



FNQROC DEVELOPMENT MANUAL

DESIGN MANUAL

D6

WATER RETICULATION

Version No. 05/23

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GENERAL

D6.01 SCOPE

1. This document sets out the acceptable solutions for the planning, design and construction of water reticulation systems that are to be constructed by a Developer and handed to Council to operate. This section also covers certain service connection issues relating to development approvals and private infrastructure that needs to be to Council standards.
2. The water reticulation system shall be defined as mains less than 300mm diameter. Design of mains 300mm diameter and greater shall be subject to the specific criteria nominated by Council. All mains less than 300mm diameter shall be designed in accordance with this manual.
3. The planning, design, construction and certification of water reticulation infrastructure is to be carried out in accordance with the following provisions in order of precedence:-
 - Council's design criteria as set out in these manuals and Council's Standard Specifications ; and
 - CTM Water Alliance Design and Construction Code (Version 1.0 August 2019)
 - The designer shall note the Queensland Workplace Health and Safety – Guide to the Workplace Health and Safety Obligations of Designers of Structures and the design shall include the required Safety Design Report
 - For general guidance on infrastructure elements not contained within council's documents, the criteria contained within the relevant state government department guidelines for Water Supply and Sewerage may be used for guidance.
4. Aspects of modification or clarification of the Water Supply Code of Australia WSA 03 – 2002 are detailed in Appendix B of this document.
5. Council's Development Guidelines and Standard Specification and Drawings shall take precedence over the CTM Water Alliance Design and Construction Codes, Water Services Association of Australia Codes and the relevant State government department Planning Guidelines for Water Supply and Sewerage.

D6.02 GENERAL

1. It is the Consulting Engineer's responsibility to ensure that the current version of this section is used and that all infrastructure is constructed in accordance with this section as a minimum standard.
2. It is the Consulting engineer's responsibility to ensure that all work is undertaken to council's requirements. Responsibility for supervision, testing, inspection, commissioning and remedial work rests with the Consulting Engineer.
3. Where a water supply source is being developed to service the development, the source shall either meet or exceed the Australian Drinking Water Guidelines (ADWG), or the developer shall provide the necessary infrastructure to treat the source to the ADWG, including disinfection before storage and/or distribution.
4. FNQROC specification S5 (Water Reticulation) contains addenda to the CTM/SEQ standard drawing list and shall be read in addition to the FNQROC Standard drawings and local authority specific standard drawings.

D6.03 OBJECTIVE

1. The objective of a water supply system is to provide to the consumer a reticulated potable water supply to meet the demands imposed upon it by both the consumers and network level fire fighting requirements. Provision for on-lot fire fighting requirements is outside the scope of the water supply network and is the responsibility of the building owner.

D6.04 REFERENCE DOCUMENTS

Note: Where Acts or reference documents are updated, reference should be made to the current version excluding the CTM Code and the Water Services Association Australia (WSAA).

Australian Standards

- AS 2566 Buried flexible pipelines
- AS 2368 Test Pumping of Water Wells
- AS 5488 Classification of Subsurface Utility Information

Council Approved Product Register

CTM Water Alliance Design and Construction Code (Version 1.0 Aug 2019)

Cairns Regional Council

- Design Guideline Switchboards
- Design Guideline Water Pumping Stations

National Health and Medical Research Council

- “Australian Drinking Water Guidelines”

QLD Government Legislation

- Water Act
- Water Supply (Safety and Reliability) Act
- Sustainable Planning Act

Water Services Association of Australia

- WSA 03 – 2011 – Water Supply Code of Australia
- WSA 01 – Polyethylene Pipeline Code
- Information and Guidance Note – Guidelines for design of pressure pipeline systems for water supply using PVC-M and PVC-O pipes

Department of Energy and Water Supply

- “Planning Guidelines for Water Supply and Sewerage”

RETICULATION

D6.05 GENERAL

1. All connections or alterations to Council water reticulation mains shall be made by Council at the Developers cost.
2. The design of the water reticulation will take into consideration all external demands that are presently acting on the system or are likely to do so in the future. Council shall be consulted to ascertain these external demands, points of connection to existing reticulation and operating parameters.
3. Council approval of water reticulation does not relieve the Consulting Engineer of responsibility for the design.
4. In staged developments, to ensure an efficient distribution system is established, the designers are required to submit to the Council an overall layout of the proposed subdivision, including all stages, showing the sizing of mains to be incorporated. This proposal shall be submitted to the Council for approval in principle before the submission of any construction plans and specifications will be accepted for review.
5. A network analysis (to determine the optimum size of the internal mains) is required by Council as part of the design submission for the development unless written agreement for waiver of this requirement has been obtained from council. The design of water reticulation schemes, and the network analysis shall be completed by the Consultant following discussions with Council and be based on the design criteria detailed in Section D6.07 below. Plans in the report are to also show residual pressures and pressures under various fire flow scenarios.
6. If a network analysis is required, the designer will be required to liaise with council regarding appropriate boundary conditions for the proposed development. Typically this will include a requirement for a hydrant test to be conducted, at the developers expense. For multi-stage developments, as a minimum, the network analysis must demonstrate compliance for both the ultimate development, and the stage subject to the application.
7. In sloping development sites, the water reticulation network is to be designed in pressure zones to allow Council to control maximum and minimum pressures within the development.
8. The network design shall be planned to satisfy the requirements of this manual at a minimum whole-of-life cost (capital cost, operational and maintenance cost) not simply a least capital cost solution.

D6.06 EXISTING MAINS

1. Council should be contacted to obtain copies of any "As Constructed" plans and details of any planned augmentation works.
2. Where, as a result of the development, existing mains are located on non-standard alignments or have less than minimum cover, the developer shall bear the cost of relocation, replacement or lowering, subject to the approval of the Council.
3. Pavement widening associated with some developments can place existing mains under the new pavement. In such cases, where the existing main has inadequate cover or less than 600mm horizontally clear of the back of kerb, the developer shall bear the cost of its replacement in a material approved by the Council, or reconstruction at an adequate cover depth or reconstruction on a standard alignment in the new verge.

D6.07 DESIGN CRITERIA ^{CRC}

1. Flow Parameters

Unless advised otherwise by Council, the Average Daily consumption and peaking factors for the design of Water Supply Schemes shall be as follows:

Average Daily Consumption (AD)	400 litre/EP/day for Cairns Regional Council 500 litre/EP/day for all other Councils
Mean Day max Month (MDMM)	1.50 x AD
Peak Day (PD)	2.25 x AD
Peak Hour (PH)	1/12 x PD

In the absence of specific flow consumption data the Average Daily Consumption shall be calculated using the equivalent demands shown in Table 6.1.

Table 6.1 Equivalent Demands

Description	Equivalent Persons (EP)/Connection
Single Family Dwelling	
Lot > 1500m ²	3.7
Lot 1101m ²	3.4
Lot 901m ² to 1100m ²	3.1
Lot 401m ² to 900m ²	2.8
Lot < 400m ²	2.5
Multi Unit Accommodation	
Units > 3 bedrooms	0.4 + 0.6/bedroom
Units = 3 bedrooms	2.2
Units = 2 bedrooms	1.6
Units < 2 bedrooms	1.0
Caravan Parks	
Van Site / Camping Site	1.2
Shops / Offices	
Per 90m ² GFA	1.0

Table 6.1 Notes:

1. Based on 2.8 Equivalent Persons/Equivalent Domestic Connection (EP/EDC), with 1 EDC equivalent to a single residential dwelling on a standard size allotment (401m² to 900m²).
2. For undeveloped land equivalent populations shall be calculated in accordance with the maximum allowable population density in the Planning Scheme, Local Government Infrastructure Plan (LGIP) or estimation of maximum allowable density agreed with Council prior to design.
3. The designer can also refer to the LGIP Extrinsic Materials Report which includes density parameters for a range of residential and non-residential zones, if available.

2. Pressure Parameters

a) Minimum Service Pressure (excluding fire fighting)

Minimum Pressure	22 metres head at peak hourly consumption
Minimum Pressure Location	For lots at or below road reserve level at the property boundary. For lots above the road reserve level at a nominated level practical building site. Or in the absence of a natural or benched building site the mean lot level shall be used.
Minimum Pressure Network Condition (for modelling from a reservoir).	Based on the reservoir level for Peak Hour of the third day of three consecutive Peak Day events (for dynamic models). In the absence of dynamic model results the minimum reservoir level shall be assumed at 15% of storage height. Liaise with Council to confirm minimum pressure constraints available at the connection to the existing system.

Note 1: The minimum pressure in the table is for the purpose of design and is not a guaranteed minimum pressure. Refer to the service providers Customer Service Standards.

Note 2: Where building envelope pressure is less than 30m, a notation will be placed on the rates file advising the owner that any booster pump required to augment pressures to the building is to be supplied, installed, maintained and replaced at the property owners expense.

b) Maximum Pressure

Maximum Pressure	60 metres head, see Note 1
Maximum Pressure Location	At the building pad
Maximum Pressure Network Condition (for modelling from a reservoir).	Based on reservoir level at 95 percent of top water level

Note 1: Where the pressure in a main exceeds 600 kPa, Council may require the installation of Pressure Reducing Valves (PRV) that may (at Council’s discretion) include telemetry control. Prior to proceeding with any design, Council shall be provided with details of the area affected and the number of lots involved.

Note 2: On some sites with varying topography, parts of the subdivision may exceed the maximum pressure criteria. Council may consider an application for dispensation where the following applies:

- a. Where Council considers it impractical to include a PRV for operational reasons
- b. Where the number of lots to be serviced by the PRV is less than 10 lots
- c. Pressure exceedance is not greater than 70m.

The consultant should submit a report and associated recommendations for consideration by council. As a minimum the report should include:

- a. Reasons for dispensation
- b. details of the pressure zones, lots affected and pressure management.

3. Fire Fighting Parameters

Category	Fireflow Requirement	Number & Duration	Residual Pressure
Small Community (Planning Guidelines for Water Supply and sewerage)	7.5L/s for 2 hrs	1 @ 2 hours	>12m at node 6m elsewhere
Residential (i.e. Residential dwellings of a maximum of 3 storeys)	15 L/s for 2 hours	1 @ 2 hours	>12m at node 6m elsewhere
Commercial (i.e. Shop and office accommodation of a maximum of 3 storeys) and Industrial	30 L/s for 4 hours	1 @ 4 hours	>12m at node 6m elsewhere
High Risk (i.e. A development where there is a probability of a fire occurring or there is a high cost of resultant damage (personal injury or property))	To be determined in consultation with council. Alternative methods of provision may be required (i.e. on-site storage).	Adopt a special hazard or risk fire	
<p>Residual pressure is to be 12m minimum at an adjacent hydrant at the required background demand time, assuming that the elevation of the supply point is equal to the ground elevation at the hydrant. 6m minimum residual pressure is to be retained in the mains for all other areas of the water supply zone at the required background demand time. Positive residual pressures must exist at peak hour, within the reticulation during the fire event.</p> <p>Small community category – As defined and limited by the Planning Guidelines for Water Supply and Sewerage.</p>			

b. Background Demand

The following minimum criteria should be adopted for background demand during a fire event:

- **Predominantly Residential Areas**
 - The minimum residual pressure specified should be exceeded with a background demand of 2/3 Peak Hour demand
 - A check should be undertaken at Peak Hour demand to ensure that pressures in the network remain positive.
 - The calculated background demand should not be less than Average Day demand.
- **Predominantly Commercial / Industrial Areas – In this case, the following scenarios should be investigated with the worst case being adopted:**
 - At Peak Hour demand of the Commercial / Industrial area (e.g. between 10am to 4pm). The intent of this scenario is to assess the local reticulation performance.
 - At 2/3 Peak Hour demand of the water supply zone (e.g. around 6pm). The intent of this scenario is to assess the zone trunk performance.
- **Mixed Residential / Commercial / Industrial Areas – In such cases a combination of background demand conditions similar to the Predominantly Commercial / Industrial Areas above should be examined.**

c. On-lot Fire System

- i. The purpose of fire provision specified in this manual is to meet network level fire fighting requirements. Water supply network design in accordance with this manual is not intended to cater for individual property fire fighting flow requirements.
- ii. Water supply network designed in accordance with this manual is not intended to cater for individual property fire fighting flow requirements. Provision for on-lot fire fighting requirements is the responsibility of the Building Owner. Council does not guarantee a standard of service available from its mains for such fire fighting systems. While a hydrant test certificate may indicate the FNQROC desired standards of service were exceeded at the time of the test, it should not be assumed that this level of service will be available at all times and during a fire event. Selection, or adoption, of flows and pressures in excess of the FNQROC desired standards of service is at the owners/hydraulic consultants risk.
- iii. Council does not permit direct pumped connections to its water supply network for boosted fire systems unless otherwise approved. Council's preference is for a 'break tank' that will serve as a physical hydraulic separation between the pump operation and the upstream hydraulic impact on Council's system.
- iv. Any proposal to utilise boosted pumping directly from the mains must be supported by evidential justification that a 'break tank' is not able to be provided and a hydraulic analysis undertaken by a competent RPEQ confirming that the main is adequately protected from very low pressures (ground water intrusion and implosion) and excessive transient water pressures associated with pump and valve operation (water hammer)

4. Storage Parameters

Component	Sizing
Reservoirs (ground level)	3 (PD-MDMM) + (greater of Emergency Storage/Firefighting Storage)

5. Pump Parameters

Treated water pumps feeding a ground level reservoir	MDMM over 20 hours	
Standby pumps	Standby pump capacity to match the largest single unit pump capacity	
Reticulation booster pump station	PH + fireflow	
Pumped System	Peak instantaneous flow + fireflow	This situation may exist in smaller systems if variable speed pumps would replace any elevated storage. In these instances it would be necessary to calculate instantaneous flow based on concurrent demand. This would exceed PH by a significant margin.

6. Pipeline Parameters

Pipe capacity – Trunk & Reticulation Mains	Size for PH + Fire Flow
Friction Equation	Darcy-Weisbach
Maximum Velocity	2.5m/s Velocities up to 4.0m/s may be acceptable during fire flows
Minimum Velocity	N/A

7. Headloss Calculations

For headloss calculations, the Darcy-Weisbach model is generally used.

Absolute roughness values for all materials

Pipe Material	Absolute Roughness K (mm) ()
Asbestos Cement	0.3
Plastic (UPVC, MDPE, Hobas etc)	0.15
MSCL/DICL	0.6
CICL	0.6

8. Road Crossings

1. Road crossings shall be minimum 100mm diameter.
2. All road crossings shall be constructed in Ductile Iron Cement Lined pipe (Note:DSC accept PVC).
3. All road crossings under Industrial Roads, Collector roads or higher order roads shall be constructed with an isolation valve each side of the road.
4. Water road crossings are not to be directionally drilled unless otherwise approved by Council for the specific site.
5. For a water main crossing of an existing road of standard width, works are to be undertaken by Council unless otherwise agreed. These works are at the developer's expense.

9. Creek Crossings

1. Creek crossings are to be in DICL or PE (pipe class to be confirmed with Council).
2. An arborist report is to be prepared to assess the risk associated with trees within 10m either side of the water main alignment.

D6.08 DEDICATION OF LAND, EASEMENTS & PERMITS TO ENTER

1. General Infrastructure

- a. All pumping stations, booster stations, storage tanks, reservoirs, water towers and the like are to be located on freehold land that is owned by or will be dedicated to Council at the time of plan sealing, except that small pumping stations may, with State Government's approval, be located in

land that is or will become road reserve. This land shall be provided to Council at no cost as freehold and zoned for water infrastructure purposes.

- b. Pumping Stations not sited beside a road reserve are to be provided with a 5-metre wide access transferred to Council as freehold.

2. Pipelines

- a. When pipelines and appurtenances relating to pipelines are constructed in land other than in what is or will become, a dedicated road reserve or property owned by Council, Council requires easements to be registered in its favour over all such pipelines and appurtenances:
 - i. Easements shall be minimum of 3 metres wide and located centrally over the pipeline. Mains are to be no closer than 1 m from an easement boundary.
 - ii. In the event that works are to be constructed through properties not under the control of the Developer, the Developer shall submit with the Operational works Application:
 - iii. A 'Permit To Enter & Construct' letter, signed by each property owner through whose property the infrastructure is to be constructed, consenting to the construction of the works.
 - iv. Where the property is owned or to be dedicated to Council approval of the relevant section of Council that will manage the property.
 - v. Proof of the registration of easements in favour of Council as specified above.
 - vi. All water mains in Community Purpose Land i.e. state reserve

D6.09 RURAL AND RURAL RESIDENTIAL DEVELOPMENTS

1. Where a development is approved subject to the provision of domestic water supply from an underground source to service individual lots, water bores shall be installed in accordance with the "Minimum Construction Requirements for Water Bores in Australia" booklet as published by the Agriculture and Resource Management Council of Australia and New Zealand and to the satisfaction of Council.
2. Aerial crossings shall be constructed with DICL or stainless steel.
3. Bores must produce a minimum sustainable yield of one litre per second as determined by a 4 hour pump test in accordance with AS 2368 "Test Pumping of Water Wells" and pump test analysis, including observations of potential interference between bores, by a person qualified in groundwater hydrology.
4. Water samples must be collected from the bores in accordance with AS 2368 and analysed by a N.A.T.A. registered laboratory or other laboratory as approved by Council. Water must be chemically suitable for human consumption in accordance with the "Australian Drinking Water Guidelines" issued by National Health and Medical Research Council.
5. The placement of the bore must be determined by an appropriately qualified person and shall be positioned in conjunction with the placement of any on-site wastewater disposal system to be used on the allotment.
6. Boreholes shall be cased and sealed at its surface to prevent the inflow of contaminated surface water.
7. Maximum bores casements size shall be 125mm in diameter.
8. Bores shall be sunk to a minimum depth of 60 metres, or until the bore reaches bedrock.

9. The development must have adequate water and access to that water for fire fighting services acceptable to the rural fire services and/or Queensland Fire and Rescue Service.
10. In rural residential areas, where subdivision of lots is proposed (reconfiguration for densification), rider mains are also required by the developer/applicant in accordance with Appendix A5.8. In this case, the rider main must be placed across the full length of frontage to provide connection points for densification on both sides (each side) of the developer lot(s). Should a rider main exist on one or both sides of the lot(s), the developer is required to connect to that rider main as well as providing full frontage coverage.
11. In rural residential areas a subdivision development with more than 20 lots is to be provided with at least two feeds for security of supply.

D6.10 RETICULATION NETWORK , TRC, CRC, CCRC, MSC

1. All water mains shall be laid on a standard alignment specific to the relevant local authorities requirements and unless directed otherwise alignments shall be in accordance with Table D6.2. For Cairns Regional Council, where water reticulation is to be laid on non-standard alignment, marker balls are to be used at changes in direction and at 50 metre spacing.
2. Bending of pipes is not permitted notwithstanding any clause to the contrary in the CTM Code.

Table D6.2 Standard Alignments

Local Authority	Urban ¹	Rural ¹
Cairns Regional Council Verge less than 4.5m Verge 4.5m or greater	2.8m 2.8m (potable) 3.2m (recycled) Refer to drawing S1010 CRC for Public Utilities alignments	1.5m offset from edge of carriageway.
Cassowary Coast Regional Council	2.8m	2.1m – 2.8m
Cook Shire	1.5m	
Mareeba Shire	2.0m	2.0m
TRC	2.5m(Rural) 2.8m(Urban)	2.5m
Notes 1. All offset dimensions shall be from the real property boundary unless noted otherwise.		

D6.11 COVER

1. Unless noted otherwise on the approved Project Drawings the minimum depth of cover to be provided for mains shall be as follows:

- Verge, Parks etc. - 600mm
- Under Kerbed Roads - 800mm
- Under un-kerbed Roads - 900mm

Where the above minimum cover cannot be achieved, the following treatment options may be used, subject to approval from Council:

Scenario	1	2	3
Cover – refer to Note 2 on S2016	Less than minimum	Less than minimum	Less than minimum
Pipe Material	AC	PVC, PE	DICL
Treatment Option 1	Replace in DICL and marker tape and sand	Replace in DICL and marker tape and sand	marker tape and sand
Treatment Option 2		Replace in PVC, PE with steel envelope pipe <i>(for rider mains only)</i>	
Treatment Option 3	Replace and lower main below service depth < 1.5m	Lower main below service depth < 1.5m	

D6.12 HYDRANTS

1. Hydrants shall be installed for fire-fighting purposes on all potable water mains unless approved otherwise by Council.
2. Generally hydrants shall be at 80m maximum centres for all areas and wherever possible located opposite allotment boundaries, and at every second allotment boundary for Rural and Rural-Residential allotments.
3. Hydrants shall be located at ends of lines in cul-de-sacs opposite the nearest allotment boundary.
4. Hydrants shall be located near access legs of battle-axe or hatchet shaped allotments.
5. Staged developments resulting in temporary dead ends shall have a hydrant located within close proximity to the end of line to enable maintenance flushing.
6. In undulating areas, hydrants should also be positioned at all high and low points of the main.
7. Hydrants shall be constructed in accordance with Standard Drawing S2005.

D6.13 VALVES

1. Valves shall be located opposite the first truncation point at a three-way intersection; or opposite the nearest allotment boundary.

2. All valves shall be located within the verge. Valves shall only be located within the road carriageway where specifically approved by Council.
3. Valves shall be installed where necessary to isolate sections of the system for maintenance purposes such that maintenance can be carried out causing minimum inconvenience and disturbance to the consumers. Generally the maximum number of houses inconvenienced should be no greater than 20.
4. Cul-de-sacs shall have an isolation valve if more than 4 lots are served.
5. At tee junctions a valve shall be located on all legs of the tee. A hydrant shall be located in between the tee and the valve on one of the legs so the hydrant can serve as a dead end flush point for all off takes. .
6. The maximum spacing between isolation valves shall be 300m.
7. In higher density areas the spacing of isolation valves may be reduced to the requirement of the Council.
8. Valves shall be constructed in accordance with Standard Drawing S2000.
9. Pressure reducing valves or other types of control valves are to have the set points identified on the drawings and in the hydraulic analysis report

D6.14 IRRIGATION

1. All irrigation systems connected to Council's water supply shall be installed to satisfaction of Council. The installation of water meters, backflow prevention device and isolation valves are mandatory in all irrigation system. Refer Design Manual D9 Landscaping for design of irrigation systems.
2. A hydraulic design certificate is required for the irrigation system and to ascertain the required service size.
3. All irrigation connections to Council's water network (existing or proposed) must be completed by Council, at the developers costs, or if the council permits, an approved subcontractors or under council supervision at the developer's cost.

D6.15 BUILDING OVER OR NEAR WATER INFRASTRUCTURE

Purpose

1. This section is provided in the development manual to assist developers and property owners understand Council's requirements for building work near Council's water assets and the constraints that may apply to such building work.
2. Any building or structure near Council's water assets is at risk of being impacted or damaged by a burst or failure. The location of buildings and structures in close proximity to water assets can also obstruct Council's access to the infrastructure, delay restoration of services and increases the maintenance cost to Council.

General

3. All buildings and structures including ancillary structures such as decks, garages and the like are **not permitted** over water mains. The prohibition of building work over water infrastructure is due to the pipes being pressurised (i.e. not passive like gravity sewerage infrastructure) and to ensure the water mains can be maintained unobstructed and the water supply restored quickly.

4. Building work located within 5m of water mains is subject to the requirements of this section.
5. Section 192 of the Water Supply Safety and Reliability Act (WSSRA) requires that written consent of the Water Service Provider be obtained for any person to interfere with a service providers infrastructure including build over, interfere with access to, increase or reduce cover over, or change the surface of the land in any way causing ponding of water over an access chamber.
6. An Application for Building over Water Mains will be required to be submitted to Council unless the works are assessable and comply with the acceptable solutions in the Queensland Development Code (QDC) MP1.4.

Note: Where a Development Approval or Operational Works Approval (OWA) has been issued any instances of building over or near water infrastructure would still be subject to a separate building over water Mains approval unless specifically noted otherwise in the OWA.

7. The Water Service Providers consent under Section 192 of WSSRA is not required if the building work is assessable under and complies with the Queensland Development Code MP1.4. "Building over or near relevant infrastructure". Note: MP1.4 is limited in its application and only provides acceptable solutions for Class 1 buildings (e.g. houses) and Class 10 buildings (e.g. sheds) or structures (e.g. retaining walls).
8. Referral to the Water Service Provider would still be required under MP1.4 in the following instances:
 - a) For work that does not comply with an acceptable solution for the performance criteria in MP 1.4, and
 - b) For alternative solutions for Class 1 and Class 10 buildings or structures.

This consent shall be considered as the referral agency response under section 4 of the QDC MP1.4.

9. Definition of building "over" or "near" Council infrastructure is given in the following table:-

"over"	any work located directly over the footprint of the pipe.
"near"	any building work (assessable under this section) located near the pipe as measured by the greater of:- <ul style="list-style-type: none"> • 5m from the centreline of the pipe; or • the zone of influence of the pipe where the zone of influence is determined by a line along the angle of repose to ground level from a point measured 300mm below the pipe invert.

Building work on an adjacent lot to where the water main is located are also subject to the requirements in this section.

10. It is recommended that the applicant meet with Council prior to lodging a building over water main application to confirm requirements and discuss building options. Note: When a building is assessable under and complies with the QDC MP1.4 it is not necessary to meet with Council.
11. Building work within a water supply easement (or combined services easement) maybe considered subject to the building work complying with the requirements set out in this section and any other relevant requirements deemed reasonable by Council at the time of approval. All building work within a water supply

easement is to be subject to written approval by Council. *(note: in the instance of combined services easements approvals are to be obtained from all relevant asset owners.)*

12. For any proposal to build near water mains, the applicant will be required to demonstrate how access to the water mains for maintenance purposes can be practically undertaken and the impacts to the building/structure is minimized in the event of a burst water main.
13. Clearances and acceptable solutions for building work located over or near water mains are to generally be in accordance with performance criteria and the acceptable solutions of the Queensland Development Code MP1.4 "Building over or near relevant infrastructure". For 225DN and trunk infrastructure Council may impose additional requirements to those set out in QDC MP1.4. Council will consider the function of the main, depth, size and access/maintenance requirements in determining the minimum clearance required.

Requirements for Building Near Water Mains

14. Where building works are within 1.5m of the water main and the pipe material is not DICL (i.e. AC, uPVC etc.) then it is to be replaced in DICL. Alternatively the water main is to be relocated.
15. Building footings are to be designed to comply with the acceptable solutions of the Queensland Development Code MP 1.4.
16. Structural certificates (i.e. Form 15 and 16) are to be provided for the design and construction of the footings.
17. Where the water main is located within private land an easement of 3m width is to be registered over the water main at the developer's expense where the building is within 1.5m of the water main. When a building encroachment occurs the easement document is to include a special clause making the property owner responsible for the reinstatement costs of the building in the event the building is damaged by a burst water main or where Council has to demolish any part of the building to gain access to the water main.
18. Submission of an as-constructed drawing if the water main has been altered.
19. When making an application for building over water main the following is to be supplied with the application:
 - a) A plan showing the location of the water main in relation to the building walls and footings.
 - b) A section showing the actual levels of building elements in relation to the water main invert level and horizontal and vertical clearances.
 - c) Certification by a structural engineer that the footing design complies with the acceptable solutions of QDC MP1.4

PUMP STATIONS

D6.16 GENERAL

1. Pump stations shall be subject to specific requirements and any design guidelines of the local authority. Council should be consulted prior to design to confirm the specific requirements for pumps, electrical, switchboards, telemetry, etc.
2. Council acceptance of pump station design does not relieve the Consulting Engineer of responsibility for the correctness of the design.

D6.17 PUMP STATIONS^{CRC}

1. Pump stations are to be contained in an above ground structure in accordance with S2040 and S2041. The structure is to be constructed from reinforced masonry block and/or reinforced concrete. The structure is to be sized to allow for adequate internal access to all items for operational control but particularly for maintenance works. Openings will allow the easy reach and replacement of the largest item contained in the pump station. The use of multistage/centrifugal pumps is preferred. Approval shall be obtained for the use of other types of pumps and is at council's discretion.
2. A back-up power supply is to be provided either by a generator or diesel pump unless a five (5) day reservoir capacity is provided; this may include provision for a three phase inlet to allow the connection of a mobile generator unit, at council's discretion. Suitable arrangements for ducting airflow to the generator/diesel pump and the disposal of exhaust gases so as not to create a nuisance is required. Sufficient fuel is to be stored to operate for 12 hours at rated load.
3. Noise suppression is to be addressed and incorporated into the pumps station design. The pump station design is to comply with the Environmental Protection Act during normal use.
4. The tenure of property on which pump stations and access roads are situated are to be transferred to Council as freehold title. Pump station sites are not to encroach upon gazetted road areas unless otherwise approved by Council.
5. Access to the pump station site is to be via an appropriate standard sealed access and the pump station site is to accommodate maintenance vehicles and their manoeuvring.
6. Internal and external pump station materials and surfaces are to be finished as approved by council.
7. Factory Acceptance testing of switchboards is to be undertaken and the designer is to arrange a suitable time and date with Council for testing prior to installation on site.
8. Underground consumer mains shall be installed in conduits between the electricity supply company's off-take point and the pumping station switchboard.
9. Asset identification plates (tagging) are to be attached to equipment i.e. switchboards, wet wells, pumps, flowmeter, generator, pipes and valves etc. Confirm asset tagging requirements with the Local Authority.
10. The analogue flow-sensing element is to be installed inside the pumping station valve pit and its associated flow transmitter will be installed within the pump house where it can be interfaced in with the SCADA for remote monitoring.
11. Scour and air valve structures are not to be constructed within private property.

D6.18 TELEMETRY SYSTEMS TRC, MSC, DSC, CRC

1. Where required by the Local Authority pump station control panel shall incorporate SCADA equipment for transmission of monitoring data and control to Council's existing master system. Council should be contacted to obtain a copy of their Technical Specification for Telemetry Systems and any design guidelines.
2. It should be noted that where amalgamated Councils have varying telemetry systems, left over from pre-amalgamation Councils, pump station telemetry systems and requirements may vary within that Council and requirements must therefore be reconfirmed as a part of the design

D6.19 ALTERNATIVE WATER PUMPING SYSTEMS

Alternative water pumping systems to provide increased pressures and flows to individual developments in lieu of a water storage reservoir may be considered by Council. Such systems should generally include a number of centrifugal pumps installed in parallel and coordinated by a pump controller, which senses, and responds to water demand. The controller shall also regulate the pump speed to give a graduated increase or decrease in the volume of water being supplied and evenly shares the work between pump units.

1. In general, Council will only permit the use of such booster pump stations where all of the following conditions apply:
 - a. Where Council considers it impractical to build a storage reservoir for topographical, geotechnical, or aesthetic reasons.
 - b. Where a reservoir would service only that particular development
 - c. Where the number of lots to be serviced by the booster pump station is less than 25
 - d. Where the booster pump station building can be blended with the architectural style of residences within the development.
2. The consultant should submit an initial report and associated recommendations for consideration by Council prior to any detailed design. As a minimum the report should include:
 - a. Reason for and benefits to the community based on the total life cycle costs of an alternative water pumping system;
 - b. Connection points to the existing system;
 - c. Water supply schematic plan
 - d. Maintenance issues
 - e. Environmental reasons

D6.20 DUAL WATER SUPPLY SYSTEMS

1. The Dual Water Supply System aligns to the latest edition of the WSAA Water Supply Code WSA 03-2011 and the FNQROC Amendments to the above.
2. The Amendments describe FNQROC's specific requirements for Dual Water Supply System works up to and including DN 300 that vary from, or are additional to those detailed in the WSA 03 – 2011 – Water Supply Code of Australia

3. Minimum domestic demand pressure requirements as specified in D6.07 will apply to Dual Water Supply Systems, unless written approval is obtained from council for an alternative pressure requirement.

D6.21 PRIVATE BOOSTERS ^{CSC}

1. Written approval for the use of private boosters must be obtained from Council.

D6.22 CONDUITS

1. A conduit shall be provided to all landscaped or grassed Medians, Traffic Islands and Roundabout islands to facilitate a future water service connection for landscaping purposes.
2. Where the length of a median exceeds 50m, conduits shall be provided at 50m centres. At roundabouts and channelised intersections the conduit layout should enable all landscape islands to be connected to a single water service connection.
3. Conduits under roadways shall be a minimum 100mm dia. uPVC Class 9 sealed each end with push-on caps.
4. Cover to conduits under roads shall be 600mm minimum or 100mm below subgrade, whichever is the greater.
5. The position of all conduits under roadways shall be clearly marked by the casting a non-ferrous cuphead bolt into of the top of the kerb.
6. Where concrete footpaths are constructed on the road verge and the future water service connections are not being provided, a conduit shall be provided under the footpath near to both side boundaries to facilitate the future installation of water services. Where it is located on the same side as the electricity supply then the conduit shall be 1.5m away from pillar box.
7. Conduits under footpaths shall be a minimum 100mm dia. uPVC Class 6 with 300mm cover and are to extend 300mm past the edge of the footpath. The position of all conduits under footpaths shall be clearly marked by casting a non-ferrous cuphead bolt into the property side of the footpath while the concrete is wet.

APPENDIX A

ADDENDUM TO CTM Water Services Design and Construction Code Part B Water

Version 1.0 August 2019

APPENDIX A - Addendum to CTM Water Services Design and Construction Code Part B Water – Version 1.0 August 2019

2.1 SYSTEM PLANNING PROCESS

2.1.1 Extending/Upgrading an Existing Water Supply Scheme

Where a water supply network simulation model exists Council shall assess the impacts of the proposed development on the existing water supply system. The assessment shall be based on the details of the system extension provided by the Consulting Engineer.

2.3.2.1 Dual Water Supply

Council does not require recycled water reticulation and currently has no plan to incorporate recycled water into the network for supply purposes. Developers should contact Council to discuss the option of recycled water for non-drinking supply, however, this will be subject to Council approval.

2.5.6 Constant flow/trickle top up systems (SEQ Clause)

The use of flow/trickle top up systems is not permitted by council.

2.8 PUMPING STATIONS

2.8.3(c) Standby Arrangements:

Council requires standby pump units to be provided. The standby capacity shall be as directed by Council.

The power supply to pumping stations shall have 50% spare capacity for future upgrading and be electrically configured such that the pumping station can operate from a permanent on site emergency generator supply at times of power failure (thus, a provision of space in the switchboard for a manual ATS change over panel is required).

2.9 SERVICE RESERVOIRS

Refer to Section D6.07 – Design Criteria of this Manual for storage parameters.

3.1.3 Empirical sizing of reticulation mains

Table 3.2 is not to be used for sizing of reticulation mains. Refer to Section D6.07 – Design Criteria of this Manual for population and design flow requirements.

3.8 PIPELINE COMPONENTS MINIMUM PRESSURE CLASS

Pipes used for water mains shall comply with the following table.

Nominal Size DN	Type of Pipe	Class of Pipe
63	MDPE	Series 1 PE100 – SDR11 MIN PN 16 ³
100 150, 225,300	PVC, PVC-M & PVC-O	Series 2 MIN PN16
100, 150, 225, 300	Ductile Iron	PN35, K12

Notes: 1) Where ductile iron is used above ground, the minimum class required will be PN35.

2) Where required by Council, a lining material may be required to restrict the loss of lining due to calcium leaching.

3) Subject to the oxidative reductive potential of the water being determined, and an appropriate determination on of class of pipe being specified by the designing engineer.

5.1.1 Design Tolerances

Horizontal alignment shall be referenced to the MGA co-ordinate system.

5.4.1 General

The location and alignment of water mains shall generally be in accordance Table D6.2

5.4.2.2 Locations in Footpaths

Refer to Table D6.2 Standard Alignments in FNQROC D6 Design Manual for Water Reticulation.

5.11.8 Property Service Meters

Refer to Drawing S2038 in FNQROC.

5.6 SHARED TRENCHING

Shared trenching shall not be specified without prior approval of Council.

5.8 RIDER MAINS

1. Properties located on the opposite side of the road to the water reticulation main shall be serviced by a nominal 50mm diameter (63 OD Polyethylene) loop main designed in accordance with the following criteria:
 - Maximum number of properties served to be 15 allotments.
 - All road crossings to be 100m diameter.

2. Unless otherwise approved all loop mains shall be Class 16 Polyethylene, subject to the oxidative reductive potential of the water being determined and an appropriate determination on of class of pipe being specified by the designing engineer.

5.9 CONNECTION OF NEW MAINS TO EXISTING MAINS

The connection of new water reticulation to Councils existing system is to be at the Developer's expense.

Council staff shall undertake all connections to Council's water infrastructure. The Contractor shall not carry out the connection unless Council gives special approval in exceptional circumstances.

5.10.1 Permanent ends of water mains

1. Dead Ends to water mains should be avoided. However, should Dead Ends be unavoidable, the following facilities shall be constructed to facilitate scouring of the lines;
 - For mains 100mm diameter or greater a hydrant shall be positioned at the end of the line.
 - For mains of 50mm diameter, a 50mm valve shall be installed to the end of line with a 50mm flushing line extended to the adjacent kerb and channel.

8.8.4 Hydrant types

Hydrants shall be the spring hydrant "Maxi Flow" 2000 type (DN80) manufactured in accordance with AS 3952 by an Australian Standards quality endorsed company. Hydrants are to be coated with a thermosetting epoxy powder to AS 2638 and AS 3952.

8.8.8 Hydrant Spacing

- a) Hydrants should be installed for fire-fighting purposes on all mains unless approved otherwise by council
- b) Generally, hydrants are to be at 80 metres maximum centres for all urban areas and where ever possible, located opposite allotment boundaries, and at every second allotment boundary for Rural, Rural Residential and Low Density Residential allotments. Care should be taken to ensure there is no clash with other services such as light poles.
- c) Hydrants are to be located at ends of lines in cul-de-sacs opposite the nearest allotment boundary.
- d) Hydrants are to be located near access legs of battle-axe or hatchet shaped allotments.
- e) Staged developments resulting in temporary dead ends are to have a hydrant located within close proximity to the end of line to enable maintenance flushing.
- f) In undulating areas, hydrants should also be positioned at all high and low points of the main.
- g) Hydrants are to be constructed in accordance with Standard Drawing S2005.
- h) Locate Hydrants within 90 m of Property sites. This may require the construction of private fire mains.

9.4 RECORDING OF WORK AS-CONSTRUCTED INFORMATION

As constructed information shall conform to Section CP1 – Operational Works Construction Procedures of the FNQROC Development Manual.

15.2.3 Curving of Pipe

Curving of PE pipes is permitted. Bending of all other pipes is not permitted.

APPENDIX B

ADDENDUM TO DUAL WATER SUPPLY SYSTEMS

WSA 03-11

APPENDIX B – Addendum to Dual Water Supply Systems – WSA 03-2011**NWD 2.2 Water Supply Mains – Drinking Water**

Buried appurtenances shall be colour coded blue.

NWD 2.3 Water Supply Mains – Non-Drinking Water

Buried appurtenances shall be colour coded lilac.

NWD 3.1 Design – Demands

Fire fighting demands shall be provided from the drinking water mains.

NWD 3.4 Cross-Connections between Drinking and Non-Drinking Water Supply Systems.

No cross-connections, either permanent or temporary, shall be installed between drinking and non-drinking water supply systems downstream of Councils headwork storages without prior council approval.

NWD 3.4.2 Temporary Cross-Connections

No temporary cross-sections shall be installed downstream of Councils headwork storages without prior council approval.

NWD 3.5 Sizing of Mains

The sizing of external non-drinking water mains shall be undertaken by the Consulting Engineer.

The standard sizes for non-drinking water mains shall be the same as the standard sizes for drinking water mains.

NWD 3.7 Location of Mains

Water mains shall be laid in the water main allocation shown on Drawing S1010. Where the non-drinking water mains and drinking water mains are laid in the same footpath, the drinking water main shall be laid nearest to the property boundary. Access to the valve and pipe need to be clear of the footpath.

NWD 3.8 Main Depths

The depths of non-drinking water mains shall comply with the requirements for drinking water mains.

NWD 3.10 Property Services

The size of non-drinking water property services shall be DN20 or DN25 as agreed with Council.

Where non-drinking water and drinking water property services are laid across a road at a common location, the services shall be placed in a common DN100 conduit.

Meters for the non-drinking water shall be placed above ground.

NWD 3.12 Hydrants

Hydrants shall only be installed on the drinking water mains. Flushing points shall be provided on the non drinking main, at all ends of line and cul-de-sac heads. Flushing points shall consist of an isolation valve and camlock coupling with dust cap.

NDW 3.18 Identification Markers and Marker Posts

Identification markers for the components for the non-drinking water network shall comply with that specified for drinking water components except that:

The hydrant road pavement markers shall be purple.

Where there is no road pavement adjacent to hydrants, posts with reflective indicator plates shall be installed similar to that for the hydrants marker posts on drinking water mains.

All marker posts for the non-drinking water components shall have the letters NDW added to the lettering on the indicator plates and the top of the marker posts painted purple.

NWD 7.1 Tapping of Mains

Tapping of non-drinking water mains shall be carried out to the same requirements as specified for tapping of drinking water mains.

NWD 8.3 Independent testing of Reticulation Main

The test pressure for non-drinking water property services shall be 1.2 MPa.