systems chosen for individual subdivisions and developments, within the overall context of the area.

Stormwater run-off within a catchment shall be carefully managed in order to avoid (often cumulative) problems of flooding, erosion and pollution of water bodies. If stormwater disposal is managed in a sustainable manner, the impact on the environment will not be increased and longer-term maintenance costs are minimised.

Understanding the implications of future land use and its design elements, such as the extent of site coverage, including paved surfaces, is important and should be taken into account.

Swales, larger grass verges, and detention basins can allow groundwater recharge, slow the movement of water, and reduce pollutants in receiving water bodies. These areas may also be used to enhance the amenity and natural quality of the subdivision or development and adjacent areas, contributing more widely to the environmental quality of the towns and district.

## 4.4 Definitions

Should a definition be in conflict with the definitions in the District Plan, then the District Plan shall prevail.

| | |
|---|---|
| Design Level of Service | Council's design for capacity (expressed as an average Storm return period) for the stormwater reticulation and this is dependant on the zoning of land services by the reticulation. |
| Groundwater Drainage | Any subsoil drainage system as designed by respective landowners. Subsoil drainage systems are permitted to discharge into land drainage systems provided they prevent any transport of fine sediment. Ground water drainage systems remain the responsibility of the landowners. |
| Infill Development | Redevelopment of urban land through either subdivision/development or Building Consent. |
| Land Drainage System | The flow of stormwater and groundwater but concentrates mainly on peak surface discharges and their reticulation under urban conditions. |
| Primary Design Flow | The estimated run-off selected to provide a reasonable degree of protection to the surrounding land. In most cases this flow will be piped or contained within relatively narrow confines under public control by means of a reserve or easement. |

| | |
|---|---|
| Secondary Flow Path | The path taken by run-off in excess of the primary drainage system capacity. It shall be capable of producing protection for a once in a 100 years return period rain event for commercial, industrial and habitable residential floor levels with allowable freeboard of 500 mm. |
| Pre Development | The state of a site before any works, permitted or as part of a resource consent, have been undertaken. |

## 4.5 Useful Documents and Standards

The designer of the stormwater system should be familiar with all of the following documents. They provide useful guides for the design procedures.

- "Procedure for Hydrological Design of Urban Storm-water Systems". Institution of Professional Engineers, New Zealand.
- Hydraulic Research Paper No. 2 "Charts for the Hydraulic Design of Channels and Pipes". Third Edition. H.M.S.O. London. 1969. Peter Ackers.
- Approved Document for NZ Building Code – Clause E1 "Surface Water"
- Auckland Regional Council Stormwater Management Devices: Design Guidelines Manual – revision to Technical Publication 10
- Erosion and Sediment Control Guidelines for Soil Disturbing Activities May 2003, Environment Waikato Technical Report 2002/01
- Matamata-Piako District Council Consolidated Bylaw
- Matamata-Piako District Council Soakage Design Procedures and Guidelines (known as the MPDC Soakage Guideline).
- MPDC Infrastructure Code of Practice.
- HIRDS High Intensity Rainfall Data, available from NIWA.
- Climate Change Effects and Impacts Assessment "A Guidance Manual for Local Government in NZ – 2nd Edition" published by the Ministry for the Environment.

## 4.6 Stormwater System

Drainage systems both during construction and completion shall be designed such that principally only urban stormwater is conveyed.

The Developer shall be responsible for ensuring that mechanisms exist to prevent water-borne litter, such as paper and plastics, and gross sediments from entering the system. Proposed design plans shall demonstrate how this is to be achieved.

Developers are required to provide for stormwater discharge on and from all lots.

On-site stormwater soakage for individual lots will form part of the building consent for each lot.

## 4.7 Resource Consents Required

Resource Consents from the Waikato Regional Council may be required for the following work:

- The discharge of contaminants during construction work
- The diversion of natural water during construction work
- The permanent diversion of natural water as a consequence of the development
- The discharge of stormwater into natural waterways

In the case of both discharge of contaminants and diversion of natural water during construction, the necessary Resource Consent shall be applied for by the Developer and is to be exercised in the name of the Developer.

The Resource Consent, in respect of the permanent diversion of natural water, or where the discharge of stormwater into natural waterways is solely from the subdivision or development, shall initially be applied for in the name of the Developer. It will be a matter of negotiation between the Developer and Council as to what scope the consents shall have. Generally construction related consents will not be transferred to the Council. The Resource Consent will not be taken over by Council until:

- All earthworks including building sites have been completed
- All consent conditions are approved by Council

The Developer must obtain agreement from the Waikato Regional Council that the consent has been complied with.

## 4.8 Design Requirements

(a) The land drainage system shall be capable of serving the entire catchment upstream of the subdivision or development and must take due regard to the effect it may have on downstream waterways and adjoining areas. It shall be designed within the terms of any approved comprehensive drainage scheme.

(b) The design storms shall be in accordance with Section 4.8.1.1 below. Note the MPDC Soakage Guidelines provide 100 year with climate change rainfall events for each of the four (4) townships and surrounding areas.

(c) Where open watercourses are to form part of the land drainage system this shall be determined at scheme plan approval stage, and the Developer shall submit sufficient engineering design to enable Council to evaluate the proposals.

(d) The means of stormwater disposal shall be capable of serving the whole of the lot (including upstream) to pre-development conditions. Generally each lot will have a single stormwater connection.

(e) Where further subdivision or development upstream of the one under consideration is provided for in the MPDC District Plan or Structure Plan, any stormwater pipelines proposed under the Development under consideration shall be to the upper limits of the subdivision or development under consideration. This will allow for the future upstream development to connect into the downstream pipe system.

(f) In new developments the stormwater disposal design shall adopt stormwater control measures that retain the secondary overland flow run-off for the particular development to pre-development conditions.

(g) Stormwater treatment devices such as stormwater detention areas, rain gardens, vegetated filters and swales are to be landscaped with vegetative cover as set out in this MPDC Development Manual, Part 9 – Landscaping Engineered Stormwater Devices. Landscape plans shall be accepted by Council prior to planting. For treatment devices constructed in conjunction with sub-division or land use consents, planting shall be completed and maintained for at least one year prior to vesting the treatment device to Council.

(h) Under no circumstances shall stormwater be led to or permitted to enter a wastewater system.

(i) Stormwater secondary flow paths shall be identified for the following situations:

- Catchpit blockage.
- Culvert blockage (or alternatively provide an unobstructed waterway capable of passing the once in 100 year return period rainfall event while maintaining at least 0. 5 m freeboard to building floor levels on upstream property).
- Rainfall in excess of design levels of service as outlined in section 4.8.1.1.

(j) Stormwater secondary flow paths, including peak flow depths, velocities and flow rates, shall be shown on design plans for pre and post development of the site for a once in 100 years return period.

(k) All stormwater secondary flow paths across private land shall be protected by an easement. The easement shall cover the full extent of the secondary flow path and shall not be less than 3 m wide. The easement shall have the effect of preventing alteration of the ground surface and prohibit location of structures that might impede the flow of water across the land. The easement shall be in favour of the Council. The easement shall be duly granted, reserved and shown on the survey plan.

(l) To ensure that the critical duration storm is utilised for each site (including upstream) the 24 hour duration nested storms with a minimum of 10 minutes duration should be used for the proposed development.

(m) ARC TP40 can be utilised as a guideline for water quantity and quality control design methods.

## 4.8.1 Stormwater Design Criteria

### 4.8.1.1 Design Storms

All new stormwater systems shall be designed to comply with at least the AEP as set out in the following table for storm durations of 10 minutes and 24 hours.

| Function | AEP (%) | Equivalent ARI (years) |
|---|---|---|
| **Primary Systems -** | | |
| Rural | 20 | 5 |
| Residential and rural residential areas | 10 | 10 |
| Industrial areas | 10 | 10 |
| Business areas | 10 | 10 |
| All areas where no secondary flow path is available | 1 | 100 |
| **Secondary Systems** | 1 | 100 |

### 4.8.1.2 Time of Concentration

The time of concentration shall be determined as the “time of entry” plus the “time of flow” from the furthest part of the whole catchment to the point of discharge.

The minimum time of concentration to be used is 10 minutes.

Time of entry to the system shall be calculated from the Overland Flow Graph in Figure 4.2 or an equivalent published graph and the formula from which it was derived.

Time of flow can be calculated from the flow velocity in pipes and channels (note since this is not known initially, an iterative type solution is necessary with time of concentration recalculated from the catchment flow calculation).

### 4.8.1.3 Rainfall

Rainfall data is to be derived from the HIRDS data for the relevant area of the District and then adjusted as below to allow for climate change factors.

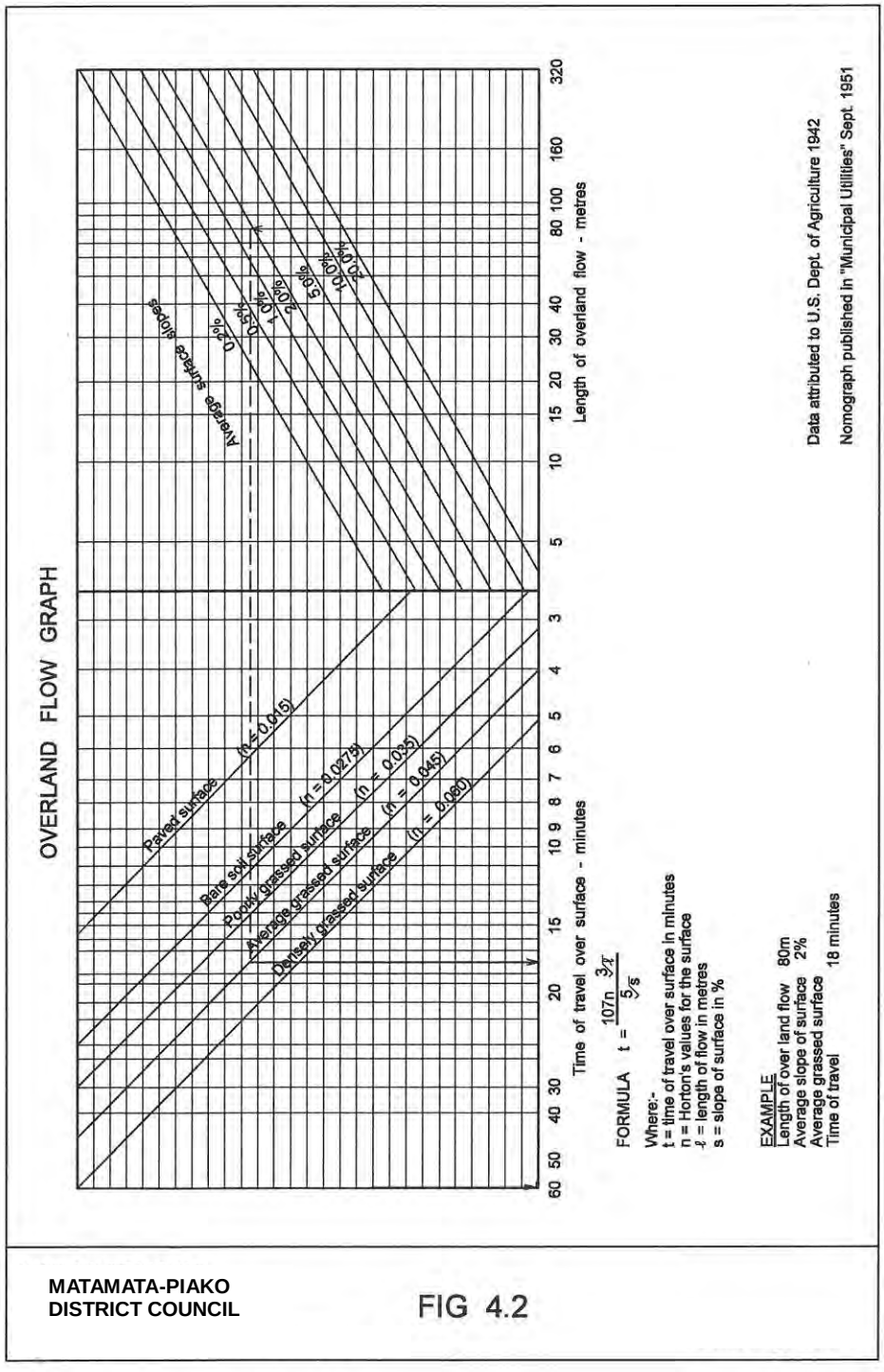
Note: Design rainfall events are shown in the MPDC Soakage Guidelines for the four (4) townships in the MPDC area.

**Factors for Deriving Extreme Rainfall Information in Matamata-Piako District**

| | ARI (years) | | | | | | |
|---|---|---|---|---|---|---|---|
| **Duration** | **2** | **5** | **10** | **20** | **30** | **50** | **100** |
| **<10 mins** | 16.8 | 16.8 | 16.8 | 16.8 | 16.8 | 16.8 | 16.8 |
| **10 mins** | 16.8 | 16.8 | 16.8 | 16.8 | 16.8 | 16.8 | 16.8 |
| **30 mins** | 15.1 | 15.5 | 16.0 | 16.4 | 16.8 | 16.8 | 16.8 |
| **1 hour** | 14.1 | 14.9 | 15.5 | 16.2 | 16.8 | 16.8 | 16.8 |
| **2 hours** | 13.0 | 14.1 | 15.1 | 16.0 | 16.8 | 16.8 | 16.8 |
| **3 hours** | 12.4 | 13.7 | 14.7 | 15.8 | 16.8 | 16.8 | 16.8 |
| **6 hours** | 11.1 | 12.8 | 14.3 | 15.5 | 16.8 | 16.8 | 16.8 |
| **12 hours** | 10.1 | 12.2 | 13.7 | 15.3 | 16.8 | 16.8 | 16.8 |
| **24 hours** | 9.0 | 11.3 | 13.2 | 15.1 | 16.8 | 16.8 | 16.8 |
| **48 hours** | 8.0 | 10.5 | 12.8 | 14.9 | 16.4 | 16.8 | 16.8 |
| **72 hours** | 7.4 | 10.1 | 12.4 | 14.7 | 16.2 | 16.8 | 16.8 |

### 4.8.1.4 Soakage Systems

All soakage systems shall be designed by a suitably qualified person.




All new soakage systems shall be designed to comply with at least the 10% AEP (10 year ARI) 24 hour nested storm where a flow path already exists to accommodate the balance of a 1% AEP (100 year ARI) 24 hour nested storm. The impermeable area draining to a soakage device will be the maximum potential impermeable area for that device.

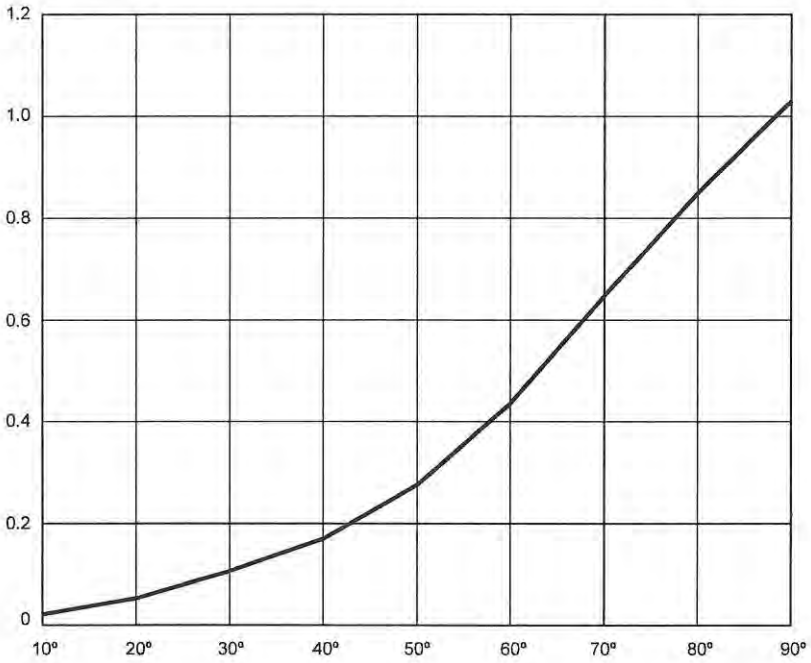
The system shall be designed to achieve a satisfactory solution recognising that the performance of soakage systems deteriorates over time. A performance deterioration factor of 50% must be allowed for and this is applied to the on-site soakage test results to achieve the "design soakage rate".

The proposed soakage dimensions and associated area shall be based on the appropriate design AEP and the "design soakage rate".

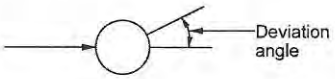
Note: The MPDC Soakage Guidelines provide guidelines to assess the design soakage rate and soakage dimensions which meets the requirements of the New Zealand Building Code section E1 and the Waikato Regional Council for individual lots. Council can also provide a "Residential Soakage Calculator".

# HEAD LOSS IN STORMWATER MANHOLES

$he = -ke \frac{V^2}{2g}$ where V is for full pipe flow




DEVIATION OF FLOW THROUGH MANHOLE




EXAMPLE:-

V = 0.2 m/s, Deviation angle = 50°

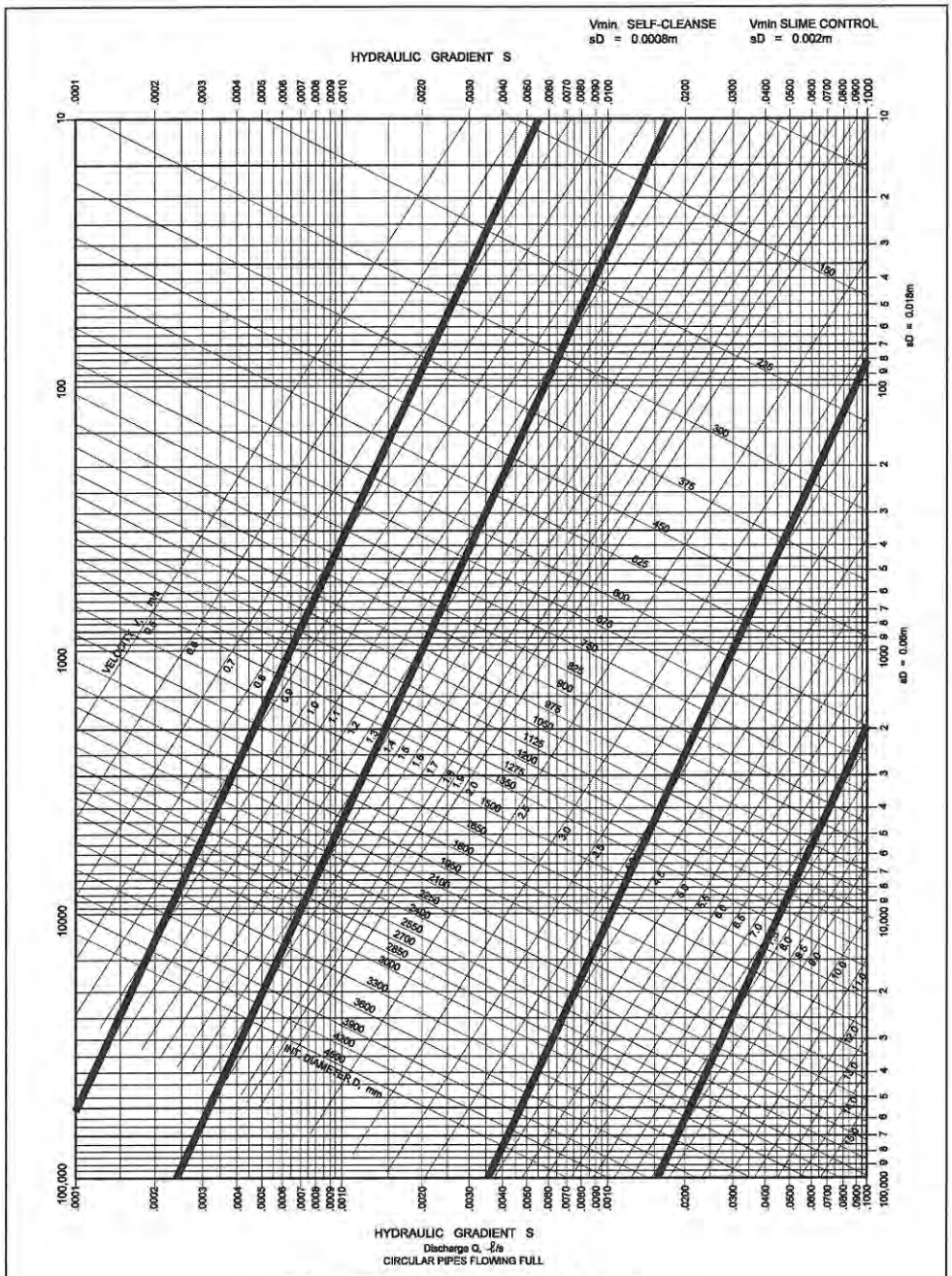
Drop in manhole = $\frac{0.3 \times 0.2^2}{2 \times 9.8}$ = 61mm

NOTE: Minimum drop in any stormwater manhole = 20mm

Reference: "Degremonts" Water Treatment Handbook Edition 1965

**MATAMATA-PIAKO DISTRICT COUNCIL**

FIG 4.4




**MATAMATA-PIAKO DISTRICT COUNCIL**

FIG 4.5

## 4.9 Open water courses

Natural watercourses are expected to be retained.

The District Plan sets out requirements which must be incorporated into any design.

The extent of stream drainage work shall be designed to achieve a satisfactory solution recognising community flood protection, bank stability, the retention of the natural topography and ecological values, maintenance, hydraulic and safety considerations, including the downstream effects of the work.

Constructed watercourses (open drains) may be piped if there are valid engineering or design considerations and approved by Council. The Engineering Plans should be noted accordingly.

## 4.10 The Hydraulic Design of Pipelines

The hydraulic capacity of stormwater pipelines shall be sufficient to convey the design flow as determined by the procedure outlined in Section 4.8.1

All pipes shall be of adequate size to carry the designed flow without surcharge.

The design shall provide that:

- No stormwater pipeline, other than connections to individual lots, shall be less than 300mm diameter pipes. This will be dependent on pipe hydraulic design.
- All public stormwater pipes shall be adequate for all potential loadings and proposed construction methods based on pipe location and depth. The preferred method of demonstrating the pipe strength grade is a software printout from the Concrete Pipe Association of Australasia for Concrete Pipes. For other accepted pipe materials the relevant manufacturer's strength recommendations shall be provided with the pipe design.
- Catch pit outlets (leads) shall not be less than 200 mm diameter and shall be of sufficient strength dependent on the proposed location and potential loadings. The minimum velocity for pipes flowing full shall be 0.7 m/s.
- The maximum velocity for pipe flow shall be 4.0 m/s.

Special measures to dissipate energy shall be designed at all outfalls to natural and constructed receiving waterways.

## 4.11 Location of Pipelines

(a) Stormwater pipelines within the Residential Zone shall normally be located within the road reserve.

(b) Stormwater pipelines in the Industrial Zone shall either be located in the road reserve or in the front yard area.

(c) Stormwater reticulation pipelines (and connections) in the Business Zone shall be either in the rear service lane or in the rear yard of properties where no service lane exists. Major reticulation and trunk lines shall be in the road reserve (as for residential zones).

Where stormwater pipelines are in the road reserve, they shall conform to the standard location of underground services and shall generally be 1.5 m out from the kerb. Where the offset from the kerb varies due to curves in the street, the manholes shall be generally 1.5 m out from the kerb.

Where a stormwater pipeline changes location within a street, it shall do so at an angle of 45 degrees or greater. Where a stormwater pipeline crosses other utility services, it shall do so at an angle of 45 degrees or greater.

On the limited occasions where a stormwater pipeline is within a private property, it is preferable to be parallel to and as near to the boundary as possible so as not to reduce the building area available but also to provide future Council maintenance access to it. No part of the manhole construction shall cross a private property boundary such that a fence or other structure cannot be built over it.

On sloping ground, the stormwater pipeline should be within the property of the higher land (to avoid conflict with excavation levelling of the lower property).

An easement is required for all pipelines within private property.

Where the pipeline gradients are greater than 1 in 5, it is expected that anchor and/or anti-scour blocks shall be constructed.

No new private drains shall pass between one property and another. If crossing of private property is unavoidable, those parts of the pipeline serving more than one lot shall be Council mains with service connections to the property boundaries.

Where Council pipes pass through private property the requirements of the stormwater bylaw in regard to building over or adjacent to a stormwater pipeline shall apply – see section 4.2 of this Part.

Pipe location for works under all consents should facilitate future subdivision.

## 4.12 Pipes

### 4.12.1 General

Pipes acceptable for use in stormwater drainage work in Matamata-Piako District are:

- Concrete Pipes.
- uPVC pipes.
- Ceramic pipes.
- PE pipes (grade 80 or 100).
- PP StormBoss pipes.

## 4.13 Joints

All pipes shall be jointed to ensure no leakage (in or out of the pipe) occurs. This considers the effects on groundwater levels – particularly in peat soils where all efforts are required to minimise groundwater level reduction.

All pipes shall be rubber ring jointed apart from the PE pipes which shall be welded.

Note: Special jointing at manholes shall generally be in accordance with the manufacturer's recommendations or as detailed by the MPDC Infrastructure Code of Practice, whichever is approved by Council for the specific case.

## 4.14 Minimum Cover Over Pipes

### 4.14.1 General

All pipelines shall be specifically designed to support the likely loadings in relation to the minimum cover to be provided.

Note: NZS/AS 3725: 2007 provides a useful guide. The minimum cover for all types of pipes under all conditions shall be 600 mm except as otherwise specified in Section 4.14.2 below

### 4.14.2 Private Property

The minimum cover over Council pipes in private property shall be 500 mm. Where due to the topography this cover cannot be provided, specific design and approval will be required by Council.

Where the reticulation lines are located in the front yard of lots, the invert level shall be deep enough not to interfere with any future development such as driveway construction.

### 4.14.3 Private Pipes

The depth of cover of private pipes is dealt with under the Building Act 2004 and overseen by the Council Building Department.

## 4.15 Manholes

### 4.15.1 General

Manholes shall normally be designed at each change of direction or gradient, and at each branching line and at a spacing of not more than 100 m.

On stormwater pipelines equal to or greater than 900 mm diameter, the spacing of manholes may be extended up to 200 m, and uniform curvature on the pipeline may be permitted providing that joint deflections are within the limits of the manufacturer's recommendations.

On stormwater pipelines equal to or greater than 1.8 m, the spacing of manholes may be extended up to 300 m between manholes.

### 4.15.2 Shallow Manholes

Shallow manholes less than 1 m deep shall be a minimum of 750 mm diameter.

Note: The MPDC Infrastructure Code of Practice provides acceptable details.

### 4.15.3 Stormwater Manholes on Larger Pipelines

Manholes on stormwater pipelines more than 600 mm diameter and on smaller pipelines where the use of standard manholes are not suitable should be specifically designed. The minimum diameter of the manhole shall be equal to the largest pipe size plus 450 mm.

### 4.15.4 Hydraulic Flows in Manholes

In addition to the normal pipeline gradient, all manholes for pipelines less than 1 m in diameter shall have a minimum drop of 20 mm plus 5 mm per 10 degrees of the angle of change of flow within the manhole.

In addition to the normal pipeline gradient, all manholes on pipelines greater than 1 m in diameter shall have the drop through the manhole designed to a minimum of 20 mm plus compensation for the energy lost due to the flow through the manhole at the deviation angle (see Figure 4.4 of this Part).

### 4.15.5 Junctions

Catchpit leads not more than 300 mm diameter and not more than 20 m in length may be saddled on to pipes 600 mm diameter and larger, with manholes not required.

Branch lines should normally be connected into a manhole. However branch lines 300 mm diameter and smaller may be saddled on to pipelines 600 mm diameter or larger, providing a manhole is supplied on the branching line within 40 m of the main line. Proprietary “Y” connections shall be used where possible.

### 4.15.6 Step Irons and Steps

All manholes other than shallow manholes shall be provided with approved manhole steps in order to give reasonable access.

Steps to be included and located on the downstream side of the manhole.

Note: The MPDC Infrastructure Code of Practice provides acceptable details.

### 4.15.7 Manhole Covers and Frames

Manhole covers and frames shall be designed to be fit for purpose at their location.

Note: The MPDC Infrastructure Code of Practice provides acceptable details.

### 4.15.8 Drop Connections

Drop connections on stormwater manholes may be avoided by allowing pipes up to and including 300 mm diameter to have an open “cascade” inside the manhole, providing the steps are clear of any cascade. Otherwise a short ramped section must be provided on the connecting line.

## 4.16 Connections

### 4.16.1 General

Connections shall be capable of taking the full primary design flow from the area to be serviced by the connection (refer Section 4.8). Where a secondary flowpath needs to be directed to a Council pipe it shall be detained to reduce the flow rate to the level of service provided for the zone.

Service connections shall be generally located on the lot road frontage. Where a property does not have a road frontage, pipes should be located within that property's legal access (right of way).

Where feasible:

- Private pipes shall not cross property boundaries.
- Existing private connections crossing boundaries shall be replaced by public connections.

Existing private pipe work shall not be acceptable for vesting to Council.

The standard size and material for single lot domestic connections is 100 mm RRJ SN16 uPVC. The standard depth of a new connection at the boundary is on average 1.2 m (range 0.9–1.5 m).

### 4.16.2 Infill Developments

Connection proposals for infill developments shall be fully documented with regard to depth to invert, pipe size and distances to boundaries. (Where Council records are not available, applicants must determine the details of existing connections).

Note: Any private pipe work needs a Drainage Consent from Council's Building Department. All connections and disconnections of Council services to the property boundary shall be undertaken by council approved contractors.

## 4.17 Ramped Risers

Unless required otherwise by Council, a ramped riser shall be constructed to bring the connection to within 0.9–1.5 m of ground level, or to such depth that will permit a gravity connection to service the whole lot.

Note: The MPDC Infrastructure Code of Practice provides acceptable details.

## 4.18 Connections to Deep Lines

Where an existing or proposed stormwater pipeline is more than 5 m deep to the top of the pipe, connections shall be provided to lots from a shallower branch pipeline connected to the deep stormwater line at a manhole. This method may also be used where ground conditions preclude direct connection to pipelines less than 5 m deep.

## 4.19 Inlet and Outlet Structures

Approved structures shall be constructed at the inlets and outlets of pipelines. Factory built proprietary structures are permissible subject to specific approval by Council.

Provision must be made for energy dissipation and the design shall ensure non-scouring velocities at the point of discharge.

Note: The MPDC Infrastructure Code of Practice provides acceptable details.

## 4.20 Catch pits and Catch pit outlet pipes (leads)

Design requirements for catchpits are included in Part 3 – Roadworks of this Manual.
Note: The MPDC Infrastructure Code of Practice provides acceptable details.

## 4.21 Stormwater Soakholes

Factory built proprietary structures are permissible subject to specific approval by Council.

Provision must be made for secondary overland flow in compliance with the requirements of the NZ Building Code section E1 and the requirements of the Waikato Regional Council.

Note: The MPDC Soakage Guidelines provide a useful guide.

## 4.22 Subsoil Drainage

Subsoil drainage shall be designed as private drainage so that it does not result in increased run-off, erosion and sedimentation on neighbouring properties.

Note: Sub-soil drainage is subject to approval under the Building Act 2004. Building Consents shall be obtained before commencement of site work.

To prevent instability of the local ground, the design should ensure that no fine soil particles are transported into the stormwater system through the subsoil drainage.

Any subsoil drainage design must consider the effects on groundwater, particularly in peat areas where water level reduction is not permitted without prior Council approval.

## 4.23 Planted Stormwater Devices

The type and planting requirements of Landscaping Engineered Stormwater Devices are contained in Part 9 of this Manual. In order to provide for maintenance of these facilities, an all weather access track shall be provided to at least the following specifications:

- Width 3.0 m.
- Maximum grade 1:8.
- Where the access road is longer than 25 metres, provide a 3-point turning area for a 10 tonne rigid truck adjacent to the device (in addition to the excavator working platform).
- The excavator working platform shall be level and adjacent to the clean out area and shall be no higher than 2.0 m above the base of the clean out area.

# Part 5 – Wastewater Drainage

## 5.0 Introduction

This Manual sets out the basic design principles for drainage of wastewater. Some construction information is included for completeness.

Note: Detailed information on construction standards can be found in the MPDC Infrastructure Code of Practice.

## 5.1 Variations: Wastewater Drainage

Where consideration is given to alternative wastewater systems, such as, for example, pressure sewer technology, attention is drawn to the overriding factors that will be used in evaluating alternatives, particularly, but not restricted to, safe and functional outcomes, sustainability of alternatives and economics of long term maintenance.

## 5.2 General

If there is a Council-owned reticulation system available the lots shall each be provided with a single connection to the reticulation. If there is no reticulation system available then on-site treatment and disposal shall be provided. Council does not permit lots to be served by multiple connections.

The wastewater drainage system shall be designed to serve the whole of the natural upstream catchment area. The flow from all portions of the upper catchment within the district boundary shall be calculated assuming complete urbanisation (excluding reserves).

The system shall have a design life of not less than 100 years for in-ground pipeline components.

Designers shall confirm with Council the specific requirements for each subdivision or development, including such information as areas of catchment to be either included or excluded in any design calculation. This will be particularly important where further subdivision or development, upstream of the one under consideration, is provided for in the district or regional planning scheme. In these cases the wastewater network shall be constructed to the upstream boundaries of the subdivision development.

## 5.3 Calculations of Flows

A statement is to be submitted with each plan to show that the design of the wastewater network has been calculated to meet the projected flows of the area under consideration. The designer shall consider the appropriate allowances for growth and clearly define any assumptions or basis for design inputs.

The pipe system shall be designed to ensure that the system is self cleaning and that the pipe gradients are such that the velocity at peak daily flow meets this requirement. Design shall be in accordance with the information given in Figure 5.1. (See also Section ~~0~~5.6 Pipeline Minimum Grade Guideline.)

**Figure 5.1 Design Data**

**Calculation of Flows**

2.1 Domestic wastewater flows are a function of water consumption, ground water infiltration and surface water ingress and shall be calculated as follows:

2.2 The wastewater flow is calculated as the product of the water consumption, the peaking factor, and the population equivalent of the area being served.

The water consumption is 200 litres per person per day.

The variable peaking factor dependent on population density for residential areas is determined from Figure 5.2.

The following equivalent population densities per hectare should be adopted in the absence of specific supportable design data:

| | |
|---|---|
| Urban | = 45 persons per hectare |
| Commercial | = 30 persons per hectare (except central business area) |
| Other establishments should be treated as follows: | |
| Primary Schools | = equivalent to 45 persons |
| Secondary Schools | = equivalent to 150 persons |
| Hospitals | = equivalent to 3.5 persons/bed |
| Boarding houses/motels | = equivalent to 0.6 persons/bed |

2.3 The infiltration allowance is 2250 litres per hectare per day.

2.4 The surface water ingress allowance is 16,500 litres per hectare per day.

2.5 The Average Daily Flow is calculated as the sum of the infiltration allowance and the daily wastewater flow (product of water consumption and the population equivalent).

2.6 The Peak Daily Flow is calculated as the sum of 2.2 and 2.3.

2.7 The Peak Wet Weather Flow is calculated as the sum of 2.2, 2.3 and 2.4.

**Industrial Domestic Flow and Trade Waste**

2.8 Where the industrial domestic waste and trade waste flows from a particular industry are known, these shall be used as the basis for the wastewater design. When this information is not available, then flows shall be calculated as above, except that the industrial peaking factor shall be used as shown on Figure 5.2 and the equivalent population density shall be 45 persons per hectare.

2.9 Provision for liquid trade wastes and 'wet' industries shall be considered and provided for by the design.

2.10 Peak Daily and Peak Wet Weather flows shall be calculated as in 2.6 and 2.7.

**The Hydraulic Design of Pipelines**

2.11 All wastewater pipelines shall be designed such that they have sufficient capacity to cater for the design wet weather flow from the area they serve without surcharge and that on at least one occasion every day a minimum velocity for solids re-suspension (self cleaning) is achieved. The minimum velocity for self cleaning at peak daily flow will be deemed to be 0.6 m/s.

2.12 The capacity and velocity of flow in wastewater pipelines shall be determined by using the Colebrook White formula as shown in Figure 4.5 in Part

4 – Stormwater Design with a roughness coefficient (k) of 1.5 mm.

Figure 5.3 can be used as a check of the design so that if the operational point falls within the appropriate envelope, then the pipeline will have adequate capacity for peak wet weather flows and achieve a self cleaning velocity at least once every day.

## Figure 5.2 Wastewater Peaking Factors

| Population Equivalent for Catchment or Sub-Catchment Area | Wastewater Peaking Factor | |
|---|---|---|
| | Residential | Commercial |
| 10 | 14 | 13 |
| 15 | 12 | 11 |
| 20 | 10 | 9.5 |
| 25 | 9.1 | 8.5 |
| 30 | 8.5 | 8.0 |
| 35 | 8.0 | 7.5 |
| 40 | 7.5 | 7.2 |
| 45 | 7.0 | 6.9 |
| 50 | 6.8 | 6.3 |
| 55 | 6.7 | 6.0 |
| 60 | 6.3 | 5.7 |
| 65 | 6.2 | 5.5 |
| 70 | 6.0 | 5.4 |
| 75 | 5.9 | 5.3 |
| 80 | 5.8 | 5.1 |
| 90 | 5.5 | 5.0 |
| 100 | 5.3 | 4.8 |
| 125 | 5.0 | 4.2 |
| 150 | 4.8 | 4.0 |
| 175 | 4.4 | 3.8 |
| 200 | 4.1 | 3.7 |
| 250 | 4.0 | 3.5 |
| 300 | 3.8 | 3.3 |
| 350 | 3.7 | 3.1 |
| 400 | 3.5 | 3.0 |
| 450 | 3.4 | 2.9 |
| 500 | 3.3 | 2.8 |
| 600 | 3.2 | 2.7 |
| 700 | 3.2 | 2.6 |
| 800 | 3.1 | 2.55 |
| 900 | 3.0 | 2.5 |
| 1000 | 3.0 | 2.4 |
| 1500 | 2.9 | 2.2 |
| 2000 | 2.8 | 2.1 |
| 2500 | 2.8 | 2.0 |
| 3000 | 2.7 | 1.9 |
| 3500 | 2.6 | 1.85 |

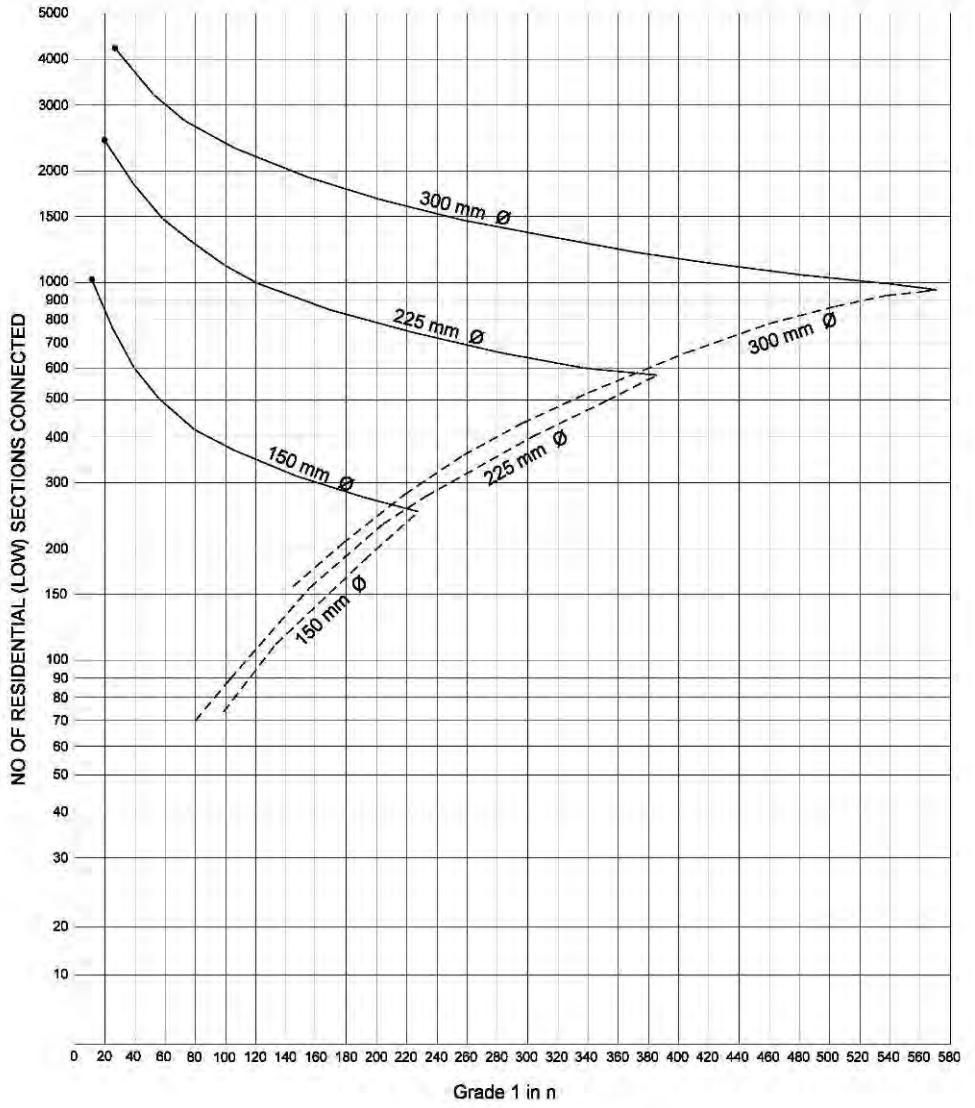



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FIG 5.3

## 5.4 Location of Pipelines

a) Wastewater pipelines within the Residential Zone shall normally be within the road reserve except where the properties served are below road level.

b) Wastewater pipelines in the Industrial Zone shall either be in the road reserve or in the front yard area.

c) Wastewater networks (and connections) in the Business Zone shall be either in the rear service lane or at the rear of properties to be served where no service lane exists. The major reticulation and trunk lines, however, shall be in the road reserve (as for Residential Zones).

Where the pipelines are in the road reserve they shall conform to the standard location of underground services and shall be sited within the carriageway, normally 1.5 m from the kerb. Where the offset from the kerb varies due to curves in the street, the manholes shall be located 1.5 m out from the kerb.

Where a wastewater pipeline changes location within a street, it shall do so at an angle of 45 degrees or greater. Where a wastewater pipeline crosses other utility services, it shall do so at an angle of 45 degrees or greater.

On the limited occasions where a wastewater pipeline is within a property, it is required to be parallel to and within 0.5–1.0 m (preferably 0.75 m) from a boundary so as not to reduce the building area available. On sloping ground, the wastewater pipeline should be within the property on the higher land (to avoid conflict with excavation levelling of the lower property).

Where Section 221 of the Resource Management Act 1991 applies a consent notice shall be registered on the Certificate of Title of any allotment having a Council owned pipeline crossing the property. The consent notice shall advise that a public stormwater or wastewater (as appropriate) pipeline crosses under the property and conditions will be placed on any building consent for a structure over the pipeline.

Manhole structures shall be clear of all boundary lines by at least 1.5 m to the centre.

Where the pipeline gradients are greater than 1 in 5, it is expected that anchor and/or anti-scour blocks shall be constructed.

No new private drains shall pass between one lot and another. If crossing of private property is unavoidable, those parts of the pipeline serving more than one lot shall be Council mains with service connections to the property boundaries.

Where Council pipes pass through private property, refer to Section 5.9.2.

Pipe location for works under all consents should facilitate future fee-simple subdivision.

Note: A useful guide is provided in the MPDC Infrastructure Code of Practice.

## 5.5 Pipes

Acceptable pipeline products that may be used for wastewater pipe work are:

- Concrete pipes
- uPVC pipes
- Ceramic pipes
- HDPE/MDPE pipes
- PP SewerBoss pipes

Concrete pipes intended for wastewater applications shall be manufactured using a sulphate resistant concrete mix and, in addition to the standard thickness of concrete mix around steel reinforcing, the pipes shall have a 25 mm thick internal sacrificial lining of concrete mix. This reduced internal diameter shall be taken into account when determining the flow capacity of concrete pipes.

uPVC wastewater pipe may be used for pipe sizes ranging from 100 mm to and including 375 mm nominal diameter. Stiffness class SN16 pipes shall be specified in all cases.

## 5.6 Pipeline Minimum Grade Guideline

Section 5.3 "Calculation of Flows" does not lend itself to determining the grade applicable to pipelines draining upper parts of a catchment. Council experience is that the minimum gradients shown in the following table provide satisfactory flow conditions for 150NB Pipe in both general soils and peat soils (those with greater than 300 mm of peat between 0.5 and 4.0 m depth of the natural ground surface).

Where the depth of soil exceeds 2.0 metres then specific design is required.

| Houses | Population | General Minimum Grade | | Peat Soil Grades |
|---|---|---|---|---|
| 3–4* | 7–10 | 1:100 | 1.0% | 1:60 |
| 5–8 | 12–20 | 1:120 | 0.83% | 1:80 |
| 9–18 | 22–45 | 1:150 | 0.67% | 1:80 |
| More than 18 | 45 and above | 1:200 | 0.50% | 1:80 |

*see also the guidelines for service connections Section 5.15

Advice Note: A 1:180 grade to the last lot is acceptable, for existing urban areas with less than 18 houses. Flatter grades will need specific approval from the Development Engineer to assess future maintenance impacts of any proposals.

## 5.7 Joints

Specification of joints shall be as follows:

- All pipes shall normally have flexible joints of an approved type, such as RRJ.
- Steel pipes shall be flexibly jointed (gibault or approved rubber ring).
- Solvent cement joints shall only be used for PVC if specifically required by Council.
- Joints shall be provided adjacent to manholes. Proprietary connections may be used in the case of PVC pipelines.

- All joints are to be designed and constructed to remain fully watertight for the design life (100 years) of the pipe network.

## 5.8 Structural Strength of Pipes and Bedding

Pipe bedding will be designed to meet the requirements of the class of pipe used under the design loading conditions set out in the manufacturer's specifications.

## 5.9 Pipeline Construction

The construction of the pipelines shall be carried out in accordance with good engineering practice.

Note: The MPDC Infrastructure Code of Practice provides a useful guide.

### 5.9.1 Requirements for Building near to or over Drainage Pipelines.

- No structural loads are to be placed on public drainage pipelines.
  - The first row of piles must be at least 1 m clear of the outside of the pipe and down to a depth of at least 1 m below the invert of the pipe.
  - Subsequent rows of piles must be constructed to a depth of at least 1 m below the 45 degree influence line form the pipe invert.
  - All structural loads on piles shall be absorbed outside the 45 degree envelope and below the pipe invert level of the first row of pipes.
- No pile ramming is permitted within 5 m from the sewer centre line, or within the 45 degree envelope (piles within 5 m must be drilled).
- The building or other work must be designed and constructed so that the sewer and trench line is not adversely affected by any future excavation necessary for maintenance of the sewer.
- The structure must allow for settlement of the sewer trench line and backfill.
- Drawings of the proposed works must accurately identify the location of the drainage pipeline affected and the distances with cross section details for all structures, footings or piles within the 45 degree line.
- Buildings are not permitted to be located over connections to pipes or manholes.
- Pipes to be built over shall be jetted and CCTV'd before and after construction work.

## 5.10 Minimum Cover Points

### 5.10.1 General

All pipelines other than those in private property shall be specifically designed to support the likely loading in relation to the minimum cover to be provided. The minimum cover for all types of pipes (other than those in private property) under all conditions shall be 600 mm.

Note: NZS 3725 provides useful guidelines.

### 5.10.2 Private Property

The minimum cover over unreinforced Council pipes in private property shall be 500 mm. Where, due to the topography, this cover cannot be provided, the pipeline shall be protected. Specific design information will be required.

Where the reticulation lines are located in the front yard of lots, the invert level shall be deep enough so as not to interfere with any future development such as driveway construction.

### 5.10.3 Under Carriageways

Where pipes are designed below carriageway, they shall be specifically designed to support the pavement design loading appropriate to the minimum cover to be provided at both subgrade and finished level.

### 5.10.4 Private Pipes

The depth of cover of private pipes is dealt with under the Building Act 2004.

## 5.11 Manholes

### 5.11.1 General

Manholes shall be located away from areas likely to pond water and away from potential building sites. They are to be designed and constructed to exclude groundwater for the life of the network.

Manholes up to 2400 mm deep shall be constructed using a single riser with a pre-cast external flange base. Manholes in excess of 2400 mm deep shall be constructed using a 2400 mm long pre-cast riser with external flange base and then completed to final ground level using no more than a single riser for manholes up to 5.0 m deep. Three risers are allowable for manholes in excess of 5.0 m depth.

In no case shall a series of short risers be permitted.

Manholes shall be a minimum of 1050 mm diameter for depths of 1.0 m or more. Manholes of 750 mm diameter may be used for depths less than 1.0 m (typically infill situation).

Manholes on pipelines less than 300 mm diameter shall be provided at each change of direction or gradient, and at each branching pipe, and at a spacing of not more than 100 m.

Manholes in pipelines 300 mm diameter and over may have the spacing increased with the specific approval of Council.

For infill developments, manholes shall not be required for a 150 mm connection on a 150 mm pipeline where a manhole is provided immediately inside the property being served and another manhole exists within 20 metres on the existing pipe and these provide adequate accessibility without needing another manhole.

Manhole lid rings may be used to a maximum depth of 150 mm. For depths over 150 mm, manhole risers shall be installed.

Drop manholes are to be constructed with internal drops only; external drops are not permitted.

### 5.11.2 Standard Manholes

These are to be circular manholes with a minimum internal diameter of 1050 mm and are to be used on pipelines up to and including 600 mm diameter. Manhole steps shall be provided.

Note: The MPDC Infrastructure Code of Practice provides a useful guide.

### 5.11.3 Specific Design Manholes

Where manholes are more than 4.0m deep they shall be specifically designed (wall strength, foundation support and adequate ballast to resist buoyancy).

Where a manhole is to be constructed in soft ground, the area under the manhole shall be undercut down to solid and backfilled with suitable hard fill to provide an adequate foundation for the manhole base. Where undercutting exceeds 1.5m, a special design will be required.

### 5.11.4 Hydraulic flow in Manholes

In addition to the normal pipeline gradient, all manholes for pipelines less than 1 metre in diameter shall have a minimum drop of 20mm plus 5mm per 10 degrees of the angle of change of flow within the manhole.

In addition to the normal pipeline gradient, all manholes on pipelines greater than 1metre in diameter shall have the drop through the manhole designed to a minimum of 20mm plus compensation for the energy lost due to the flow through the manhole at the deviation angle.

## 5.12 Connections

### 5.12.1 General

A single connection provided at the boundary of each lot shall be of a type capable of taking an approved pipe of 100 mm nominal diameter, unless a larger size is required by design. Council does not permit lots to be served by multiple connections.

Each connection shall be capable of serving the whole of the lot by gravity. This requirement shall allow adequately graded drains within the lot, together with the depth required for gully traps. The standard depth of a new connection at the boundary is 1.2 m (range 0.9–1.5 m). Note: Private wastewater pumps will not be approved where gravity discharge is feasible.

In laying “greenfield” service connections which are capped pending connection of house drainage the maximum depth at the end of the service connection pipe shall be 1.5 m. Sections which slope away from the drainage direction may require a service connection which is deeper than 1.5 m at the boundary in order to comply with the requirement to drain the whole of the lot. In such cases the service pipe shall be extended into the property on grade and to the extent that its end cap is no deeper than 1.5 m. Note the service pipe needs to be located near the boundary or within a right of way in order to avoid conflict with possible building locations. This detail shall be shown on construction plans.

Where the wastewater pipe is outside the lot to be served by it, the connection shall be extended to the boundary of the lot.

If the above conditions cannot be met, then contact Council for further advice.

All connections, which are to be made directly to the line, shall be designed using a factory manufactured “wye” or “London Junction” and shall be watertight.

Service connections shall generally enter each lot from the road frontage. Where a property has no road frontage, pipes are located within that property’s legal access (right of way).

Where feasible:

- Private pipes shall not cross property boundaries;
- Existing private connections crossing boundaries shall be replaced by a public connection; and
- Existing private pipe work will not usually be acceptable for vesting to Council.

All connections, which are to be made directly to the line up to 150 mm diameter, shall be cut into the main line using a PVC “wye” and approved rubber adapters. Larger diameter connections shall be designed using a factory manufactured “wye” or “London Junction”. All connections shall be watertight.

### 5.12.2 Infill Developments

Connection proposals for infill developments shall be fully documented with regard to depth to invert, pipe size and distances to boundaries. (Where Council records are not available, applicants must determine the details of existing connections.)

Any private pipe work needs a Drainage Consent.

Note: All connections and disconnections of Council services to the property boundary are undertaken by Kaimai Valley Services.

## 5.13 Requirements for Service Pipe Size and Alignment

- For 1 to 4 dwellings a 100 mm nominal bore service pipeline is adequate.
- For 5 or 6 dwellings the capacity of a 100 mm nominal bore service is only adequate if installed at a grade 1:60 or steeper.
- The service pipeline shall be laid to a public drain as a straight pipeline between boundary inspection fitting and manhole, or between boundary inspection fitting and a wye connection on the wastewater main, or between a boundary inspection fitting and a wye connection on a service pipeline conforming to either of the previously listed variations.
- The minimum acceptable grade is 1:80 (preferred grade 1:60)
- It shall be no longer than 50 m.
- It must comply generally with the in-roadway alignment guideline, ie where a wastewater pipeline changes location within a street, it shall do so at an angle of 45 degrees or greater. Where a wastewater pipeline crosses other utility services, it shall do so at an angle of 45 degrees or greater.

More than 6 dwellings (also suitable for 3 or more dwellings) – requires the capacity of a 150 mm nominal bore pipeline. (Refer Section 0.)

## 5.14 Ramped Risers

Unless required otherwise by Council, a ramped riser shall be constructed to bring the connection to within 0.9–1.5 m of ground level, or to such depth that will permit a gravity connection to service the whole lot.

Note: The MPDC Infrastructure Code of Practice provides acceptable details.

## 5.15 Connection to Trunk and Interceptor Pipelines

Connections to wastewater trunk pipelines shall only occur at manholes.

## 5.16 Connections to Deep Lines

Where an existing or proposed sewer is more than 5 m deep to the top of the pipe, or where required by the ground conditions, the connection shall be designed as a manhole constructed on the deep line and a shallower branch sewer shall be laid from the manhole.

## 5.17 Testing

All wastewater mains and branch pipelines, including extended connections, are to be flushed, CCTV inspected, then tested using the low pressure air test.

Note: The low pressure air test is described in the MPDC Infrastructure Code of Practice.

## 5.18 Pumping Stations

### 5.18.1 General

All equipment and/or components used for similar functions and purposes must be of the same design, make or model for ease of operation and maintenance. This includes new pumping stations. The requirements for the design of new pumping stations are detailed on Drawing TS 503.

Note: The MPDC Infrastructure Code of Practice provides useful guides for pump station layout.

### 5.18.2 Structural Stability

The pump station wet well shall be designed to have negative or zero buoyancy. Ground water level shall be assumed to be at ground level. The mass of the wet-well structure included in the stability analysis shall not include the associated mechanical and electrical components of the pump station. Nor can the soil friction forces of backfill around the wet well chamber be taken into account. Any additional weight needed shall be added in the form of mass concrete in the bottom of the chamber. The pump station drawings shall provide dimensions of the extent of mass concrete needed to counter buoyancy of the chamber.

### 5.18.3 Pumps, Rising Main, Delivery Point and Overflow

Pumps shall be Flygt MT pumps (medium head performance range) models CP or NP versions 3085, 3102, 3127 or 3152 or Homa equivalent for the 3152 models.

The pumping range shall be selected to give between 1 and 15 starts per hour at peak daily flow.

The pump system shall be an N + 1 system where N pumps are required for duty and a standby pump identical to the duty pumps shall be installed.

Exceptions to the duty plus one standby pump requirement can be made in small installations serving no more than 12 residential dwellings. In such installations the wet well shall be designed to have a minimum storage capacity sufficient to contain 12 hours of the catchment's Average Daily Flow.

The rising main will be a minimum size of 80 mm and designed such that the minimum velocity, with one pump operating, is 1 m/s and the maximum velocity, with all duty pumps operating, is 3 m/s.

The point at which the pumping station is connected to Council's system will be governed by the capacity of the network downstream from that point.

The emergency overflow pipeline shall be of sufficient capacity to carry peak wet weather flow from the station without surcharge. The inlet to the overflow pipe shall be baffled to restrict the entry of solid floatable material. This can normally be done using a 90 degree downturn bend.

The overflow pipe shall be from the pump station chamber to the nearest stormwater system. A backflow device shall be fitted where there is potential for stormwater to backflow into the pump well.

The upstream impacts of a pump station overflow shall be checked to ensure no overflow occurs elsewhere.

### 5.18.4 Pump Chamber, Valve Chamber and Manifolding

The layout of the pumping chamber, valve chamber and pipe work shall be similar to that shown on Drawing TS 503. The valve chamber shall be attached to the pumping chamber. Where the delivery point is within close proximity to the pumping station the valve chamber may be dispensed with and a separate rising main from each pump laid to the delivery point.

The floor of the pumping station shall be set at such a level below the inlet pipe so that the inlet pipe will not surcharge during the normal pump operation cycle.

The floor shall be designed to be of sufficient thickness to ensure that the pump station cannot become buoyant with groundwater at ground level and in any case not less than 600 mm thick.

Note: The MPDC Infrastructure Code of Practice provides useful information related to wastewater pumping stations

### 5.18.5 Pump Station Storage

Pump stations shall provide for wastewater storage in the event of pump failure, control malfunction, electricity outage etc.

A minimum of twelve hours storage at Average Daily Flow shall be provided before emergency overflow occurs. The required storage volume shall be provided in the volume of the wet well, plus any additional ancillary storage chambers, plus the volume of pipelines (below overflow level) draining to the facility. The wet well volume below pump switch off level shall be excluded from the calculation of available storage volume.

If necessary the required storage capacity can be obtained through use of an associated storage chamber constructed as an adjacent manhole haunched and connected to the wet well so as to completely drain into the wet well before the pump shuts off on the pump out cycle.

Preferably the storage volume shall be provided in the pumping wet well structure and upstream pipelines. Where this is impractical, additional storage can be provided in an additional manhole type structure adjoining the wet well. Or if this configuration is impractical, the storage shall be provided in a horizontal chamber made from large pipes.

### 5.18.6 Water Supply

A standard 630D MDPE pipeline as used for water supply rider mains shall be provided to the pump station. Wastewater pump stations are a “High Hazard” risk requiring reduced pressure zone type backflow prevention devices installed above ground level. The backflow prevention device is to be positioned adjacent to the electrical control cabinet.

### 5.18.7 Access

A permanent concrete all-weather vehicle access shall be provided to the pump station to allow maintenance vehicles to access wet wells.

## 5.19 Rising Mains

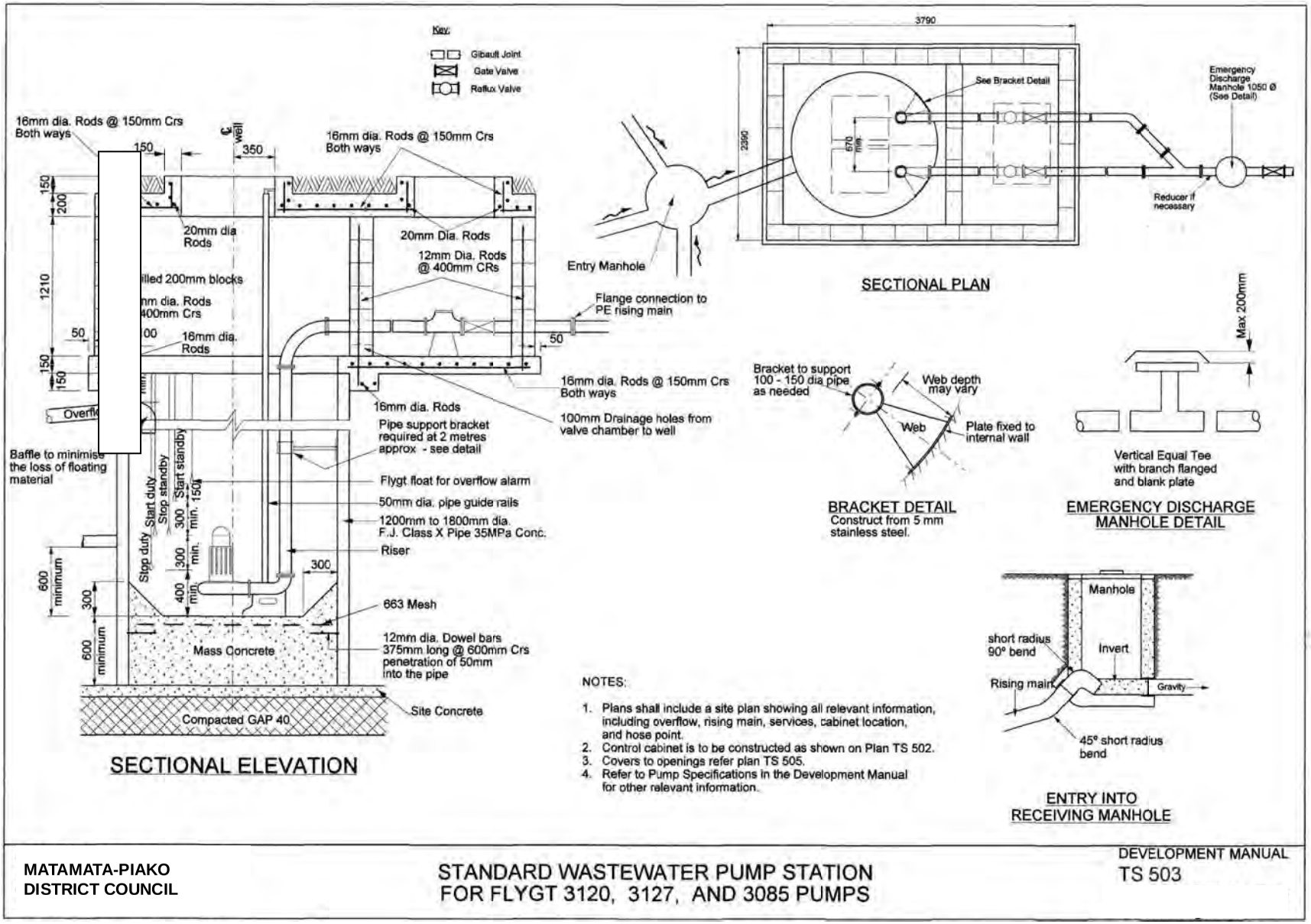
Rising mains shall meet the requirements for water supply pressure mains. Rising mains in private property shall be located clear of building sites and the alignment protected by 'Easement in Gross'. The test pressure shall be at least twice the maximum working pressure and the final test must be witnessed by Council.

Only polyethylene pipe may be used for wastewater rising mains.

Air relief valves shall be fitted as necessary and/or as required by Council.

## 5.20 Commissioning Test – Pump Stations

All pumping stations shall undergo a commissioning test witnessed by Council. A minimum of 24 hours’ notice shall be given prior to the test taking place.


Key:
Gibault Joint
Gate Valve
Reflux Valve
16mm dia. Rods @ 150mm Crs Both ways
16mm dia. Rods @ 150mm Crs Both ways
20mm dia Rods
20mm Dia. Rods
12mm Dia. Rods @ 400mm CRs
Flange connection to PE rising main
16mm dia. Rods @ 150mm Crs Both ways
16mm dia. Rods
100mm Drainage holes from valve chamber to well
Pipe support bracket required at 2 metres approx - see detail
Baffle to minimise the loss of floating material
Flygt float for overflow alarm
50mm dia. pipe guide rails
1200mm to 1800mm dia. F.J. Class X Pipe 35MPa Conc.
Riser
663 Mesh
12mm dia. Dowel bars 375mm long @ 600mm Crs penetration of 50mm into the pipe
Mass Concrete
Site Concrete
Compacted GAP 40
Start duty
Stop standby
Stop duty
SECTIONAL ELEVATION
3790
See Bracket Detail
Emergency Discharge Manhole 1050 Ø (See Detail)
Reducer if necessary
Entry Manhole
SECTIONAL PLAN
Bracket to support 100 - 150 dia pipe as needed
Web depth may vary
Web
Plate fixed to internal wall
BRACKET DETAIL
Construct from 5 mm stainless steel.
Max 200mm
Vertical Equal Tee with branch flanged and blank plate
EMERGENCY DISCHARGE MANHOLE DETAIL
Manhole
short radius 90° bend
Invert
Rising main
Gravity
45° short radius bend
ENTRY INTO RECEIVING MANHOLE
NOTES:
1. Plans shall include a site plan showing all relevant information, including overflow, rising main, services, cabinet location, and hose point.
2. Control cabinet is to be constructed as shown on Plan TS 502.
3. Covers to openings refer plan TS 505.
4. Refer to Pump Specifications in the Development Manual for other relevant information.
MATAMATA-PIAKO DISTRICT COUNCIL
STANDARD WASTEWATER PUMP STATION FOR FLYGT 3120, 3127, AND 3085 PUMPS
DEVELOPMENT MANUAL
TS 503

# Part 6 – Water Supply

## 6.0 Introduction

This Manual sets out the basic design principles for the provision of reticulation for the supply of water. Some construction information is included for completeness.

Note: Detailed information on construction standards can be found in the MPDC Infrastructure Code of Practice.

## 6.1 Variations: Water Supply

Where it is proposed to provide a private water supply serving more than one property.

Note: Attention is drawn to the requirements of the Health (Drinking Water) Amendment Act 2007. In particular the water supply shall be registered with the Director General (of Health) and shall comply with various requirements laid down in the Act where applicable.

## 6.2 General

### 6.2.1 Design Life

The water supply system shall have a design life of not less than 100 years for in-ground pipeline components.

### 6.2.2 Level of Services

Note: Designers should be familiar with the New Zealand Fire Service Fire Fighting Water Supplies Code of Practice (SNZ PAS 4509:2008).

The design of the reticulation shall be such that a water supply connection can be readily provided to the "front" of each allotment (i.e. where the driveway will be installed).

The water supply reticulation shall comply with the New Zealand Fire Service Fire Fighting Water Supplies 2008 requirements (see also Section ~~0~~ 6.4.4).

For fire fighting, the minimum residual running water pressure shall be 100 kPa (1 atmosphere, 10 m head of water) at any hydrant.

The Council reticulated working residual water pressure in other than fire fighting conditions shall in all areas be no less than 150 kPa (1.5 atmospheres, 15 m head of water) at ground level at the building site in each lot in urban areas, and at the point of connection in rural and rural residential areas.

Note: Designers may be limited by the water pressure available and Council will consider the implications of any such limitations in assessing the engineering plans with the possible outcome that special water supply conditions may apply to the affected properties.

Where a proposed development is currently outside an Urban Fire District, Council will require that all water mains that will be vested with Council shall have hydrants affixed in accordance with the New Zealand Fire Service Code of Practice for Fire Fighting Water Supplies 2008 as applying within Urban Fire Districts. See also section ~~00~~ 6.4.4.

New dwellings not served by a public supply shall install adequate water storage to meet the New Zealand Fire Service Fire Fighting Water Supplies Code of Practice requirements.

Individual rainwater tanks, individual privately owned bores, wells or restricted supply may adequately serve isolated small subdivisions in rural settings.

Note that rural trickle feed water supply schemes are not required to provide fire fighting capacity.

To protect the level of service of new subdivisions, no more than 100 lots are to be serviced, at any point in time, from a single ended water main. Connectivity of the water network is to be established prior to further lots being brought forward for 224(c) release.

## 6.3 Useful Documents and Standards

- New Zealand Fire Service Fire Fighting Water Supplies Code of Practice (SNZ PAS 4509:2008)
- MPDC Infrastructure Code of Practice
- Matamata-Piako District Council Consolidated Bylaw

## 6.4 Design Requirements

Tables 1 and 2 from SNZ PAS 4509:2008 are copied below and form part of the design requirements for water reticulation.

### 6.4.1 Water Demand and Pressure

~~The design shall provide for a domestic demand of 260 litres/person/day with a peak flow rate of five times this amount. A population density of 45 persons per hectare shall be the basis of the design.~~

The water supply system shall be designed for the worst case flow and pressure requirements. In most subdivision design, the fire fighting requirements will control the design. The designed network should be checked to ensure that the annual, seasonal and peak demands are met using the available pressures in existing mains. Calculations supporting the proposed design are required.

### 6.4.2 Domestic Supply

The design shall provide for a domestic demand of 260 litres/person/day with a peak flow rate of five times this amount. A population density of 45 persons per hectare shall be the basis of the design.

### 6.4.3 Commercial and Industrial Supply

The water demand for commercial and industrial areas shall be analysed and specifically allowed for in the design.

### 6.4.4 Fire Fighting Supply

The water reticulation shall be designed to comply with the New Zealand Fire Service Fire Fighting (2008) requirements as shown in Table 1 and Table 2 which are copied from the manual. Designs shall meet the requirements with regard to fire fighting flows, running pressure and the spacing of hydrants, together with any additional requirements set out herein, including storage where applicable. In addition designs shall provide for a minimum flow to each hydrant of 25 L/s flowing as a single hydrant test with residual flow pressure of 100 kPa.

Unless stated otherwise in a subdivision, land-use or building consent, the minimum fire fighting water supply classification shall be as follows:

- Detached or semi-detached housing in suburban areas FW2
- Schools, local suburban shopping areas and equivalent development FW3
- Commercial and Industrial areas FW4

Note: Designers should be familiar with New Zealand Fire Service Fire Fighting Water Supplies Code of Practice (SNZ/PAS 4509:2008).

### 6.4.5 Design Basis

Details of the working pressure or pressures at the point or points of connection to the existing reticulation can be obtained from Council. These details shall be used for design purposes

### 6.4.6 Pipe Working Pressures

The minimum acceptable pipe class in the Matamata-Piako District Water Supply Areas is PN12.

Note: Council hold the maps showing these areas.

### 6.4.7 Pipes

Pipes for water reticulation shall be uPVC, Ductile Iron or Polyethylene.

Note: The MPDC Infrastructure Code of Practice provides a useful guide and reference to standards.

**Table 1 – Method for determining required water supply classification**

| **Sprinklered structures** | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Category** | **Water supply classification (see table 2)** | | | | | | | | | | | | | | |
| Single family homes with a sprinkler system installed to an approved Standard | FW1 | | | | | | | | | | | | | | |
| All other structures (apart from single family homes) with a sprinkler system installed to an approved Standard | FW2 | | | | | | | | | | | | | | |
| **Non-sprinklered structures** | | | | | | | | | | | | | | | |
| **Category** | **Water supply classification (see table 2)** | | | | | | | | | | | | | | |
| Housing; includes single family dwellings, multi-unit dwellings, but excludes multi-storey apartment blocks | FW2 | | | | | | | | | | | | | | |
| **All other structures (characterised by fire hazard category[1]), examples of which are given below** | **Water supply classification (see table 2)** | | | | | | | | | | | | | | |
| | **Floor area of largest firecell of the building ($m^2$)** | | | | | | | | | | | | | | |
| | 0-199[10] | 200-399 | 400-599 | 600-799 | 800-999 | 1000-1199 | 1200-1399 | 1400-1599 | 1600-1799 | 1800-1999 | 2000-2199 | 2200-2399 | 2400-2599 | 2600-2799 | > 2800 |
| **FHC 1[2]** | FW3 | FW3 | FW3 | FW4 | FW4 | FW4 | FW5 | FW5 | FW5 | FW5 | FW5 | FW5 | FW5 | FW5 | FW6 |
| **FHC 2[3]** | FW3 | FW3 | FW4 | FW5 | FW5 | FW5 | FW6 | FW6 | FW6 | FW7 | FW7 | FW7 | FW7 | FW7 | FW7 |
| **FHC 3[4]** | FW3 | FW4 | FW5 | FW5 | FW6 | FW6 | FW7 | FW7 | FW7 | FW7 | FW7 | FW7 | FW7 | FW7 | FW7 |
| **FHC 4[5]** | FW4 | FW6 | FW6 | FW6 | FW6 | FW7 | FW7 | FW7 | FW7 | FW7 | FW7 | FW7 | FW7 | FW7 | FW7 |
| **For special or isolated hazards not covered in above categories [9]** | FW7 | | | | | | | | | | | | | | |

NOTE –

(1) Fire hazard category as defined in the compliance documents for the New Zealand Building Code, Acceptable Solution C/AS1.

(2) FHC 1 is sleeping activities including care facilities, motels, hotels, hostels; crowd activities of <100 people including cinemas, art galleries, community halls, lecture halls, churches; working/business/storage activities processing non-combustible materials such as wineries, cattle yards, horticultural products; multistorey apartment blocks.

(3) FHC 2 is crowd activities of >100 people, libraries, bock storage, night clubs, restaurants; working/business/storage activities with low fire load such as hairdressers, banks, medical consulting rooms, offices.

(4) FHC 3 is working/business/storage activities with medium fire load such as manufacturing, processing, bulk storage up to 3 metres.

(5) FHC 4 is working/business/storage activities with high fire load such as chemical manufacturing, feed mills, plastics manufacturing, supermarkets or other stores with bulk display over 3 metres.

(6) For special or isolated fire hazards in an area with a lower water supply classification, an assessment should be carried out to determine measures to mitigate the hazard or increase the water supply (see 4.4).

(7) The values in the table were determined by heat release rate modelling for fully developed fires.

(8) All non-sprinkler protected structures, except houses, have an entry level of FW3.

(9) Examples of special or isolated hazards may include bulk fuel installations, timber yards, tyre dumps, wood chip stock piles, recycle depots, and marinas.

(10) For non-sprinkler protected fire hazard category 1 structures less than 50 $m^2$ in floor area, the FW3 requirement may be reduced by up to 50% with the agreement of the Fire Region Manager. Examples of the sorts of structures intended to be covered by this comment are predominantly garages, sheds, and outbuildings.

**Table 2 – Method for determining firefighting water supply**

| | Reticulated water supply | | | Non-reticulated water supply | |
|---|---|---|---|---|---|
| **Fire water classification** | **Required water flow within a distance of 135 m** | **Additional water flow within a distance of 270 m** | **Maximum number of fire hydrants to provide flow** | **Minimum water storage within a distance of 90 m** (see Note 8) | |
| | | | | **Time (firefighting)** (min) | **Volume** ($m^3$) |
| FW1 | 450 L/min (7.5 L/s) (See Note 3) | – | 1 | 15 | 7 |
| FW2 | 750 L/min (12.5 L/s) | 750 L/min (12.5 L/s) | 2 | 30 | 45 |
| FW3 | 1500 L/min (25 L/s) | 1500 L/min (25 L/s) | 3 | 60 | 180 |
| FW4 | 3000 L/min (50 L/s) | 3000 L/min (50 L/s) | 4 | 90 | 540 |
| FW5 | 4500 L/min (75 L/s) | 4500 L/min (75 L/s) | 6 | 120 | 1080 |
| FW6 | 6000 L/min (100 L/s) | 6000 L/min (100 L/s) | 8 | 180 | 2160 |
| FW7 | As calculated (see Note 7) | | | | |

NOTE –

(1) Table 1 lists the minimum requirements for firefighting water supplies. In developing towns' main reticulation systems, a water supply authority needs to cater for domestic/industrial water usage in addition to the above. This procedure is outlined in Appendix K.

(2) Special or isolated fire hazards which have higher requirements in an area of lower water supply classification must determine measures to mitigate the hazard or increase the water supply (see 4.4).

(3) Where houses have a sprinkler system installed to an approved Standard, the distance to a fire hydrant or alternative water supply may be negotiated by agreement with the Fire Region Manager.

(4) The water requirements for fire protection systems must be considered in addition to the firefighting water supplies, as detailed in table 1 (FW2), the fire protection system demand plus 1500 L/min (25 L/s) at 1 bar residual pressure.

(5) The minimum flow from a single hydrant must exceed 750 L/min (12.5 L/s), except for those cases where a home sprinkler is installed, in which case the minimum is 450 L/min (7.5 L/s) while the maximum design flow, for safety reasons, is limited to 2100 L/min (35 L/s).

(6) If the minimum water storage requirement as listed in the above table is not available from the reticulated system (reservoir), water can be sourced from an 'alternative supply' as approved by the Fire Region Manager. This water supply must always be within 90 m of the fire risk.

(7) FW7 is for either special or isolated hazards or where the fire hazard due to the size of the largest firecell and its fire hazard category make specific fire engineering assessment necessary. Appendix H and J must be used as the basis for calculating this required firefighting water supply.

(8) See Appendix B.

## 6.5 Reticulation

A water main of a minimum of 150 mm nominal bore fitted with fire hydrants (hereinafter referred to as the principal main) shall be laid and on one side of all through-streets and one side of every cul-de-sac to the head of the cul-de-sac, subject to the requirements for hydrant spacing and required flow.

A rider main shall be laid to the road frontage of all lots not fronted by a principal main. Rider main street crossings shall be kept to a minimum.

In the case of arterial and dual carriageway streets, principal mains may be required to be laid on both sides of the street.

In order to provide Fire Fighting Water Supplies in excess of the W3 standard, principal mains shall be laid on both sides of the street (note: generally in Matamata-Piako District a 150NB pipeline barely provides adequate flow to 2 hydrants flowing simultaneously from the same pipeline). To provide sufficient flow for fire fighting, principal mains may need to be larger than the minimum 150 mm nominal bore; this will depend on the proximity of trunk water mains and the adequacy of the selected pipe size may need to be proved with reticulation flow modelling. At street intersections the arrangement of pipe connections shall spread fire fighting flow rates to both sides of the adjoining street.

In order to provide Fire Fighting Water Supplies in excess of the FW2 standard, principal mains shall be laid on both sides of the street. To provide sufficient flow for fire fighting, principal mains may need to be larger than the minimum 150 mm nominal bore; this will depend on the proximity of trunk water mains and the adequacy of the selected pipe size may need to be proved with reticulation flow modelling. At street intersections the arrangement of pipe connections shall spread fire fighting flow rates to both sides of the adjoining street.

## 6.6 Alignment of Water Mains in Street

The standard position of water mains in the street shall be in the roadway berm and 1.5 m behind the kerb face. Where water mains cannot be laid in the standard alignment, an alternative alignment showing the relative locations of all services shall be designed and proposed with the engineering plans.

## 6.7 Intersections

At street intersections, two 45 degree bends are preferred rather than single 90 degree bends so that valves can be located in grass berms wherever possible (refer to Drawing DCS 604.

## 6.8 Rider Mains

Rider mains shall be 63 mm OD MDPE. Table 6.3 below sets out the maximum number of domestic connections permitted to be served by a rider mains.

**Table 6.3 – Rider Mains: Service Connections**
Maximum number of dwelling units (service connections)

| Medium-Pressure areas[1] | | Low pressure areas[2] | |
|---|---|---|---|
| One-end Supply | Two-end Supply | One-end Supply | Two-end Supply |
| 15 | 30 | 7 | 15 |

Notes:
(1) Medium-pressure means sites where the static pressure measured at the nearest hydrant is 450 kpa or above.
(2) Low-pressure means sites where the static pressure measured at the nearest hydrant is below 450 kpa.

Rider mains with supply from only one end shall have a flushing valve at the terminal end.

In general 150 mm diameter mains will give adequate fire flows in the urban areas. Council may take the opportunity to increase the water main size to allow for future growth beyond the development being considered. Separate pressure zones are discouraged as this may compromise water quality and fire flows.

## 6.9 Hydrants

### 6.9.1 Spacing

Hydrants shall be spaced at intervals not exceeding the following:

- Residential areas 135 m
- Commercial and industrial areas 90 m (on each side of the road)

In a cul-de-sac or in other terminal streets, the last hydrant shall be not more than 65 m from the end of the street measured at the property boundary.

Where houses or residential units are situated on private ways, there shall be a hydrant within 135 metres of any house or unit.

Where a residential private way is more than 65 metres long, a hydrant shall be sited at the street end of the private way or on the other side of the street immediately opposite the entrance.

If necessary, a principal main shall be constructed and a hydrant placed within the private way in order to ensure each house or unit is within 135 m of a hydrant.

Hydrants should be located clear of property entranceways (in the grassed roadway berm).

In new developments, where formation of property entranceways are deferred until construction of the buildings, hydrants should be located in the centre of the street frontage to avoid the most likely location of the entranceways along side boundaries.

In addition to hydrant spacing for fire fighting, hydrants shall be positioned at high points to facilitate flushing air from the mains and at low points to facilitate flushing sediment from the mains.

Hydrants shall be placed within hydrant boxes and the location of the hydrants marked.

Note: The MPDC Infrastructure Code of Practice provides a useful guide.

## 6.10 Valves

Valves shall be installed as necessary to permit isolation of sections of the pipe network for maintenance purposes. The spacing and location of valves shall be such as to limit the number of dwellings affected by a shutdown to no more than 30.

Valves shall be placed on at least two of the three legs leading from each T intersection. The maximum spacing of valves shall be 250 m.

Air release valves are not normally required on principal mains. Automatic air release valves shall be installed when required by Council; they must be positioned so that ground water cannot enter the main should it become depressurised.

## 6.11 Depth of Water Mains

Both principal mains and rider mains shall have the following minimum cover. Greater depths may be required by specific design of the system:

| | | | |
|---|---|---|---|
| • Under grass berms and footpaths | : | Principal mains | 750 mm |
| | : | Rider mains | 500 mm |
| • Under carriageways | : | Principal mains | 900 mm |
| | : | Rider mains | 600 mm |

The sections of main adjacent to a carriageway crossing shall be gradually deepened, to allow the required cover under the carriageway without the provision of vertical bends. Similar provision shall be made to ensure the necessary cover over valve and hydrant spindles.

Service connection pipes shall have a minimum cover of 350 mm.

## 6.12 Anchor Or Thrust Blocks

Concrete anchor blocks shall be provided on mains exceeding 50 mm internal diameter at all points where an external thrust occurs.

The design of anchor blocks shall be based on the allowable bearing capacity of the site soil conditions, except that the maximum value used shall be 75 kPa. The inner face of the block shall not be of a lesser thickness than the diameter of the fittings, and shall be constructed so as not to impair access to the bolts on the fittings. Concrete shall have a minimum compressive strength of 17.5 MPa at 28 days.

## 6.13 Connections to Private Property

### 6.13.1 Point of Supply to Consumer

The point of supply to the consumer is shown on Drawing TS 627. The following practices are deemed acceptable and should be followed:

- One connection per lot to be provided.

- No water supply pipes shall pass between one lot and another except where lots are amalgamated under one rating assessment.
- Services shall be located against the boundary at the centre of each front lot or close to one side boundary of the access ways to rear lots.
- Meter box shall be located clear of any vehicle movements, immediately outside the property boundary.
- Easements for water supply through road frontage lots to back lots will require specific approval and generally will only be considered in "two-lots-from-one" type developments in situations where it is impractical to locate the connection within the ROW or access lot boundary.

### 6.13.2 Services in Accessways, Access Lots or Right of Ways

The following shall apply:

a) Urban Areas

- One connection approved manifold including dual check valve, and standard meter box per lot to be provided.

b) Where 5 or more service connections will be required in an access lot or right of way, a single pipe shall be used, subject to the following design criteria:

- Pipework shall be 63 mm OD MDPE unless fire fighting requirements control the design.
- Service pipes crossing the access lot shall be 25 mm OD MDPE and shall be placed in 50 mm internal diameter ducts.
- The supply pipe shall be designed to be in the grass berm.
- Service connections, meters (where applicable), manifold boxes and gate valves shall be laid and marked in accordance with Drawing TS 627
- The supply pipe shall have a flushing valve of minimum 50 mm internal diameter at the furthest point from the reticulation
  Note: The MPDC Infrastructure Code of Practice provides details.
- Metallic detector tape, laid directly above the supply pipe at a maximum depth of 200 mm is required where the alignment of the pipe is not clearly defined as a straight line between valve box lids and, in other circumstances as required by Council.
- An "Easement in Gross" shall be granted in favour of the Council to allow access for maintenance of the pipe.
- The Council's responsibility for maintenance of the supply pipes shall cease at the boundary to each individual lot

### 6.13.3 Diameter of Service Connections

All service pipes, and associated fittings shall normally be 20 mm internal diameter. In elevated areas where there is a low pressure supply, a 25 mm diameter connection and fittings shall be required where site elevation dictates or an access leg is over 45m length.

### 6.13.4 Connections for Fire Fighting

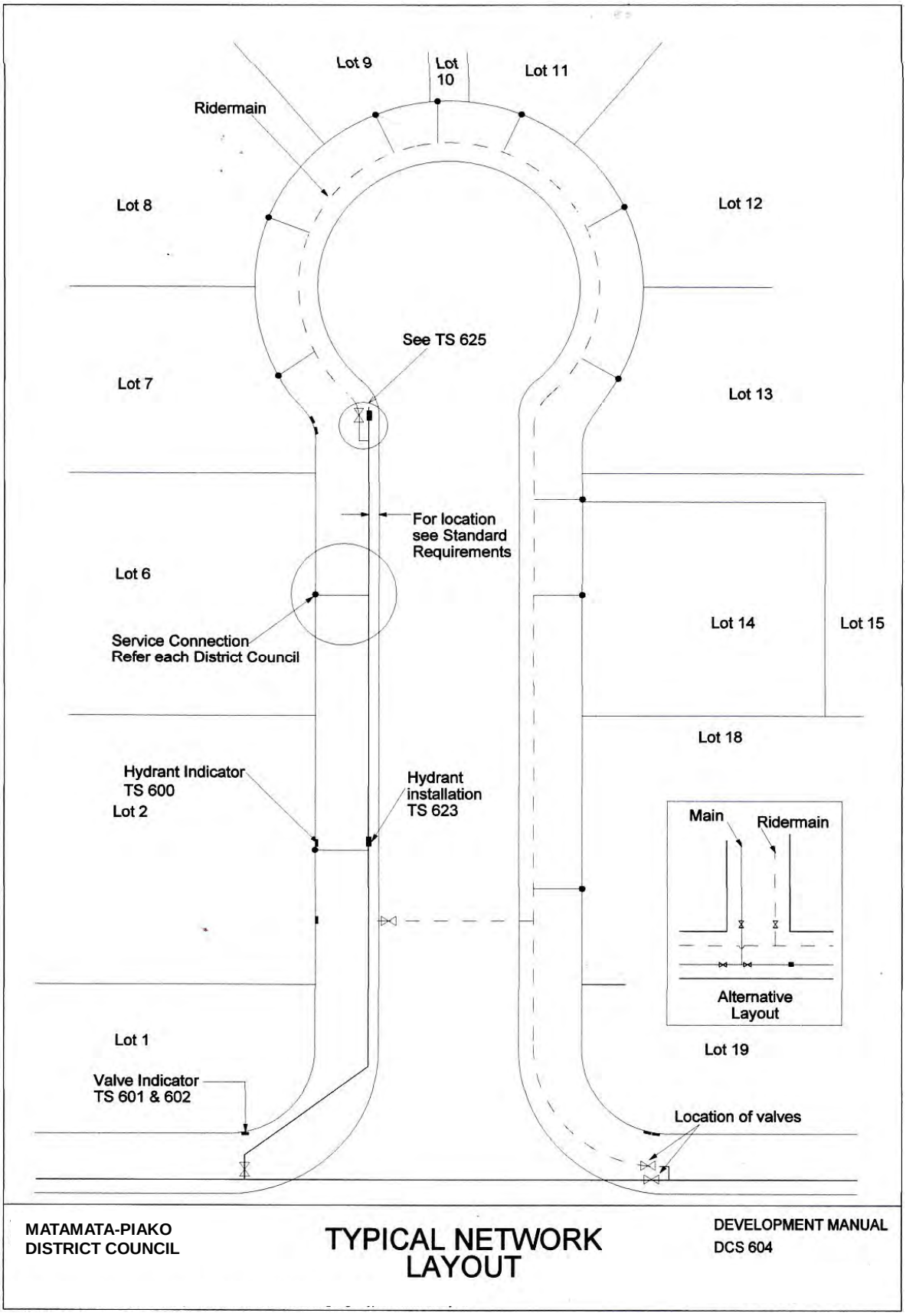
Pipes and fitting arrangements for fire fighting water supply shall meet local requirements.

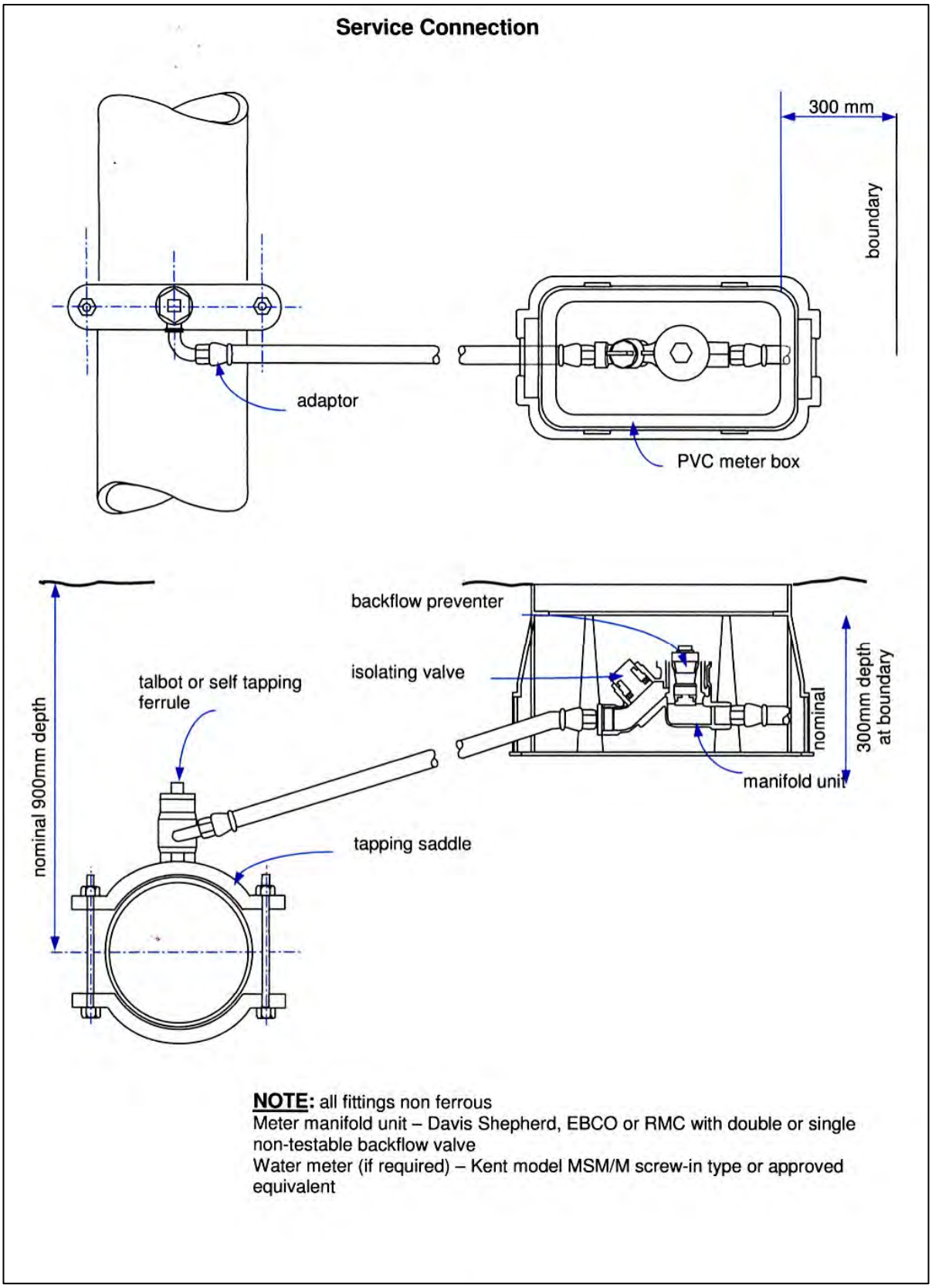
Note: The DBH Building Code and the Matamata-Piako District Council Consolidated Bylaw provide details.

### 6.13.5 Connections to the Unit Title Developments

Council does not own or operate pipelines on private property. While Unit Title developments are required to conform to service connection layouts described in Sections 6.13.1–6.13.4 ~~0~~ this is in order to facilitate for subsequent subdivision should this be required as a future development of the site.

Note: Isolation valves for individual units shall be located outside of the building platform.


Lot 9
Lot 10
Lot 11
Ridermain
Lot 8
Lot 12
See TS 625
Lot 7
Lot 13
For location see Standard Requirements
Lot 6
Service Connection Refer each District Council
Lot 14
Lot 15
Lot 18
Hydrant Indicator TS 600
Lot 2
Hydrant installation TS 623
Main
Ridermain
Alternative Layout
Lot 1
Lot 19
Valve Indicator TS 601 & 602
Location of valves
MATAMATA-PIAKO DISTRICT COUNCIL
TYPICAL NETWORK LAYOUT
DEVELOPMENT MANUAL
DCS 604

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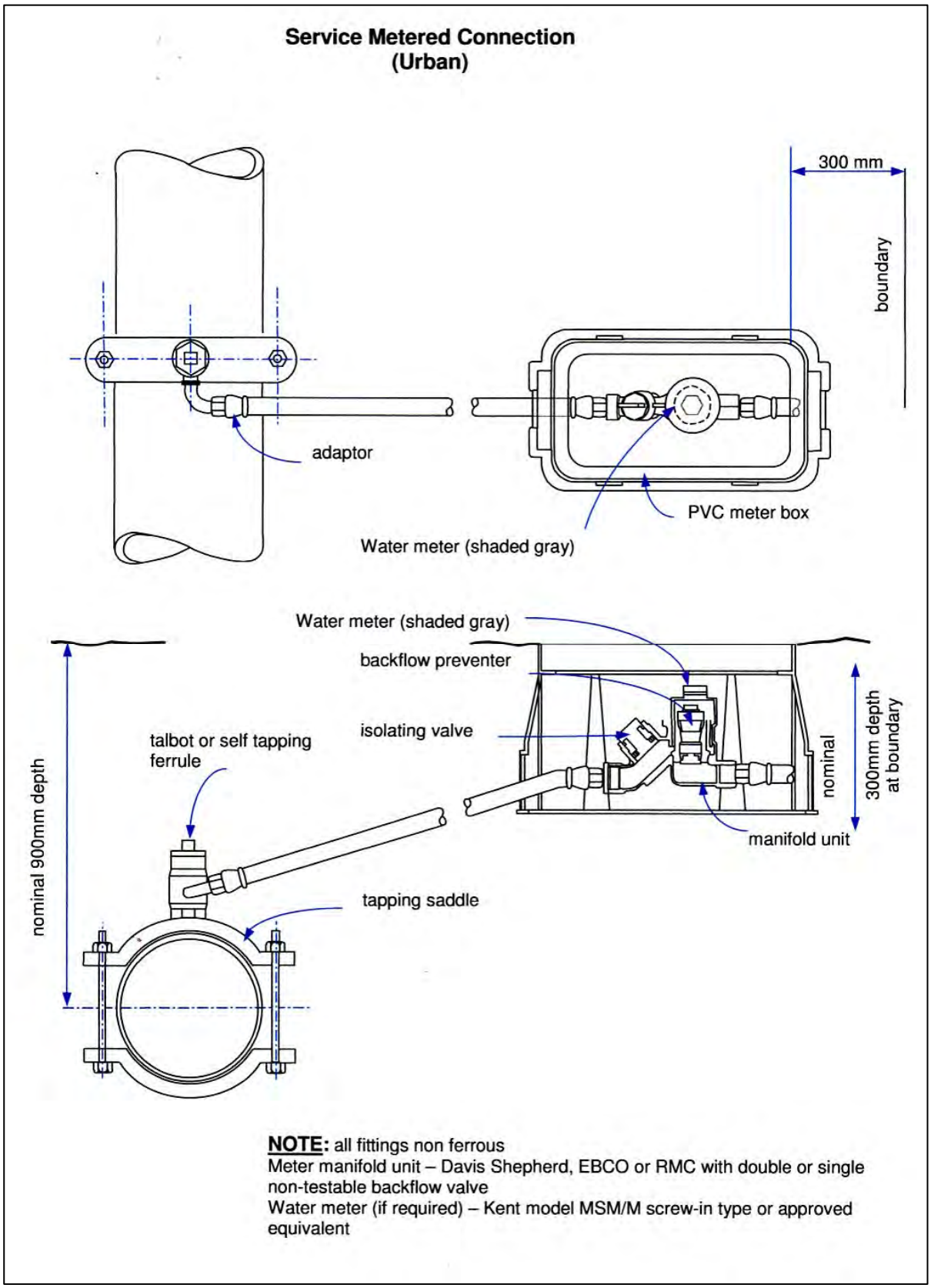


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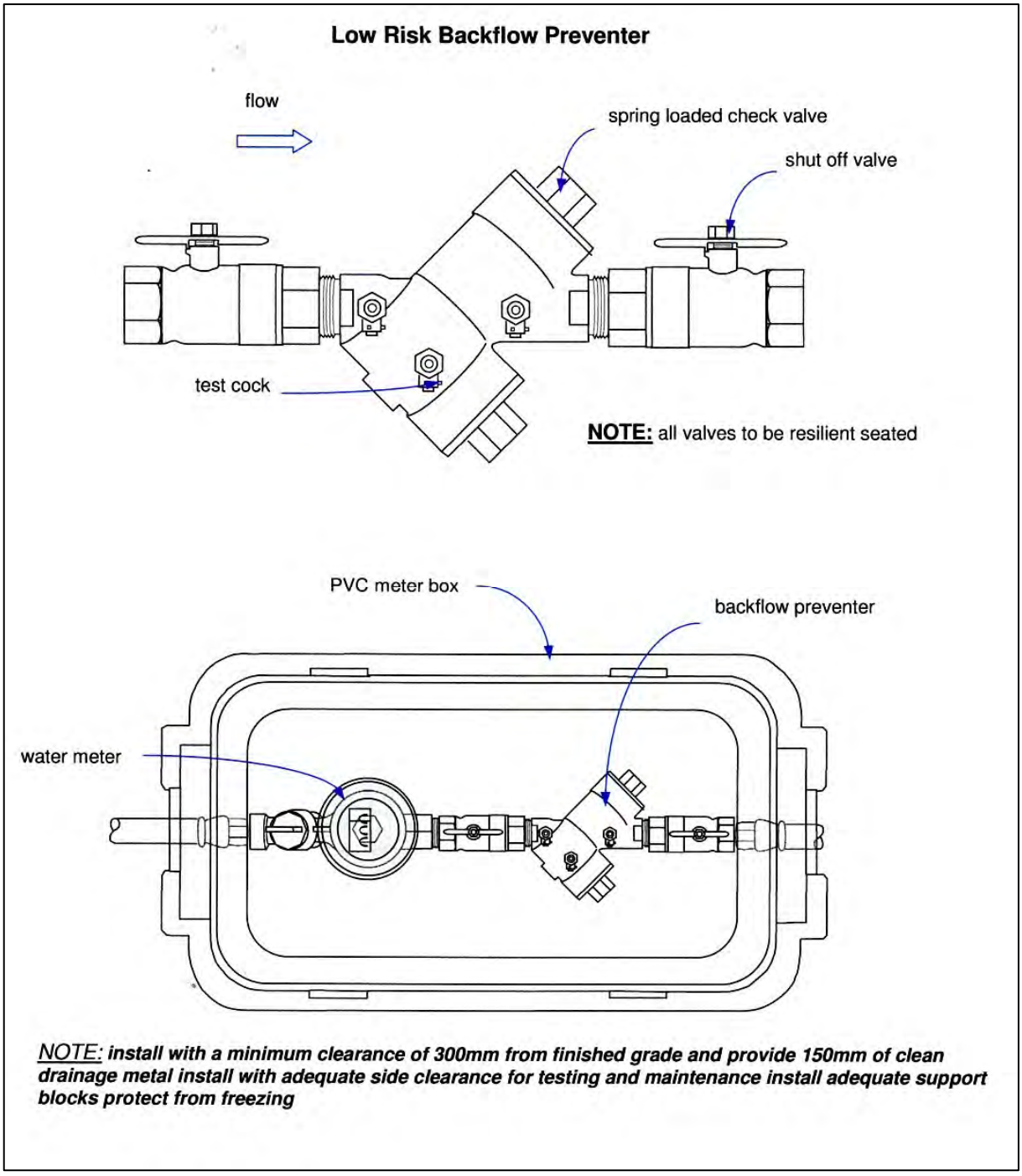


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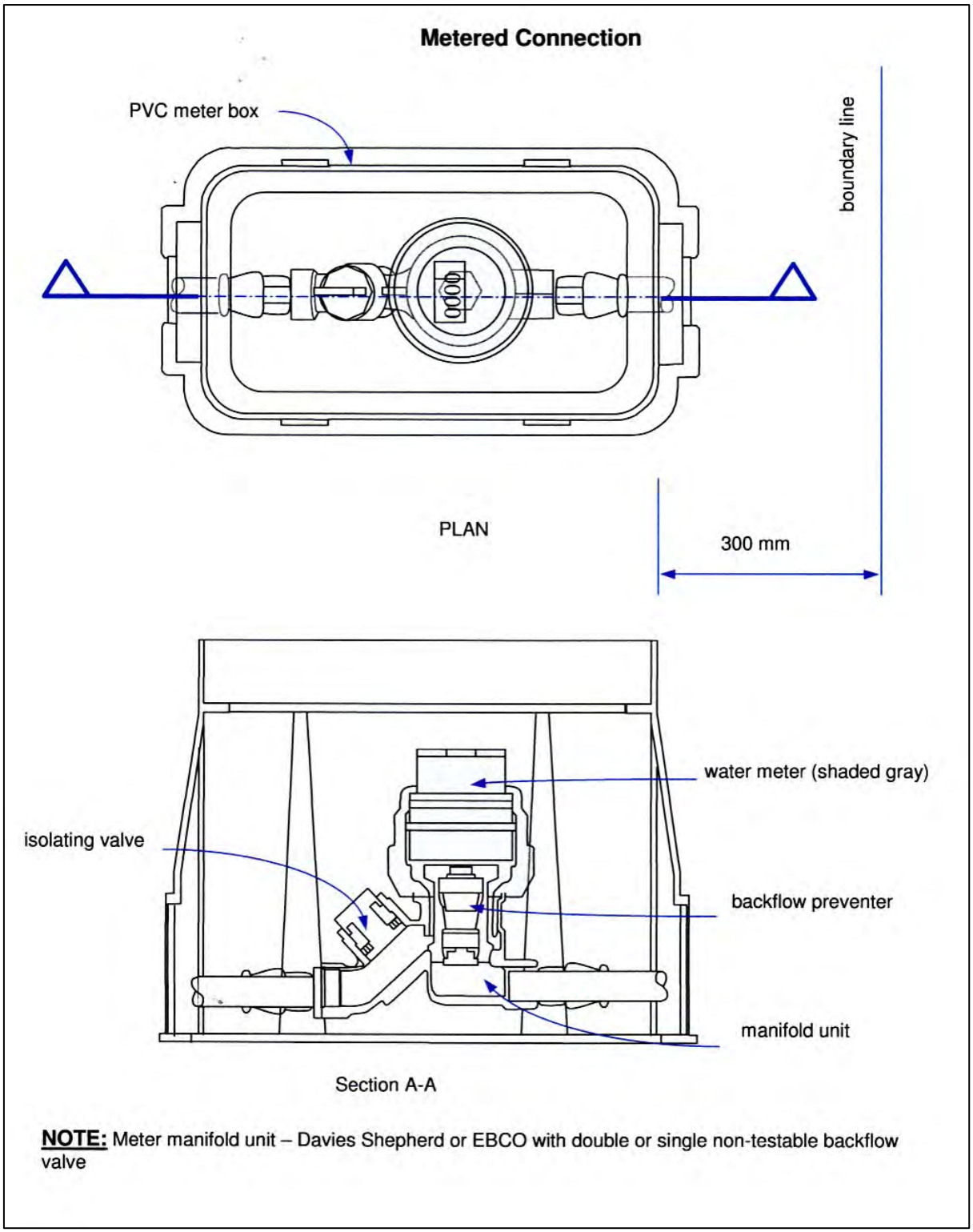
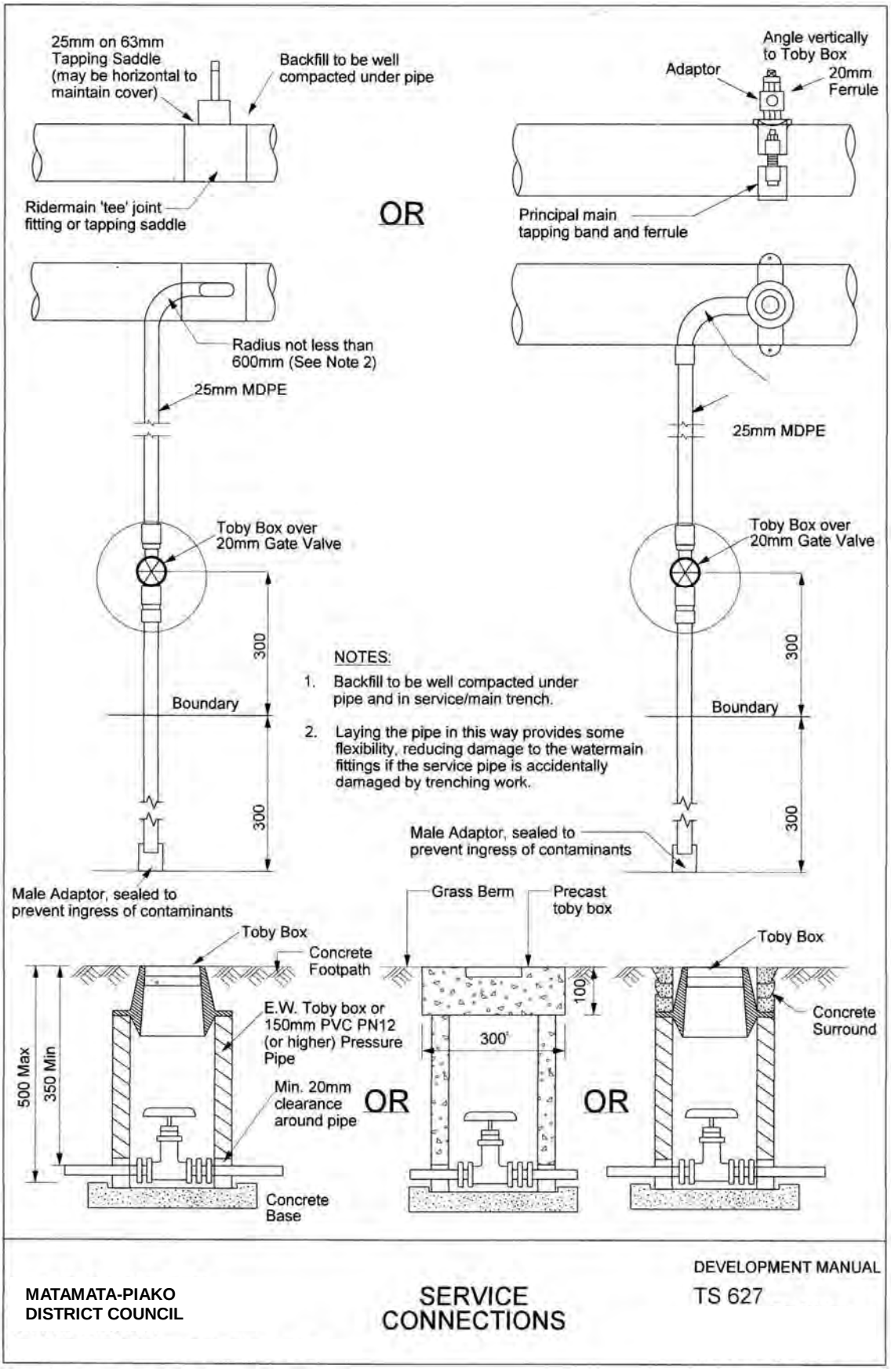



**Drawing WS 04**




MATAMATA-PIAKO DISTRICT COUNCIL

# SERVICE CONNECTIONS

DEVELOPMENT MANUAL
TS 627

# Part 7 – Street Landscaping

## 7.0 Introduction

This section applies to all proposed road reserve landscape design or works in any part of the Council road network, in respect to both existing and proposed roads, including any subdivision or where required as a condition of subdivision consent.

Designers of proposed landscape works shall be familiar with the MPDC District Tree Strategy 2010 which has objectives to:

- Recognise the importance of high quality landscape.
- Recognise the role of tree planting in achieving a high quality landscape.
- Provide for appropriate planned tree planting in the Matamata-Piako District.
- Maintain and enhance the amenity, landscape, historical, cultural and botanical value of all trees on Council land, Parks, Reserves, Cemeteries, Esplanades, Street Trees, Corporate buildings.
- Avoid the adverse effects of trees for existing areas.
- Complement the reserve Management Plans where the plans have a specific policy for the management of trees on reserves

Street landscaping includes street trees and permanent planting on traffic islands and other sites within the road reserve.

Landscape Plans will be required by Council and are to be submitted for approval with the Engineering Plans.

The street landscape is the backbone of a high quality urban environment. The standard and appearance of street trees, plantings, paving, walls, fences, seats and other structures play an important role in establishing the identity, quality, safety, amenity, visual interest and ecological contribution of the subdivision. The core design principles, context and site analysis are integral to establishing an appropriate design response and rationale for the street landscapes within individual subdivisions and in the context of the surrounding area in which they are located.

As densities and development increases there is more reliance on the street to provide public open space and amenity, contributing to the natural environment. Therefore, the quality and design of the street is very important in the overall context of urban development. However it is important that consideration be given to road widths, utility assets above and underground, on-going maintenance, the life-cycle, and the effects on adjoining building sites and properties.

Street landscaping, and the nature of it, can play a role in Crime Prevention through Environmental Design (CPTED).

In a rural environment the landscape elements are primarily located in private space alongside the road, or the public space tends toward a more naturalised character and low key environment. The rural character should be reflected through the simplicity of the design and a less structured approach.

## 7.1 Minimum Requirements

Minimum planting provision requirements are:

- Planting of street trees generally at an equivalent rate of 1 tree per residential property; groups of trees may be approved where the kerbline and location of services allow for local features.
- Planting of all approved traffic islands and traffic control devices necessary for traffic management purposes.
- Protection of existing trees or vegetation identified as being of value in the District Plan and/or as a condition of any consent.

Generally, all landscape works must have low long-term maintenance characteristics.

Note : Topsoiling and sowing of grass verges is dealt with under Part 3 – Roadworks of this Manual.

## 7.2 Means of Compliance

### 7.2.1 Location

Trees and garden plantings shall be located so that they do not compromise the integrity and efficient operation of infrastructural services.

The minimum separation and site distances referred to in Part 3 of this Manual should be observed for tree planting. These distances are guidelines and may have to be increased depending on the road geometry.

Alternative location and design proposals may be considered, such as provision of trees in a dedicated “non-services” berm, either side of a footpath. “Curved” footpaths may allow for tree planting in groups, and may help to accentuate road groups and road perception. Strategically placed grouped plantings of trees may be of greater benefit and impact than individual trees placed outside each house. (Refer to Drawings DG 702–703.)

Where traffic control devices are required as part of the road works, they shall be planted as traffic island planting (refer to Drawings DG 704–705).

The Council will maintain an MPDC Tree Strategy that provides a useful guide to location, species and quantities.

### 7.2.2 Street Trees

Street tree planting is required to be provided by the Developer in all subdivisions incorporating new roads to vest in Council with details of the planting to be supplied at the time of application for engineering plan approval.

The following matters are to be considered for species selection:

- Suitability to environmental conditions, e.g. ground moisture, wind.
- Pest and disease resistance.
- Non-suckering habit.
- Longevity.
- Shading consistent with location.
- Minimum maintenance requirements.

- Compliance with Part 3 of this Manual in regard to sight distances.
- Minimal leaf fall in autumn (which can block catchpits).

The Council will maintain an MPDC Tree Strategy that provides a useful guide to location, species and quantities.

#### 7.2.2.1 Species

Any new development shall use species selected from the street tree species for the relevant neighbourhood. Normally only one species will be used for street trees in any one street although this will depend on associated design requirements and considerations.

#### 7.2.2.2 Dedicated Tree Planting Corridor

A service-free corridor, minimum 900 mm wide, shall be located within the berm on both sides of the road.

Alternative tree planting areas shall be provided where streets are narrow or such a corridor cannot be provided. Alternative areas are equivalent to 1 m² per metre of street length with any one area having a minimum site area of 12 m².

Areas protecting existing trees may be accepted as contributing to dedicated tree planting areas.

#### 7.2.2.3 Location

Typically, tree planting locations should conform to those shown on Drawing DG 701. Normally one tree per property frontage is acceptable. No trees are to be planted within the SISD at intersections or within the minimum sight distance standards at vehicle crossings.~~or RSD visibility splays. Trees planted within the CSD visibility splays must be clear pruned to 2.5 m above ground level~~.

Refer to Part 3 of this Manual for visibility splay specifications.

### 7.2.3 Traffic Island and Berm Planting

Traffic islands and berms to be planted shall be shown on the Landscape Plans submitted with the Engineering Plans, and must have particular regard for the SISD and sight distance standards at cehicle crossings ~~or RSD visibility splays~~ specified in Part 3 of this Manual.

All shrub and groundcover planting shall comply with the visibility ~~splays~~ requirements specified in Part 3. Within all SISD at intersections or within the minimum sight distance standards at vehicle crossings~~SSD and RSD visibility splays~~, planting shall be designed to be no more than 450 mm high. In front of low sign boards at intersections, planting shall be designed to be not more than 100 mm high or these areas are to be paved ~~to ensure compliance with Part 3 of this Manual~~.

In general, traffic islands with an infill area of less than 4 m² shall not be planted. The width of the planted area should not be less than 600 mm. Tapered or curved areas should be squared off and paved or concreted when the infill width is less than 600 mm. Single or isolated islands should generally be larger than 4 m² to be considered for planting, whereas islands smaller than 4 m² will be considered where

they are an integral part of a larger landscaping scheme, or there are traffic engineering reasons for planting.

~~At roundabout intersections, groundcovers or bedding not exceeding 300 mm height in the Criterion 2 areas and 400 mm height in the Criterion 3 areas although these may vary depending on road grades and levels. See Section 3.4.2(d) for a description of Criterion 2 and 3 areas.~~

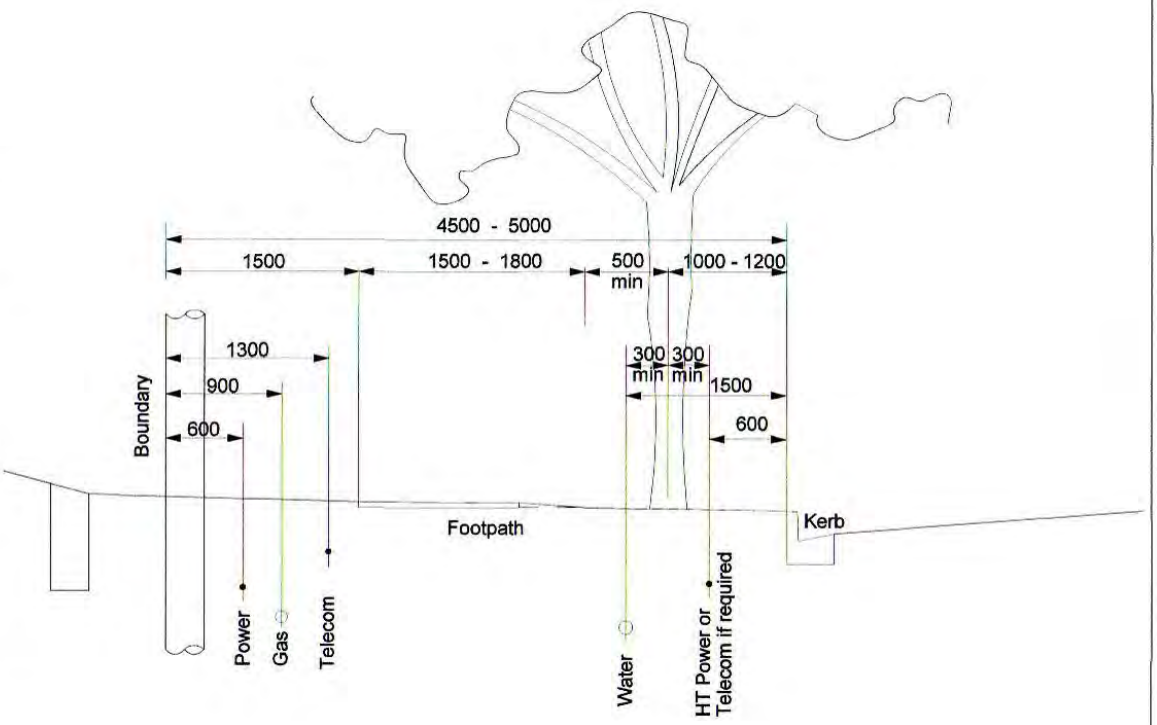
For roundabouts greater than 12 m diameter, it is preferably that 65% of the internal area be planted up with approved intersection plant species while ensuring that visibility splays, frangibility requirements and utility services remain uncompromised. Tree framework, the centre of roundabouts greater than 12 m diameter, shall be planted with taller approved shrub and tree species to aid in slowing traffic and act as a visual nodal reference.

When planting in traffic islands, ensure that mature plants are at the required heights and at centres that will not spread over the back of the kerb and channel into the road lanes, with a minimum setback of 200 mm from the back of kerb. This is especially pertinent in respect to flax species.

Likewise, plants are to be located at centres so that at maturity they cover as much of the traffic island planter bed area as possible to reduce weed maintenance. Ensure that planting does not impair sightlines to road signs.

## 7.3 Standard and Non-Standard Options for Street Tree Location

Design of streets may include kerb extensions for intersections and speed controls which allow non-standard tree planting where utilities are not a problem and visibility requirements are designed to incorporate planting as a means of slowing traffic (refer to Drawings DG 702–705).




NOTE:

This diagram is for the typical situation ~~i.e. excludes 17a and 18a standard drawings~~

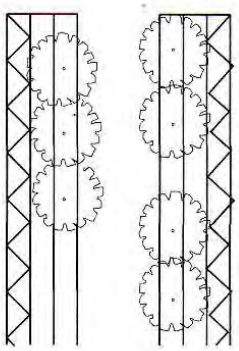
With a full complement of utilities, the minimum berm width required for street tree planting is 4150 mm.
Without the HT Power or Telecom, the minimum berm width for street tree planting is 3850mm. If the footpath is wider than normal at 1800 mm, the required berm widths are increased to 4700mm and 4400mm respectively with and without HT Power or Telecom Utilities

If these minima cannot be met, Clause 7.5.2.2 applies ~~(i.e. Trees provided in alternative locations).~~

| | | |
|---|---|---|
| MATAMATA-PIAKO DISTRICT COUNCIL | TYPICAL UTILITY AND STREET TREE LOCATIONS | DEVELOPMENT MANUAL DG 701 |

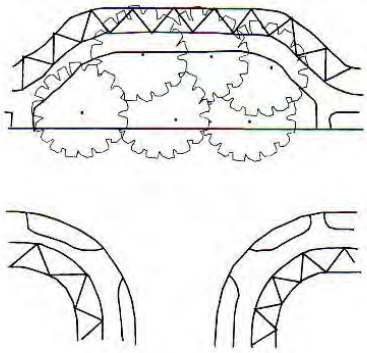
A. STANDARD DESIGN

- carriageway in centre of street reserve



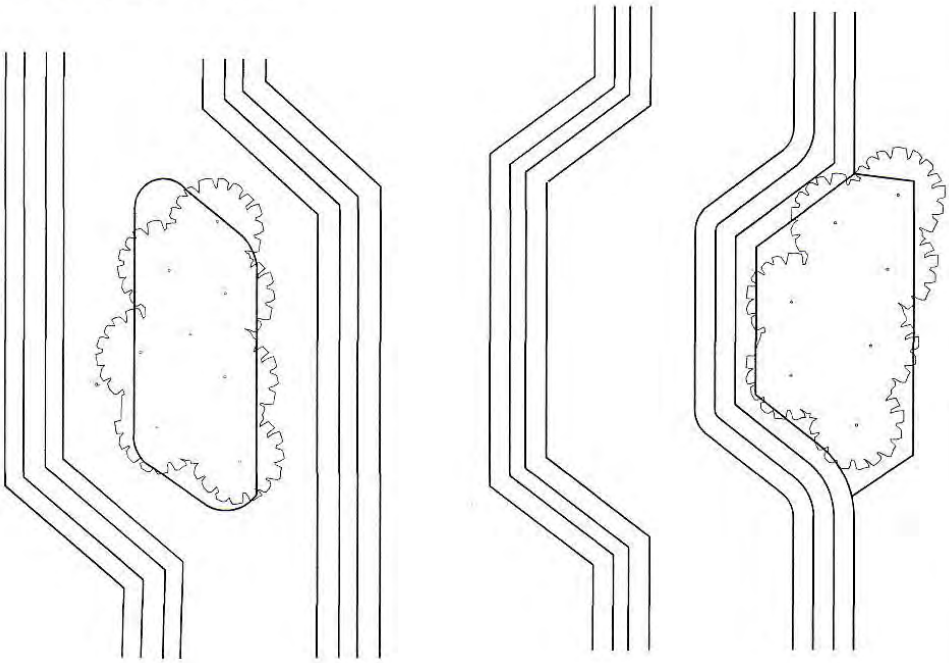
B. RESERVE WITH VARIATION

- at intersection increase in area may allow significant trees which give visual emphasis to the intersection, close views to houses, screening them from headlights



C. RESERVE WIDTH VARIATION

- increase in area may protect significant trees or remnant bush



MATAMATA-PIAKO DISTRICT COUNCIL

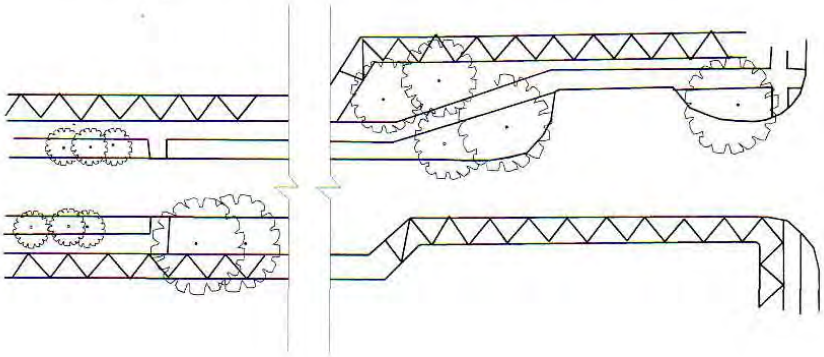
PLANTING FOR STANDARD AND NON STANDARD DESIGNS

DEVELOPMENT MANUAL
DG 702

## A. FOOTPATH, CARRIAGEWAY AND RESERVE VARIATION

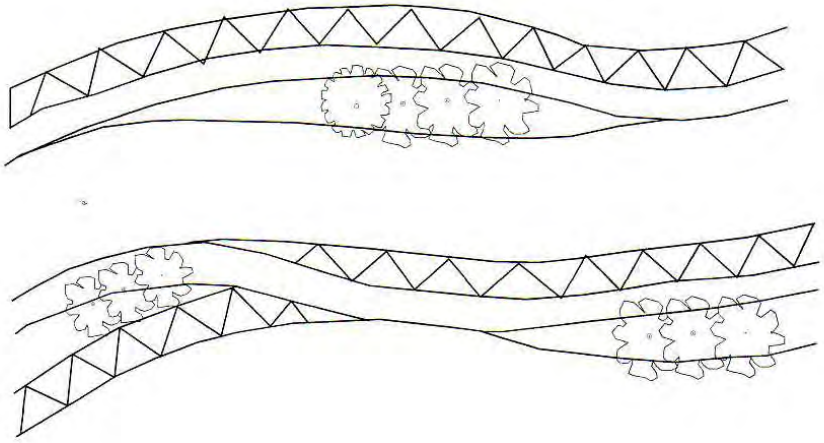
- for speed restriction, parking provision and more intimate street scale. Small radius curve at street entry and narrowed area act as speed control devices

Version 1



## B. FOOTPATH AND CARRIAGEWAY VARIATION

- to discourage high speeds and vary the driver's experience of streetscape in an informal manner. Boundary planting links with private planting service strip can be located relative to boundary lines or footpath. Location adjacent to boundary extends the useable lawn-garden area. Location adjacent to outside edge of footpath provides pedestrian buffer zone



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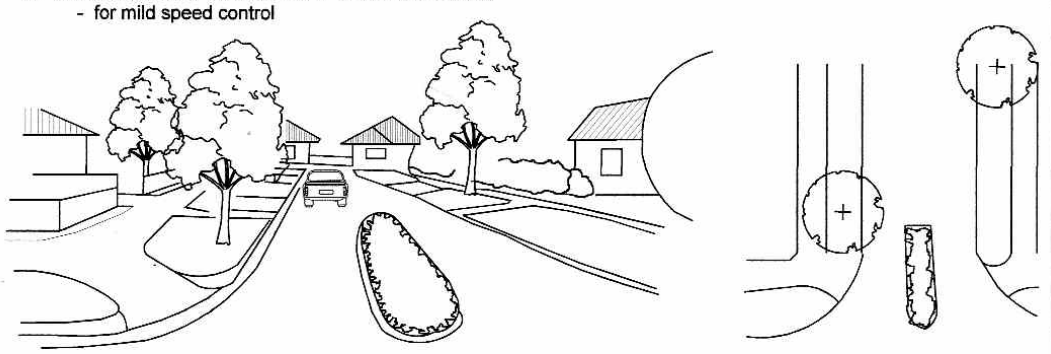
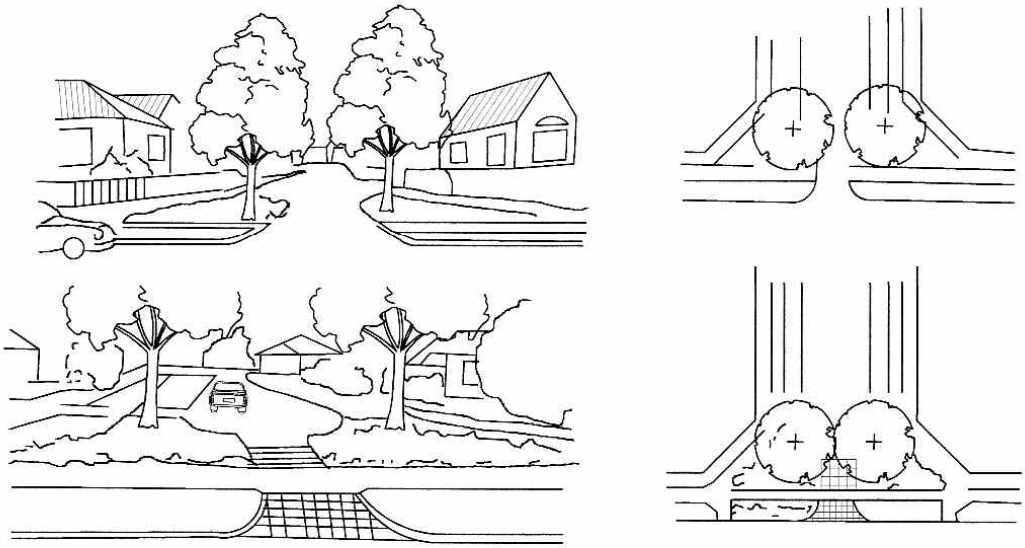
| **MATAMATA-PIAKO DISTRICT COUNCIL** | PLANTING FOR NON-STANDARD ROAD DESIGN | DEVELOPMENT MANUAL DG 703 |

A. CARRIAGEWAY VARIATION - SPLITTER ISLAND
- for mild speed control

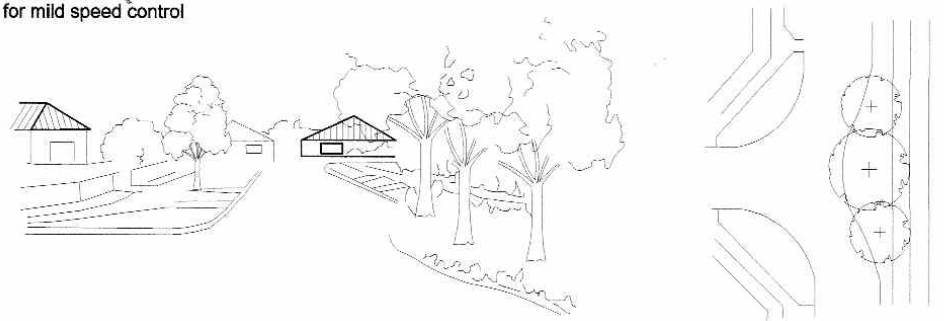


B. CARRIAGEWAY VARIATION - THRESHOLDS

- Narrowing the entrance to a street, incorporating planting for reinforcement signifies a more pedestrian-orientated enviroment. Introduction of paving materials or incorporation of footpaths to improve speed control further reinforces the 'traffic route' vs 'residential zone' distinction



C. CARRIAGEWAY VARIATION - CHANGE OF ALIGNMENT AT INTERSECTION
- for mild speed control



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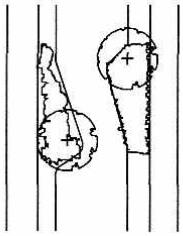
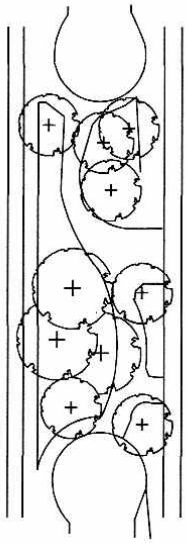
| **MATAMATA-PIAKO DISTRICT COUNCIL** | PLANTING FOR TRAFFIC CONTROL DEVICES | DEVELOPMENT MANUAL DG 704 |

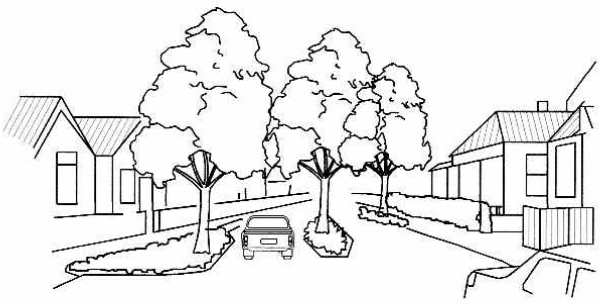
A. CARRIAGEWAY VARIATION - ONE LANED ANGLED SLOW POINT
- for strong speed control

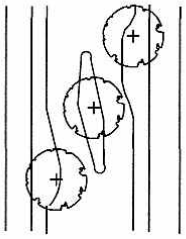


B. CARRIAGEWAY VARIATION - MEANDERING RESTRAINT ZONE
- for very strong speed control



C. CARRIAGEWAY VARIATION - TWO LANED ANGLED SLOW POINT
- for moderate speed control





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| **MATAMATA-PIAKO DISTRICT COUNCIL** | PLANTING FOR TRAFFIC CONTROL DEVICES | DEVELOPMENT MANUAL DG 705 |

# Part 8 – Network Utilities

## 8.0 General

The developer is required to make all arrangements with the appropriate network utility for the supply and installation of services for:

- Electric power.
- Telephone.

All reticulation shall be in underground systems in a services corridor of a width acceptable to all utilities (refer to Drawing DG 302).

Under road carriageways and vehicle crossings to private ways, ducts shall be installed to facilitate the installation of the services and future extensions of the networks.

The developer will be required to provide in the road width for the above ground structures required by the utilities which may include:

- Power transformers.
- Switching stations.
- Phone boxes.
- Telecommunications radio infrastructure.

Where the developer is required to install ducts, the developer shall advise the network utility operator before ducts are backfilled to enable the network utility operator to plot the location.

Council will not issue a certificate under Section 224 of the Resource Management Act 1991 until the relevant clearance certificates are completed and provided to Council.

Where a water or gas main is on the kerb side of a proposed cable, delaying the installation of service connection pipes will facilitate laying of the cable. Stormwater connections from the boundary to the stormwater system should be carried out before the installation of utility services.

In preparing the engineering plans, due regard shall be given to the requirements of the network utility operators as to:

- Minimum cover to cables.
- Standard alignment.
- Minimum separation distances between power or telephone cables, and gas or water mains.
- The width of berm which must be clear of other services and obstructions to enable efficient service laying operations.

The Developer shall obtain work clearance from each network operator, as appropriate. These work clearances shall be submitted to Council with the application for 224(c) Certificate.

## 8.1 Conversion to Underground on Existing Streets

Where a proposed subdivision fronts onto an existing street, the conversion of overhead reticulation to underground will usually be desirable. Agreement on the feasibility and benefit will first be agreed between the electrical network utility operator, telephone network utility operator, and Council. In some circumstances there may be justification for a contribution from Council to the cost of undergrounding.

## 8.2 Industrial and Commercial Subdivisions

The service requirements for industrial and commercial areas are often indeterminate. Close liaison between the developer and the network utility operator is essential, particularly immediately before cabling or piping is installed so that changes can be incorporated to accommodate extra sites or the requirements of a particular industry.

## 8.3 Location of Services

Network utility operators are required to maintain a procedure for recording the location of underground services on plans.

It is essential that all services are laid to predictable lines if there is to be a reasonable opportunity of laying new services within existing systems. These should generally be parallel or perpendicular to the legal land area. In addition to specifying the location of any service in the street berm, there should also be a tolerance which must on no account be exceeded without proper measurement and recording on the detailed record plan. A maximum tolerance of no more than ± 100 mm is required.

## 8.4 Waterway Crossings

Any services crossing drains or waterways within the road reserve shall do so without utilising Council road bridges or culvert crossings unless specifically authorised by the Planning Department. If requested by Council, the services shall be relocated, at the service owners cost.

# Part 9 – Landscaping Engineered Stormwater Devices

## 9.0 Introduction

This section applies to engineered stormwater devices that have a planted component (planted stormwater devices or "PSDs") or works in any way related to the use of landscaping as either an amenity or water mechanism in the development of new engineered stormwater devices and the remediation of existing engineered stormwater devices.

This Design Guide Part 9 is supplementary to Part 7 – Street Landscaping of this Development Manual and is to be read in conjunction with Part 4 – Stormwater Drainage.

Note: Where there is a conflict between the requirements of the PSD Design Guide (Part 9) and the requirements of Parts 4 and 7, this Part 9 takes precedence.

These design guidelines apply to all PSDs that are located in any part of a road reserve, drainage reserve, subdivision or vested reserve, or where required as a condition of resource consent. These include, (but may also include other stormwater devices as required by resource consent conditions):

- Permanent stormwater ponds.
- Rain gardens.
- Swales.
- Vegetated filters.

Proposed landscape designs or works shall be approved or rejected at the sole discretion of Council or its delegated officer.

Landscape Plans will be submitted for approval with the Engineering Plans.

### Applicable Engineered Stormwater Devices

Examples of devices that require a landscaping component are as follows:

Note: The Auckland Regional Council publication TP10 Stormwater Management Devices: Design Guidelines Manual provides in-depth definitions of engineered stormwater devices.

### Permanent Stormwater Ponds

These are either wet ponds (where there is a permanent pool of water) or detention ponds (which have temporary pooling dependent on rain events).

Note: Council opinion is that "wet pond" type detention dams should be avoided if possible. Both are used to capture and store stormwater in rain events and then release it at a slow rate. This rate is intended to be consistent with pre-urbanisation stormwater flow from the catchment. Landscape planting is used to:

- Prevent erosion and stabilise the pond slopes and flood zone.
- Minimise long-term maintenance costs.
- Increase run-off water quality.
- Increase local amenity values.

- Increase the quality of ecological greenbelts throughout the city for regional flora and fauna.

### Raingardens

These are temporary stormwater detention devices that retain water and release it into the stormwater catchment over a designed period of time, such as 24 hours, when peak stormwater flows have diminished. Water is absorbed by the plants and released through vegetative evapotranspiration. Plants also use trapped sediments for nutritional requirements. Depending on the design, stormwater flows and the trapped sediment loading, these last for 15-30 years, after which they will need to be excavated and replanted.

### Swales

These are mechanisms to control stormwater flow velocities from or through a site. Engineered ditches, they reduce the impermeable area of sites and assist with groundwater recharge. To be effective, they need to have low water velocities and are normally planted with a grass cover that is maintained at a calculated height so that velocities are slowed but not impeded. On slowing, suspended solids drop and aid in the soil nutritional value. Other plants may be used depending on the swale design.

### Vegetated Filters

Vegetated filters act as stormwater water quality filters that rely on a distributed waterflow to produce a thin layer of water passing through the vegetation to be effective. They are often used in conjunction with other stormwater treatment practices.

## 9.1 Minimum Requirements

Minimum PSD design requirements are as follows:

- Stormwater Devices may be permanently grassed if the slope ratio is more than 1 (vertical) to 4 (horizontal). Should Council deem the slope too steep for safe maintenance, the slope shall be mulched and planted with permanent landscaping.
- Any embankment that the engineer determines is either too inaccessible or unsafe for regular grass mowing shall be permanently planted.
- All inlet pipes must have a 1 m wide concrete apron or band around the external portion. Between this apron and 2 m from the inlet pipe, Carex virgata and/or Carex germinata shall be planted on the embankment with mulch matting, unless otherwise specified by the engineer. No other plant species, including grassing, may be installed within 2 m of the inlet pipe.
- PSDs need to enhance and strengthen the existing character and intended future character of neighbourhood areas
- Any landscaping shall provide maximum long-term benefit with minimum ongoing maintenance. It shall not compromise the safety of adjacent property owners nor the local community
- PSDs are to be landscaped so that they:
  - Comply with engineering requirements;
  - Improve stormwater water quality discharge where possible;
  - Become a community asset and positive visual amenity; and
  - Provide, where possible, forage and habitats for native flora and fauna.

- Safety of the site is paramount by incorporating CPTED (Crime Prevention through Environmental Design) principles (refer to Part 7 – Street Landscaping).
- Plant species allocations are to be specific to soil type and conditions, site topography and exposure, post-development groundwater table levels and alignment with local indigenous native plant species.
- Plant species are to be indigenous to the Waikato Region, although native New Zealand grasses are permitted. Likewise, plants are to be eco-sourced where possible from the Waikato Region.
- Planting plans are to be detailed, indicating different mixes and/or individual planting as applicable to the different Planting Zones, topographical, ecological and amenity zones within the PSD and surrounding environment. Pond planting may be staged to minimise slope erosion. The initial stage shall be grassing the site with the Council approved PSD grass mix, followed by landscape planting once grass has established.

Minimum planting provision requirements are:

- Quick establishment of plant cover is required for PSDs throughout the site, as engineering requirements permit.
- PSDs are to be landscaped with groundcovers, shrubs and trees where site conditions and engineering requirements permit, otherwise the PSDs are to be grassed or turfed as site design permits.
- Of the vegetation mix in Stormwater Ponds, at least 10% and no more than 25% must be staked 1.5 m high grade trees.
- Avoid planting woody vegetation near the slope toe of Stormwater Ponds to prevent future bank stability issues when the plant reaches the end of its lifecycle and its root systems decompose.
- Swale surface treatments shall be preferably established with low maintenance treatments such as rolled turf (for short lengths) or planted up in approved Carex species or laid with loose river rocks. Swales sown with grass seed, though low cost to construct are often difficult to establish and maintain. Acceptance of grassed swales or other swale surface treatments shall be at the Engineer's discretion.
- Where mulch is used, it is to be contained within the plant area that it is providing cover for. Other mulch applications are to be utilised on slopes greater than 1:3.

Appropriate maintenance is required post-landscaping.

Note: The MPDC Infrastructure Code of Practice includes a PSD Defects Liability minimum standards and Maintenance Schedule.

## 9.2 Means of Compliance

### 9.2.1 Location

Planting shall be located so that the integrity and efficient operation of the engineering stormwater device or any other infrastructural service or structure both within and adjacent to the site are not compromised in any way.

### 9.2.2 Site Preparation

In regard to adjacent water bodies and/or courses, ensure that no debris or chemical spray enters or impedes the functionality of the water body, whether it is natural or manmade.

### 9.2.3 Planting Zones

In addition to the aesthetic appeal and ecological benefits, plants in and around PSDs contribute to the stormwater device functional requirements such as trapping sediment and preventing scouring of the embankments.

The following planting zones define the planting regimes within PSDs. They are intended for stormwater ponds but can be applied to other PSDs and are based on vegetative tolerances to wet/damp roots and frequent/infrequent inundation. Refer to Table 9.2 for approved plant species.

Due to site conditions and PSD configuration it may not be feasible for all Planting Zones to be used within a PSD. Consult with the Engineer to confirm the applicable Planting Zones. The Planting Zones are:

| | |
|---|---|
| Wet Zone | This area is where the pond ground surface is designed to be permanently submerged and where the plant roots may be permanently water logged. Note: Council opinion is that "wet pond" type detention dams should be avoided if possible. |
| Marginal Zone | This area is likely to be submerged or partially submerged in a 2-year return storm event. |
| Lower Bank Zone | This is the planting zone between the Marginal Zone and Upper Bank Zone where plants may be occasionally submerged (storm events more severe than the 2-year return period storm). Plants are able to withstand inundation for short periods of time. |
| Upper Bank Zone | This planting zone is generally above the spillway level. Plants are able to sustain damp roots for periods but should not be fully inundated. |

## 9.3 Planting

### 9.3.1 Site Screening

Site vegetative screening is to comply with Council requirements.

### 9.3.2 Planting Grades

Planting grades are to be of a suitable size to ensure that vegetation establishes rapidly with minimum mortality rates and/or replacement requirements. Refer to Table 9.2 for the minimum plant grades. Trees are to be a minimum grade of 1.5 m high.

### 9.3.3 Plant Spacing and Selection

#### (a) Species Selection

Species are to be selected with regard to good conformation, healthy robust root systems, and low maintenance.

Planting species are to be selected according to the planting list indicated in Table 9.2 and corresponding site topography and ecology unless there are more suitable plants according to site conditions and/or local ecology. Where trees, shrubs and groundcovers are to be planted within a road reserve, the provisions of Part 7 – Street Landscaping design shall also apply.

Species selection considerations include:

- Compliance with Part 3 of this Manual in regard to sight distances where the PSD is within or near the road reserve
- Engineering requirements, including improving post-treatment stormwater water quality
- Ensure that intended plants are not classified as regionally noxious weed or pest species.
- Longevity and corresponding maintenance requirements
- Minimal leaf fall in autumn (which can reduce PSD efficiency)
- Pest and disease resistance
- Services, including overhead cables
- Shading consistent with location and adjacent landowners
- Suitability to environmental conditions, for example, modified groundwater table, exposure to wind and frost, vehicular and cycle traffic.
- Ensure that no species that drop branches, debris, or may in any other way cause damming and/or unplanned flooding in and adjacent to watercourses (such as streams and spillways) are planted within 5.0 m of watercourses

#### (b) Plant Selection for Specific Landscaped Engineering Stormwater Devices

**Raingardens**

Plants selected shall be a mix of groundcovers, shrubs and/or small trees (up to 4 m high) that are able to withstand periods of soil waterlogging according to the Marginal and Lower Bank Planting Zone plant species.

Where PSDs occur in the road reserve species indicated in Table 9.2 may be used.

Ensure that no large trees are selected that may impede maintenance requirements and/or require a resource consent for removal should this be required in the future. Should Council approved biodegradable matting be used for mulch, this shall not be visible once plants are fully established.

**Stormwater Ponds**

Stormwater ponds are to be planted up as soon as possible after civil construction is completed according to the Planting Zones indicated in 9.2.3. All stormwater ponds with an inner batter slope ratio of 1 (vertical) to 4

(horizontal) or steeper must be landscaped as the slope is too great for safe maintenance.

Where site conditions such as unstable soil structures require a more rapid groundcover than shrubs and trees provide, exposed surfaces above the Upper Bank and Lower Bank Planting Zones shall be stabilised with grassing first prior to landscape planting.

Planting within the Marginal Zone shall be installed at the same time that the upper slopes receive grassing to minimise slope toe erosion. The Wet Zone shall be planted up once the normal standing water level has been achieved. Note: Council opinion is that "wet pond" type detention dams should be avoided if possible. Refer to Figure 9.1, Stormwater Pond Staged Landscape Planting.

Pond plant species shall be a mix of Council approved groundcovers, shrubs and trees from Table 9.2 as site conditions and engineering requirements permit.

**Vegetated Filters**
Species shall be a mix of Council approved groundcovers, shrubs and trees from Table 9.2 according to the Planting Zone criteria, as site conditions and engineering requirements permit.

**Swales**
Swales may be turfed to ensure rapid establishment and mitigate channel surface scouring. Generally, grass needs to be maintained at heights between 50 and 150 mm, depending on engineering design parameters.

Where engineering requirements permit, Carex virgata or Carex germinate may be planted in the wet and marginal zones. No other ground cover, shrub or tree species are permitted in these zones. These need to be planted with mulch rounds.

### (c) Plant Spacing

Plants are to be planted according to the following spacing allocations:

- Trees, shrubs and groundcovers, as per Table 7.2 required spacings.
- Within the Marginal Zone, Carex shall be evenly staggered at 1.0 m intervals.
- Where plantings are to include approved partially submerged species, these are to be irregularly clumped in groups of 3 to 7 plants along the circumference of the stormwater pond.
- For permanent stormwater ponds, plant 0.4 m below the designed normal standing waterline, approved sedges and rushes.
- Amenity plantings of tussocks are to be clumped in groups of 3 to 10 plants.
- Trees shall be spaced at minimum 2.5 m intervals from other trees and underplanted with 4 equidistant same-species groundcovers, installed 0.75 m from the plant stem. The groundcover species shall provide a weed suppression canopy while the tree is establishing, and as such will have no more than 1 m mature height and minimum 0.75 m spread. Ensure that the groundcover species does not compete with the tree establishment requirements. Depending on the zone planting

locations, possible plants would be Phormium “Green Dwarf”, various Carex such as Carex Virgata, and Coprosma groundcovers such as Coprosma kirkii “Minogue”.

- In respect to the pond maintenance access track:
  - No shrub or groundcover centres are to be located within 1.0 m of the track.
  - No trees centres are to be located within 2.5 m of the track.
  - Plantings within 2.0 m either side of the access track are to have species that are able to recover quickly should they become damaged during pond maintenance.
  - In subdivision and shopping precincts, planting design either side of the access track should also ensure that the track may be used for pedestrian amenity purposes.

### 9.3.4 Planting Definitions

The following definitions are applicable when implementing PSD planting:

**“Established”**

Plants are established when they:

1. Are healthy and free of pests, disease, spray and weed-trimmer damage; and
2. Are grown to the approximate species mature height; and
3. Have obtained a shape and form generally consistent with the species type; and
4. Are producing seeds/propagating naturally.

**“Establishing”**

Plants are establishing when they:

1. Are healthy and free of pests, disease, spray and weed-trimmer damage; and
2. Are growing generally consistent with the species type shape and form.

**“Failed” or “Failure”**

Plants have failed when they have one or more of the following:

1. Stunted growth (up to 5 years post installation). This requires further investigation to determine the cause and who or what is responsible.
2. Been more than irreparably damaged by pests and/or disease and/or weed cover suppression.
3. Been severely spray damaged.
4. Been ring barked or severely damaged by a weed-trimmer or manual tool.
5. Died.

**“Installed”**

Installed plants are those that have been planted intentionally according to the PSD planting plan.

## 9.4 Plant Sourcing

Plants are to be eco-sourced from the Waikato Region where possible, at grades that minimize potential mortality rates, from reputable nursery stock. It is strictly prohibited

to transplant vegetation from existing wetlands and other such environments to be used in PSD landscaping.

## 9.5 Mulching

The types of mulching specified are to ensure rapid planting establishment while maintaining good ground infiltration without souring the soil or causing negative amenity values, and allowing some scope for landscape design variations. Mulching for the PSDs shall be as detailed in Table 9.1.

Council favours biodegradable weedmats over synthetic geotextile weedmatting. No synthetic geotextile weedmatting is to be utilised in the installation of the landscaping portion of landscaping engineered stormwater devices. However, synthetic geotextiles and other materials may be used, as applicable, to meet device engineering requirements; for example, at inlets, outlets and high velocity channels.

Biodegradable matting must:

- Have a lifespan of at least 12 months.
- Prevent weed growth within the mulched area.
- Help stabilize the soil while plants are establishing.
- Not easily lift from the ground if submerged for periods of time.
- Appear reasonably tidy from a visual amenity perspective.

Examples of approved biodegradable matting products include:

- Coir matting, 10 mm thick minimum.
- Jute-Hessian weed control mats, 800 g/m² minimum.
- Densely woven flax matting.

Where shredded tree mulch is used, it is to be contained within the plant area that it is providing cover for. Shredded tree mulch is not permitted in any PSD:

- Within 3.0 m of any watercourse or water body.
- Where water ponding or flooding may occur.
- On slope gradients of greater than a 1:3 ratio.

**Table 9.1 – Council Approved Landscape Mulching for PSDs**

| Engineering device | Planting Zone | Mulch Type |
|---|---|---|
| **Raingarden** | All | Council approved biodegradable weed matting.<br><br>50–150 mm diameter River Rocks in 100–300 mm deep Council approved gabion matting. |
| **Stormwater Pond** | Amenity Planting – Site Entrance and Drainage Reserve Boundary Line to Upper Bank Zone where no ponding, flooding, or mulch travel is possible<br><br>Amenity Planting – Site | Council approved Bark and/or aged Woodchip<br><br>Council approved |

| | | |
|---|---|---|
| | Entrance and Drainage Reserve Boundary Line to Upper Bank Zone where ponding or flooding is possible<br><br>Upper Bank and Lower Bank Zones<br><br>Marginal Zone<br><br>Wet Zone | biodegradable weed matting<br><br>Council approved 0.5 m diameter biodegradable weed matting rounds<br><br>Council approved biodegradable weed matting<br><br>No mulch |
| **Swale – River Rocks** | All | Loose River Rocks on Council approved biodegradable weed matting<br><br>50–150 mm diameter River Rocks in 100–300 mm deep Council approved gabion matting |
| **Swale – Roll on Turfing** | All | No mulch |
| **Swale – Vegetated (Carex Grasses)** | All | Council approved biodegradable weed matting |
| **Vegetated Filters** | All | Council approved biodegradable weed matting |

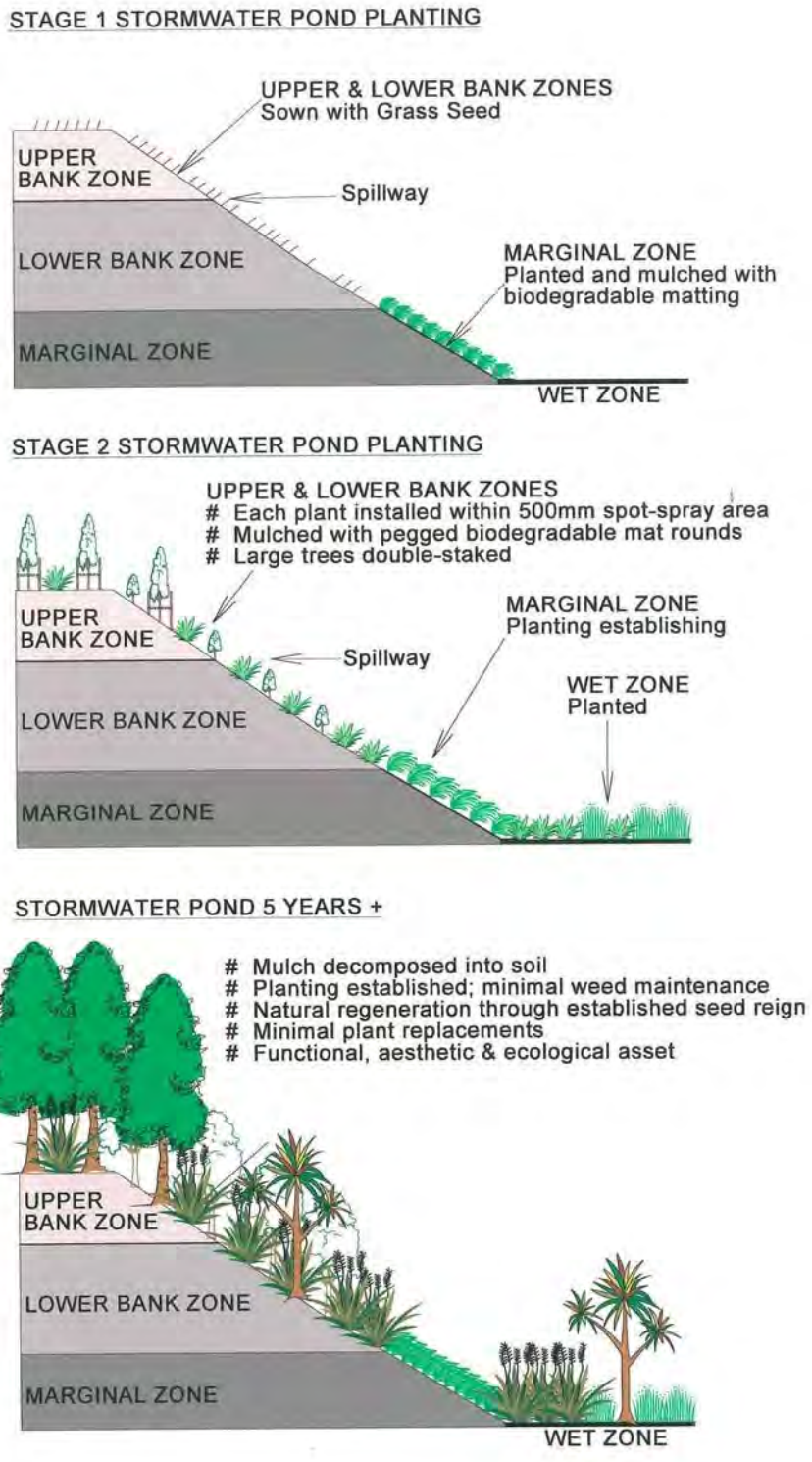


**Figure 9.1 – Stormwater Pond Staged Landscape Planting**

## Table 9.2 – Approved PSD Plant Species

| Botanical Name | Common Name | Required Spacing (m) | Minimum PB Grade | Type | APPLICABLE LESD | STORMWATER PONDS | Upper Bank Zone | Lower Bank Zone | Marginal Zone | Wet Zone | RAINGARDEN | SWALE | VEGETATED FILTERS | TOLERANCE | Peat Soil | Frost | Wet / Moist | Dry | Wind | LIGHT REQUIREMENT: | Full Sun | Part Shade | Full Shade | CHARACTERISTICS | Rapid Growth | Nurse Plant | Bird Forage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aristotelia serrata | Wineberry | 1.0 | 5 | Small Tree | | | | | | | | | | | | | | | | | | | | | | | |
| Arthropodium cirratum | | 1.0 | 3 | Low Shrub | | | | | | | | | | | | | | | | | | | | | | | |
| Asplenium bulbiferum | Hen & chicken fern | 1.0 | 5 | Low Fern | | | | | | | | | | | | | | | | | | | | | | | |
| Astelia grandis | | 1.0 | 3 | Medium Shrub | | | | | | | | | | | | | | | | | | | | | | | |
| Baumea articulata | | 1.0 | 2 | High Rush | | | | | | 0.3m | | | | | | | | | | | | | | | | | |
| Baumea rubiginosa | | 1.0 | 2 | Low Rush | | | | | | | | | | | | | | | | | | | | | | | |
| Blechnum novae-zelandiae | Kiokio | 1.0 | 3 | Medium Fern | | | | | | | | | | | | | | | | | | | | | | | |
| Carex buchananii* | | 1.0 | 3 | Sedge | | | | | | | | | | | | | | | | | | | | | | | |
| Carex dispacea | | 1.0 | 3 | Sedge | | | | | > | | | | | | | | | | | | | | | | | | |
| Carex dissita | | 1.0 | 3 | Sedge | | | | | | | | | | | | | | | | | | | | | | | |
| Carex gaudichaudiana | | 1.0 | 3 | Sedge | | | | | | | | | | | | | | | | | | | | | | | |
| Carex geminata | | 1.0 | 3 | Sedge | | | | | > | | | | | | | | | | | | | | | | | | |
| Carex secta | | 1.0 | 3 | Sedge | | | | | > | | | ? | | | | | | | | | | | | | | | |
| Carex testacea | | 1.0 | 3 | Sedge | | | | | | | | | | | | | | | | | | | | | | | |
| Carex virgata | | 1.0 | 3 | Sedge | | | | | > | | | | | | | | | | | | | | | | | | |
| Chionocloa flavicans* | | 1.0 | 3 | Sedge | | | | | | | | | | | | | | | | | | | | | | | |
| Coprosma grandifolia | Raurekau | 1.0 | 5 | Tall Shrub | | | | | | | | | | | | | | | | | | | | | | | |
| Coprosma kirkii 'Minogue' | | 1.0 | 5 | Groundcover | | | | | | | | | | | | | | | | | | | | | | | |
| Coprosma propinqua | Mingimingi | 1.0 | 5 | Tall Shrub | | | | | | | | | | | | | | | | | | | | | | | |
| Coprosma rhamnoides | | 1.0 | 5 | Tall Shrub | | | | | | | | | | | | | | | | | | | | | | | |
| Coprosma rigida | | 1.0 | 5 | Tall Shrub | | | | | | | | | | | | | | | | | | | | | | | |
| Coprosma robusta | Karamu | 1.0 | 5 | Tall Shrub | | | | | | | | | | | | | | | | | | | | | | | |
| Coprosma tenuicaulis | Swamp Coprosma | 1.0 | 5 | Tall Shrub | | | | | | | | | | | | | | | | | | | | | | | |
| Cordyline australis | Cabbage tree | 1.0 | 5 | Small Tree | | | | | | | | | | | | | | | | | | | | | | | |
| Cortaderia fulfida | Small Toe toe | 1.0 | 5 | Small Grass | | | | | | | | | | | | | | | | | | | | | | | |
| Cortaderia toe toe | Toe toe | 1.0 | 5 | Medium Grass | | | | | | | | | | | | | | | | | | | | | | | |
| Cyathea dealbata | Ponga | 1.0 | 8 | Tree Fern | | | | | | | | | | | | | | | | | | | | | | | |
| Dacrycarpus dacrydioides | Kahikatea | 2.5 | 1.5m High | Tall Tree | | | | | | | | | | | | | | | | | | | | | | | |
| Dianella nigra | | 1.0 | 5 | Small Shrub | | | | | | | | | | | | | | | | | | | | | | | |
| Dicksonia fibrosa | Wheki ponga | 1.0 | 8 | Tree Fern | | | | | | | | | | | | | | | | | | | | | | | |
| Dicksonia squarrosa | Wheki | 1.0 | 8 | Tree Fern | | | | | | | | | | | | | | | | | | | | | | | |
| Dodonea viscosa | Ake ake | 1.0 | 5 | Small Tree | | | | | | | | | | | | | | | | | | | | | | | |
| Eleocharis acuta | Sharp spike rush | 1.0 | 2 | Low Rush | | | | | | 0.1m | | | | | | | | | | | | | | | | | |
| Eleocharis sphacelata | Kuta | 1.0 | 2 | Low Sedge | | | | | | 0.4m | | | | | | | | | | | | | | | | | |
| Fuschia excorticata | Kotukutuku | 2.5 | 1.5m High | Medium Tree | | | | | | | | | | | | | | | | | | | | | | | |
| Griselinia littoralis | Papauma | 2.5 | 1.5m High | Medium Tree | | | | | | | | | | | | | | | | | | | | | | | |
| Hebe paviflora* | | 1.0 | 5 | Medium Shrub | | | | | | | | | | | | | | | | | | | | | | | |
| Hebe stricta | Koromiko | 1.0 | 5 | Medium Shrub | | | | | | | | | | | | | | | | | | | | | | | |
| Hoheria sextylosa | Lacebark | 1.0 | 5 | Small Tree | | | | | | | | | | | | | | | | | | | | | | | |
| Kunzea ericoides | Kanuka | 1.0 | 5 | Tall Tree | | | | | | | | | | | | | | | | | | | | | | | |
| Leptospermum scoparium | Manuka | 1.0 | 5 | Small Tree | | | | | | | | | | | | | | | | | | | | | | | |
| Melicytus ramiflorus | Mahoe | 1.0 | 3 | Medium Tree | | | | | | | | | | | | | | | | | | | | | | | |
| Myrsine australis | Mapou | 1.0 | 3 | Medium Tree | | | | | | | | | | | | | | | | | | | | | | | |
| Phormium cookianum | Wharariki | 1.0 | 5 | Medium Flax | | | | | | | | | | | | | | | | | | | | | | | |
| Phormium 'Green Dwarf'* | Flax culitvar | 1.0 | 5 | Low Flax | | | | | | | | | | | | | | | | | | | | | | | |
| Phormium tenax | Harakeke | 1.0 | 5 | Medium Flax | | | | | | | | | | | | | | | | | | | | | | | |
| Pittosporum crassifolium* | Karo | 1.0 | 5 | Small Tree | | | | | | | | | | | | | | | | | | | | | | | |
| Pittosporum eugenoides | Lemonwood | 1.0 | 5 | Small Tree | | | | | | | | | | | | | | | | | | | | | | | |
| Pittosporum tenuifolium* | Kohuhu | 1.0 | 5 | Small Tree | | | | | | | | | | | No | | | No | | | | | | | | | |
| Plagianthus regius | Ribbonwood | 2.5 | 1.5m High | Medium Tree | | | | | | | | | | | | | | | | | | | | | | | |
| Podocarpus totara | Totara | 2.5 | 1.5m High | Tall Tree | | | | | | | | | | | | | | | | | | | | | | | |
| Schefflera digitata | Pate | 2.0 | 5 | Small Tree | | | | | | | | | | | | | | | | | | | | | | | |
| Sophora microphylla | Kowhai | 2.5 | 1.5m High | Small Tree | | | | | | | | | | | | | | | | | | | | | | | |
| Streblus heterophyllus | Turepo | 1.0 | 3 | Small Tree | | | | | | | | | | | | No | | | | | | | | | | | |
| Typhus orientalis | Raupo | 1.0 | 2 | Rush | | | | | | | | | | | | | | | | | | | | | | | |
| Syzgium maire | Swamp Maire | 2.5 | 1.5m High | Tall Tree | | | | | | | | | | | | | | | | | | | | | | | |
| Grassing | | | | Groundcover | | | | | | | | | | | | | | | | | | | | | | | |
| Roll-on Turfing | | | | Groundcover | | | | | | | | | | | | | | | | | | | | | | | |

KEY:

Grey areas indicate applicable species to be utilised in PSD planting designs and their corresponding tolerances and characteristics. Refer to the Indigenous Vegetation Types of Hamilton Ecological District (Clarkson, Clarkson and Downs), and Hamilton City Council Gully Resotration Guide (Clarkson and Wall) for other locally indigenous plants that may be more suitable for site conditions.

> Indicates that the vegetation mix for this planting zone should have a high percentage of this plant. Avoid root systems of woody vegetation near the slope toe to prevent future stability issues when plants reach the end of their lifecycle.

? Swales: Carex secta in the lower channel is inappropriate as this eventually forms a trunk that will impede water flow.

* Plant species is not indigenous to the Waikato region, but is an approved PSD plant.

## 9.6 Useful Documents and Standards

Auckland Regional Council, (2003), TP10: Stormwater Management Devices – Design Guidelines Manual

Clarkson, B.D., Clarkson, B.R., Downs, T.M., (2001), Indigenous Vegetation Types of Hamilton Ecological District, The University of Waikato: Centre for Biodiversity and Ecology Research

Clarkson, B.D. and Wall, K., (2002), Gully Restoration Guide: A Guide to Assist in the Ecological Restoration of Hamilton's Gully Systems, Hamilton City Council

Environment Waikato Regional Council, (1995), Design Guidelines for Earthworks, Tracking and Crossing

Environment Waikato Regional Council, Volumes 1 and 2, Erosion and Sediment Control: Guidelines for Soil Disturbing Activities