



FNQROC DEVELOPMENT MANUAL

DESIGN MANUAL

D7

SEWERAGE SYSTEM

Version No. – 11/19

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GENERAL

D7.01 SCOPE

1. This document sets out the minimum standards for the planning and design of sewer reticulation systems that are to be constructed by a Developer and handed to Council to operate. This section also covers private infrastructure that needs to be to Council standards.
2. The sewer reticulation system shall be defined as gravity sewers of 150mm and 225mm diameter, used to collect and convey sewage from properties. Designs for sewers larger than 225mm diameter shall be subject to specific criteria nominated by the Council. All sewers 225mm diameter or less shall be in accordance with this manual. This definition of sewer reticulation systems applies only to this FNQROC Sewerage Design Manual and Specification and is independent of the definition of trunk infrastructure as relates to trunk infrastructure charges.
3. The planning, design, construction and certification of infrastructure is to be carried out in accordance with the following provisions in order of precedence:-
 - a) Council's criteria as set out in this manual and Council's Standard Specifications and Drawings; and
 - b) Any relevant criteria contained within the CTM Water Alliance Design and Construction Code identified in D7.04 which is applicable to Rubber Ring Joint Gravity systems – refer appendix A; and
 - c) The criteria contained within the Water Services Association of Australia (WSAA) publications identified in D7.04. While vacuum and pressure sewer scheme WSA codes are listed, they are still considered unconventional infrastructure – refer D7.07; and
 - d) For general guidance on infrastructure elements not contained within council's documentation, the criteria contained with the relevant State Government Department Planning Guidelines for Water Supply and Sewerage may be used for guidance.
4. Aspects of modification or clarification of the CTM Water Alliance Design and Construction Code are detailed in Appendix A of this manual.
5. Aspects of modification or clarification of the Water Services Association of Australia codes are detailed in Appendix B of this manual.
6. Smart Sewers are considered Unconventional Infrastructure
7. Smart Sewer planning, design, construction and certification may be carried out in accordance with CTM Water Alliance Design and Construction Code. The design criteria shall be confirmed with Council prior to commencement of detailed design.

D7.02 GENERAL

1. It is the Consulting Engineer's responsibility to ensure that the current version of FNQROC Development Manual 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. FNQROC Specification S6 (Sewerage 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.

D7.03 OBJECTIVE

1. The objective of the sewerage system is to transport sewage from domestic, commercial and industrial properties using gravity flow pipes and, where this is uneconomic, by pumping to the treatment plant.
2. While various options can be determined that meet the minimum technical requirements, the selected option should represent the least whole of life cost. To achieve the optimum solution will require sewerage reticulation issues to be considered at the commencement of the planning process and to integrate with other planning issues, and not be considered an end of process infrastructure provision exercise.

D7.04 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 of Australia (WSAA)

Australian Standards

- AS 1547 On-site domestic wastewater management
- AS 3500 National Plumbing and Drainage Code

Council Approved Products Register

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

Cairns Regional Council

- Design Guideline Switchboards
- Design Guideline Sewage Pumping Stations

QLD Government Legislation

- Water Supply (Safety and Reliability) Act
- Plumbing and Drainage Act
- Queensland Plumbing and Wastewater Code
- Planning Act

Queensland Development Code

Water Services Association of Australia

- WSA 02-2014 Sewerage Code of Australia
- WSA 04-2005 Sewerage Pumping Station Code of Australia
- WSA 05-2013 Conduit Reporting Code of Australia
- WSA 06-2008 Vacuum Sewerage Code of Australia
- WSA 07-2007 Pressure Sewerage Code of Australia
- WSA 01-2004 Polyethylene Pipeline Code

Department of Environment and Resource Management

- Planning Guidelines for Water Supply and Sewerage

SEQ Water Supply and Sewerage Design and Construction Code. (www.seqcode.com.au)

- NuSewers Design and Construction Specification – NuSewers Edition V.6

DESIGN CRITERIA

D7.05 GENERAL

1. Sewers shall be designed to accommodate flows from upstream catchments, calculated on the basis of future development in accordance with Council's Planning Scheme, and accordingly, shall be extended to the upstream boundary(ies) of the proposed development (where required) to service upstream properties with the least whole of life cost. Designers should consult with Council to confirm location of any future connections points, details of any planned augmentation works and sewerage catchment areas.
2. Council approval of sewerage reticulation does not relieve the Consulting Engineer of responsibility for the correctness of the design.
3. 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. Refer to Application Procedures.
4. The designer is required to demonstrate that there is sufficient capacity in the downstream sewerage network, from the proposed connection point to the nearest downstream trunk sewer.

D7.06 EXISTING SEWERS

1. Prior to proceeding with the design, the designer shall obtain from Council' "As Constructed" sewer information relevant to the proposed development and confirm point(s) for connection.
2. Works associated with some developments can impact on existing mains. Where as a result of the development an existing main has inadequate cover, it shall be reconstructed with a material approved by the Council or such other alternate protection measures deemed necessary by Council. Subsequent to construction, CCTV footage taken after the completion of works in accordance with this Manual are to be submitted to Council.
3. Where finished surface levels around existing manhole covers are altered, the manhole shall be reconstructed to conform with the requirements of this manual.
4. All connections or alterations to Council sewerage network, shall be made by Council at the Developers cost. It may be possible for some works to be performed by the contractor under special circumstances and subject to appropriate conditions agreed to with Council.

D7.07 UNCONVENTIONAL INFRASTRUCTURE

1. Conventional infrastructure includes gravity sewers, lift stations, pumping stations and pressure (rising) mains. The use of unconventional infrastructure shall require special approval and may require extended maintenance periods and a higher value for performance bonds. Unconventional infrastructure includes smart sewers, small bore systems of any kind, including vacuum systems, hybrid low pressure systems, common effluent drainage systems, grinder pumps serving small clusters of properties and the like, and any other unconventional or unusual systems.

2. In unconventional systems, Council may not have design criteria. Accordingly proposals will be considered on the basis of best engineering practice and are to be subject to a lifetime benefit cost analysis.
3. If unconventional infrastructure is proposed the Consultant shall submit an initial report and associated recommendations for consideration by Council prior to any detailed design. The report should include as a minimum:
 - a. Description of proposed infrastructure.
 - b. Reasons for departing from Conventional systems.
 - c. Reasons for and cost benefits to Council.
 - d. Connection points to existing system
 - e. Schematic layout plan
 - f. Maintenance and operational issues.
4. Subject to Council's assessment of the Consultant's initial report and prior to any detailed design, Council may engage an independent Consultant to act for Council in assessing the initial report and to recommend suitable system parameters. All costs associated with the engagement of the independent Consultant shall be at the Developers expense.
5. Any subsequent designs of infrastructure shall be planned to satisfy the requirements to meet Council Customer Service Standards, which are published pursuant to the requirements of the Water Supply (Safety and reliability) Act, at a minimum whole-of-life cost (capital cost, operational and maintenance cost) for an environmentally acceptable solution and not simply a least capital cost solution.

D7.08 DESIGN CRITERIA

1. Capacity

- a. Population estimates shall be based on those equivalent demands detailed in Table 7.1

Table 7.1 Equivalent Demands

Description	Equivalent Persons/Connection
Single Family Dwelling	
Lot > 1500m ²	3.7
Lot 1101m ² to 1500m 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 x no. bedrooms)
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

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 for that land use, or estimation of maximum allowable density agreed with Council prior to design

- b. The minimum pipe capacity shall be based on the criteria detailed in Table 7.2

Table 7.2 Sewerage Loading

1	Average Dry Weather Flow (ADWF)	270 L / EP / d	Based upon analysis of pump station flows and STP inflow records during dry weather
2	Peak Wet Weather Flow (PWWF)	5 x ADWF or C ₁ x ADWF whichever is greater	C ₁ Peaking Factor = 15 x (EP) ^{-0.1587} Minimum Value C ₁ to be 3.5
3	Peak Dry Weather Flow (PDWF)	C ₂ x ADWF	C ₂ Peaking Factor = 4.7 x (EP) ^{-0.105}
4	Vacuum Sewer Peak wet weather flow (PWWF)	4xADWF	Peaking factor of 4
5	Smart Sewer Peak wet weather flow (PWWF)	4xADWF	Peaking factor of 4

2. Pipe Velocity

- a. Pipe velocities shall be based on the details shown in Table 7.3

Table 7.3 Pipe Velocities

Design Criteria	Recommended value
Mannings 'n' (PVC)	0.0128
Mannings 'n' (Poly)	0.0128
Minimum velocity @ PWWF	0.7 m/s
Minimum velocity @ PDWF	0.3 m/s
Depth of Flow @ PWWF – Proposed sewers	Max Flow depth shall not exceed ¾ pipe full

3. Minimum Grades

- a. Minimum grades for sewer reticulation mains are to be as summarised in Table 7.4.

Table 7.4 Minimum Grades for Gravity Sewers

Diameter	Minimum Grade
100mm – Property Connection Branches	1 in 60
150mm – Property Connection Branches	1 in 80
150mm – First MH length, head of sewer	1 in 100
- Second MH Length	1 in 150
- Remaining MH lengths (see note below)	1 in 150
225mm	1 in 290

Note:

1. Where deemed appropriate a minimum grade of 1 in 180 may be adopted for 150mm control sewers based on the following criteria:
 - The sewer is located in flat country (reclamation areas, canal estates) with resultant high water tables and associated excavation difficulties;
 - A minimum 20 EDC are serviced; and
 - The Consultant has obtained specific written approval from Council.
 2. Design of gravity sewers of diameter greater than 225mm shall be undertaken in consultation with Council.
4. Gravity Sewer Flows in Equivalent Domestic Connections
- a. Table 7.5 details the maximum allowable Equivalent Domestic Connections for various gravity sewer pipeline grades and diameters.

Table 7.5 Gravity Sewer Flows in Equivalent Domestic Connections

GRADE	150DIA	225DIA
570		
550		
500		
450		
420		
400		
350		
300		
290		549
250		591
200		661
180	236	697
150	259	763
125	284	836
100	317	935
75	366	1080
50	448	1322

5. Sewer Depths

- a. Minimum pipe cover over sewers shall be in accordance with CTM/SEQ Code Table 5.11
- b. Gravity sewerage clearance requirements shall be in accordance with CTM table 4.2
- c. Sewers shall be not greater than 3m deep unless approved by the Council.
- d. Where sewers are greater than 3m deep, the following requirements shall apply:
 - i. Submit calculations demonstrating sufficiency of the strength of the proposed pipe type and trenching condition.

6. All road crossings under Industrial roads, Collector roads or higher order roads where the sewer is less than 1.5 meters below the lowest point in the road cross section is to be in DICL for the full width of the road formation.

D7.09 SEWER ALIGNMENT ^{TRC, MSC}

1. The preferred, or standard, alignment of sewer lines in relation to property boundaries is presented in Table 7.6

Table 7.6 Preferred Alignment of Sewers

Location	Alignment
Carriageway	Not permitted, crossings only
Verge	1.6m subject to approval
Private Property (other than commercial) - Side and Rear boundary - Front boundary	0.8m inside allotment 1.5m inside allotment
Commercial Property - Front boundary	1.5m inside front of allotment

2. Where sewer lines are located along the road frontage of allotments, the preferred alignment is 1.5m inside the allotment. However, to reduce the number of manholes on curved roads and where truncations occur, the sewer alignment may be varied slightly subject to Council approval.
3. Where the allotment is located adjacent to a designated Council Park or Drainage Reserve, and the sewer is proposed to be constructed adjacent to the Park or Drainage Reserve boundary, the sewer shall be constructed on a 0.8m alignment and wholly within the Park or Drainage Reserve. Where the sewer is proposed to be located elsewhere in the park, approval for the location must be obtained from Council.
4. Where sewers are to be located within existing road reserves, the designer shall check that the sewers do not conflict with other utility services and locate the sewers to the satisfaction of Council and in accordance with the services clearances as set out in CTM Table 5.4
5. Where retaining walls are located on or near the boundary of allotments, sewers, property connection points, manholes etc. must not be constructed under or within the zone of influence of the retaining wall foundations. Consideration is to be given to the difficulty of maintenance excavation on the lower side of retaining walls and in these instances the sewer must be located in the road reserve.
6. Where access for persons is required, adequate clearance must be provided around access structures and property connection points. For access structures, an area within a 1.5 metre radius (on three sides to permit the set up and use of confined space equipment and other maintenance equipment such as jet rodders and remote cameras) must be provided around the central point of the facility .
7. Stubs must be extended a minimum of 0.5m past the property boundary.
8. Where benched sites are developed, sewers must be located on the lower side of the batter or retaining wall.

D7.10 MANHOLES

1. Manholes shall be placed on gravity sewers at the following locations:
 - a. At changes of pipe diameter;
 - b. At ends of lines where ends are more than 30m from previous manhole;
 - c. At ends of lines where the line depth is greater than 1.5m;
 - d. At end of lines servicing greater than two Property Connection Branches;
 - e. At council approved connections to trunk sewer;
 - f. At maximum spacing of 100m.
2. Manholes shall not be constructed across property boundaries. Minimum clearance from the edge of the manhole to the property boundary shall be 100mm.
3. The maximum change of angle through a manhole shall be 90° unless specifically approved otherwise by Council.
4. Manholes shall be constructed in accordance with the Standard Drawing S3000.
5. Rectangular covers shall be provided to manholes less than 1400mm deep measured from the top of the manhole cover to the obvert level of the outlet. This has been derived so that a minimum 1.0m high clear working space is available within the manhole.
6. Provide a flat area of 1.5metre radius around the manhole lid where manholes are located in batters. Where the manhole is located on the standard alignment to a side or rear boundary, provide a clear flat area on three sides.
7. Where practical, manholes are to be above the 1% AEP flood level. In the event this is not possible, bolt down manhole covers are to be used.

D7.11 COVERS AND SURROUNDS

1. See S6 Sewerage Reticulation Specifications for cover and surround requirements.

D7.12 DEDICATION OF LAND, EASEMENTS, AND PERMITS TO ENTER

1. General Infrastructure
 - a. All pumping stations, lift stations, storage tanks and the like are to be located on freehold land that is held by or will be transferred to Council at the time of plan sealing, except that lift stations, and 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 sewerage purposes.
 - b. Pumping Stations and lift stations that are not sited beside a road reserve are to be provided with a 5-metre wide access transferred to Council as freehold.
 - c. Dedicated or freehold land requirements shall include provision for the pump station setback as indicated in D7pump stations"
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 as follows:
 - i. All sewage rising (pressure) mains.
 - ii. All trunk sewers.
 - iii. All sewers in properties developed for commercial, industrial and 2 & 3 residential purposes.
 - iv. All sewers in residential properties, crossing body-corporate areas, and land subject to a development approval for residential subdivision that are not on a preferred alignment
 - v. All sewers where the depth to invert is greater than 3 metres,
 - vi. Where there will be retaining wall greater than 1 metre high,
 - vii. Where there are batters greater than 1m high and steeper than 1 on 3.
 - viii. All sewers in Community Purpose Land (I.e. state reserve)
- b) Easements shall be a minimum of 3m wide and located centrally over the pipeline, where no property boundary is common to any easement boundary. In the case where a pipeline is laid on a standard alignment from a proposed property boundary, the following criteria must be met:
 - i. The boundary of the lot and one boundary of the easement must be coincident
 - ii. Where the property boundary is to be created in the future, the boundary must be coincident to the easement boundary.
- c) Sewers are to be no closer than 1 m from an easement boundary except where the sewer is on a preferred alignment.
- d) 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:
 - i. 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.
 - ii. Where the property is owned or to be dedicated to Council approval of the relevant section of Council that will manage the property.
 - iii. Proof of the registration of easements in favour of Council as specified above.

D7.13 CREEK CROSSINGS

1. Where a sewer crossing of a water course is proposed, the sewer is to have 1.5m cover. All sewer creek crossings are to be in DICL. If the cover is less than 1.5m the sewer is to be concrete encased using CLSM type concrete. Regardless of the cover, if the water course is considered unstable and susceptible to erosion, the sewer should be in DICL and concrete encased using CLSM type concrete.

D7.14 PROPERTY CONNECTIONS ^{DSC}

1. Property connections shall be installed in accordance with Standard Drawing S3005 in all allotments.
2. Property connections should generally be located at the lowest corner of the allotment between 0.5 and 1.5m upstream of the allotment boundary or manhole.
3. Property connections will not be accepted within 0.5 m of a lot boundary.

4. Where sewers are greater than 1.5m deep then alternative property connection branch types should be considered such as y-branch and maintenance shafts. The use of alternatives should be confirmed with council prior to detailed design.
5. Property connections into maintenance shafts are not permitted unless in circumstances approved by Council and carried out in accordance with the manufacturer's instructions.
6. Combined Property Drains are not permitted in any development works.
7. For commercial / industrial premises, where the PCB is to be built over, a manhole is to be constructed at the point of connection. The route to the manhole through the building from the external entrance to where the manhole is located is to be a minimum of 3m wide by 2.4m high to facilitate access.
8. Where a sewer main lies within an adjoining allotment, the property connection is to extend within the allotment with the riser of the PCB located no more than 1.0m into the allotment. For battle-axe allotments with the property connection located within the access, the Property drain shall extend from the property connection along the access to a point 1.0m within the main part of the allotment or, where a sealed driveway is required for the full length of the hatchet 'handle' then 1m past the extents of the driveway to allow a suitable future point of connection. Where a sewer is contained within a stormwater drainage easement, then the property connection should be located no more than 1m past the easement boundary and into the lot it is serving. All property connections should be finished a minimum of 1m clear of any infrastructure.
9. Property connections sizes shall be as follows:
 - i. Residential (single Dwelling) – 100mm dia.
 - ii. Others (i.e. Commercial, Industrial, Multi Residential) – 150mm dia.
10. Property connections to existing sewer mains shall only be permitted when the construction of a new main to service the proposed properties is not possible.
11. Property connections to existing sewer mains shall be constructed in accordance with Standard Drawing S3005.
12. All Property connections shall be deep enough to service the entire lot using the following property drain design criteria:
 - i. 300mm minimum cover at the start of the drain or at any other control point on the allotment, (where property drains are subject to vehicular traffic, cover shall be increased to 600mm).
 - ii. 1 in 60 minimum grade from the most distant corner where any Property or structure can be located on the allotment, on an alignment parallel to the property boundary. The designer is to include the measured drop into the sewer taking into account the house drain connection tee fitting that will be used.
 - iii. Consideration to be given to the finished level of the lot after all earthworks are complete including likely benching for building platforms.
 - iv. Additional 600mm to be allowed for the height of the heavy duty deep sewer drop (reinforced with fibreglass) junction on Type E1 PCB's

D7.15 ON-SITE SEWERAGE FACILITIES – TREATMENT AND DISPOSAL

1. Due to the increased loading of on-site sewerage facilities on the environment and legislative considerations, the Consultant shall submit a report containing a detailed assessment of site and soil factors, an elevation of the site constraints and review of all relevant information available. The report shall consider all major constraints and opportunities relating to the management of wastewater in relation to the development. The report shall also include a cumulative impact on the effects to the existing ground water

table, creeks and watercourses so that the development achieves environmental objectives of air, land and water resources.

2. To accommodate the on-site sewerage facility, required for a dwelling with five or less bedrooms and a range of associated facilities, a minimum area of 2000m² shall be required. It should be noted that this area is based on an ideal site and the minimum area shall be located above the Q50 Flood Level and shall not contain any land required for access, or drainage and service easements.
3. The Consultant should refer to the Queensland Plumbing and Wastewater Code, On-Site Sewerage Code and AS/NZ 1547 and Environmental Protection Act, so that the most appropriate on-site sewerage facility can be chosen for the development and, in particular, be of sufficient capacity to receive, treat and absorb all wastewater outputs from premises on a property, complete the treatment, uptake, and absorption of the final effluent within the boundaries of the property, and avoid likelihood of creating unpleasant odours, or the accumulation of offensive matter. In accordance with AS/NZ1547, on-site sewerage facilities are to be designed for up to 10 equivalent persons. For loading greater than 10 EP additional facilities will be required.
4. The minimum separation distance between on-site facilities (i.e. disposal trenches and the like) and water mains is to be 10 metres.
5. The minimum requirements for the wastewater disposal report:
 - a. Site plan showing dams, creeks and water courses;
 - b. Contour plan maximum of 1 metre intervals;
 - c. Areas of each block with proposed Lot No's and property boundaries;
 - d. Proposed use of the land to be developed;
 - e. Soil survey, including permeability of soil by either a percolation test or textural classification of soil;
 - f. Depth of ground water, if any encountered during testing;
 - g. Estimated daily flows and site evaluation in accordance with AS1547;
 - h. A daily allowance of 200 litres/person for all waste units (AS/NZ 1547:1547 5.4.2.2)
 - i. Method of disposal, eg. DSTP, split septic system or other;
 - j. Size of estimated disposal area to suit system;
 - k. Calculations to justify disposal site;
 - l. Assessment of any additional nutrient loadings of the area caused by on-site waste water disposal.

D7.16 BUILDING OVER OR NEAR SEWERAGE INFRASTRUCTURE

1. General

- a. An Application for Building over Sewer 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.
- b. This section of the manual applies to all building over or adjacent to sewer infrastructure which does not comply with QDC MP1.4.
- c. This consent shall be considered as the referral agency response under section 4 of the QDC MP1.4.

- d. Where a Development Approval or Operational Works Approval (OWA) has been issued any instances of building over or near sewerage infrastructure would still be subject to a separate building over sewer approval unless specifically noted otherwise in the OWA.
- e. It is recommended that the applicant meet with Council prior to lodging a building over sewer 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.
- f. For applications referred to Council, the following table sets out the type of sewerage infrastructure that can or cannot be built over.

Not Permitted	Permitted subject to the design being given Council Approval
<ul style="list-style-type: none"> • Gravity reticulation mains of 225DN • Gravity trunk mains of >225DN • Sewerage pressure mains of any size • Maintenance structures ¹ • Property connection branches ^(see note 1) 	<ul style="list-style-type: none"> • 150DN gravity reticulation mains

Note 1: May be considered under exceptional circumstances

- g. Residential dwellings including any liveable areas associated with any form of accommodation type or commercial buildings with internal wall systems are not permitted to be located over sewerage infrastructure. Those parts of a residential dwelling or commercial building that are considered ancillary to the dwelling such as decks, garages and the like will be considered subject to compliance with this section.
- h. Building work within a sewerage 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 sewerage 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.)
- i. For any proposal to build over or near sewerage infrastructure, the applicant will be required to demonstrate how access to the sewer for maintenance purposes can be practically undertaken.
- j. Clearances and acceptable solutions for building work located over or near sewerage infrastructure are to consider the 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.

2. Requirements for Building Over or Near Sewers

- a. If the existing sewer is not DICL or uPVC SN8 (i.e. AC, concrete etc.) then it is to be replaced with uPVC SN8. Alternatively if the existing sewer is found to be in a condition acceptable to Council then it can be relined by a Council approved relining contractor.
- b. Building footings are to be designed to achieve the performance criteria of the Queensland Development Code MP 1.4.
- c. Structural certificates (i.e. Form 15 and 16) are to be provided for the design and construction of the footings.
- d. An easement of 3m width is to be registered over the sewer at the developer's expense where the building is within 1.5m of the sewer. When a building encroachment occurs, the easement document is to include a special clause making the property owner responsible for the demolition/removal and

reinstatement costs of the building in the event Council has to demolish any part of the building to gain access to the sewer.

- e. CCTV inspection of the existing or constructed sewer is to be carried out with the CCTV footage and report submitted to Council. When an existing sewer is to be retained CCTV inspection will also occur prior to construction to determine the condition of the sewer.
- f. Submission of an as-constructed drawing if sewer levels or other changes have occurred to the sewer.

3. Submission Requirements

- a. When making an application for building over sewer the following is to be supplied with the application:
 - i. A plan showing the location of the sewer in relation to the building walls and footings.
 - ii. A section showing the actual levels of building elements in relation to the sewer invert level and horizontal and vertical clearances.
 - iii. Certification by a structural engineer that the footing design achieves the performance criteria of QDC MP1.4

PUMPING STATIONS AND RISING MAINS^{CRC}**D7.17 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 determine specific requirements for pumps, electrical, switchboard and telemetry etc. Outlined below is Councils minimum requirements unless specified otherwise.
2. Council prefers that sewage be conveyed by gravity and a pumping station be used only when all other options have been considered and rejected.
3. Council requires documentary evidence that life cycle costs of all options have been analysed before approving a pumping station.
4. When the use of a pumping station has been approved it must be designed and constructed in accordance with this Manual and WSA 04-2005 "Sewage Pumping Station Code of Australia".
5. A submersible sewage pumping station built to Council requirements and incorporating two submersible sewage pumps with motor sizes up to 22 kW each will be regarded as a "standard" installation. Any station with pumps larger than 22kW will be regarded as a "non-standard" installation and will need to be specifically designed to suit the design flows. The design of a "non-standard" station must be carried out in consultation with Council.
6. Where the calculated C_1 value is less than 3.5, the pump operation mode shall be duty/assist. Where the C_1 value is 3.5 and greater; the pump operation mode shall be duty/standby. This requirement is to be confirmed with Council.
7. Wet well washers are required in all pump stations except in CRC and CSC pump stations.

D7.18 PUMP STATIONS^{TRC, CCRC, MSC, CRC}

1. Pump stations shall be designed as detailed on Standard Drawings S3020, S3025, S3030 and S3035, except where modified by Council specific requirements or design guidelines. Project specific design drawings are to be provided with the operational works submission which include but is not limited to the following:
 - a. Relative levels (A through G) as denoted on these drawings as well as all pump start, stop and alarm levels appropriate to operating conditions shall be provided with the pump station design,
 - b. Detailed site planning showing pump station relative to existing and proposed surface contours and in the relation to boundaries, flood levels and other elements and features,
 - c. Cross-section and plans of the pump station drawn to scale and dimensioned,
 - d. Pipework and ancillary elements drawn to scale and correct orientation,
 - e. Generator building (if applicable),
 - f. Switchboard drawings,
 - g. Detailed cross-section and plan of emergency storage infrastructure, and
 - h. Design system curve and pump curves
 - i. Access hatch workshop drawing.

2. Operation levels for pump stations to be controlled by “Multitrode” probes or hydrostatic probes and not by float switches. Major pump stations as determined by the Council shall be controlled by ultra sonic level controllers.
3. The pump station overflow pipe shall be designed to cater for the maximum possible flow. Council and the Environmental Protection Authority should be consulted to determine emergency storage and overflow requirements.
4. The designer shall be responsible for obtaining all necessary licenses and approvals associated with the provision of pump station emergency overflow.
5. Pump stations shall be located as far as possible away from existing or proposed habitable dwellings. A 100m setback is desirable with absolute minimum of 30m unless otherwise approved by Council for standard pump stations only. New developments are to comply with the setback conditions from existing pump stations.
6. The tenure of property on which pump stations and access roads are situated shall be transferred to Council as freehold title. Pump station sites shall not encroach upon gazetted road areas unless otherwise approved by State Government and Council
7. Water supply – 25mm with RPzD backflow device if water supply is available. (Cairns Regional Council does not require the RPzD)
8. Access to the pump station site shall be via an appropriate standard sealed 3.5m wide road (within the 5m access reserve) and the pump station site shall accommodate maintenance vehicles and their manoeuvring. An acceptable layout will need to be determined in consultation with council.
9. The requirements of fencing of pump stations is to be confirmed with Council at the time of Operational Works application.
10. The sealed access can be either of the following construction:
 - i. 2 coat seal on 100mm sub-base and 100mm base course, subject to the sub grade strength indicated by the CBR
 - ii. 30mm asphalt on 100mm sub-base and 100mm base course, subject to the sub grade strength indicated by the CBR
 - iii. 125mm thick reinforced concrete
11. Pump stations will be located a minimum 300mm above the ARI 100 year storm event. The finished ground level around the pump station will be shaped to fall away from the pump station.
12. Detailed calculations of the pump station, Sewerage Pump Station Commissioning Plan and pressure main sizing shall be submitted to Council with the design and/or Operational Works submission in the format required by Council.
13. The Sewerage Pump Station Commissioning Plan shall be completed in accordance with WSA 04-2005 2.17.
14. Pump Station switchboards are to be stainless steel.
15. New or upgraded pump stations which are or will be part of the trunk main reticulation network or have less than 4 hours emergency storage capacity will be required to have a standby generator or diesel pump (as approved by council) as part of the sewer scheme; this may include provision for a three phase inlet to allow the connection of a mobile generator unit, at council’s discretion. The standby generator will be contained within a roof structure and located a minimum of 300mm’s above the ARI 100 year flood event. Unless otherwise advised by Council, the generator is to be sized to run both duty pumps.

16. The design of the pump station shall consider measures to prevent damage from vandals and to restrict unauthorised access; this may include screens and cages around equipment.
17. 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.
18. Factory acceptance testing of the switchboard is to be undertaken and the designer is to arrange a suitable time and date with Council prior to installation at site.
19. Access hatches are to have fall protection installed.

D7.19 SEWAGE PUMPING SYSTEMS^{CRC}

1. Sewage Pumping Station Design Criteria

Sewage pumping stations shall be designed in accordance with the minimum specific design criteria shown in Table 7.14 and WSA 04-2005.

Table 7.14 Sewage Pumping Station Design Criteria

Item	Description	Adopted Design Parameter	Comments
1	Pump Motor Drives	Pump Motor Drives shall be as follows: <ul style="list-style-type: none"> • < 6 kW – Direct Online starter (DOL) • > 6 to 22 kW – VFD • > 22 kW – special design, refer to Council 	Where Variable Frequency Drives (VFD) are used, cables are to be shielded Where VFDs are used, a magnetic flow meter must be provided with the pump station. Variable Frequency Drives should be considered for pump stations that discharge into a common rising main. For DOL and VFD refer to Council's Standard Electrical Drawings.
2	Number of pumps	Two (2)	Pump station controls must allow for automatic alternating duty pumps
3	Fixed Speed Pumps Wet Well Operating Volume (kL)	$\frac{0.9 \times Q}{N}$	Where Q is the flow rate (l/s) of a single pump operating and N is the allowable number of pump starts, the number of pump starts (N) should be not more than 10 for pumps less than 50kW rating. For pumps greater than 50kW rating, according to manufacturer's recommendations
4	Variable speed Pumps Wet Well Operating Volume (kL)	$\frac{0.9 \times Q}{N}$	Q = discharge of a single pump (L/s) at 50 Hz. N = maximum number of starts per hour recommended by the motor manufacturer

Item	Description	Adopted Design Parameter	Comments
5	Bottom Water Level (duty pump cut-out)	<p>a) For fixed speed pumps: 100mm above minimum submergence level of pumps.</p> <p>b) For variable speed pumps: minimum of 100mm above top of motor casing</p>	In case of variable speed drives a permanent water level must be maintained above the motor casing to ensure continuous cooling of the motor.
6	Well Diameter	<p>Minimum internal well diameter 2100mm internal well diameter may be increased in increments of 300mm depending upon considerations such as:</p> <p>a) Clearance around pumps and pipework.</p> <p>b) Depth of pump station, and</p> <p>c) Geotechnical conditions.</p>	
7	Top Water Level (TWL) (standby start)	<p>Must be set no higher than 300mm below invert level of inlet sewer. The drop pipe is to terminate at least 50mm above the TWL</p> <p>Must be no lower than 100mm above duty start but confirmed by project specific design</p>	
8	Sizing of overflow pipe	Equal to PWWF	
9	Operating Range (TWL – BWL)	This shall be in accordance with WSA 04, Clause 5.4. Generally this range should be between 1000mm and 2800mm.	
10	Duty Point	<p>With static head corresponding to bottom water level and pipe friction factors as follows determine Duty Point 1 and 2:</p> <p>Duty Point 1 – Single Pump Operation:</p> <p>$C_1 \times \text{ADWF (L/s) vs. Static Head + Friction Head (m)}$</p> <p>Duty Point 2 – Duty Pump operating in parallel with Standby Pump:</p> <p>$5 \times \text{ADWF (L/s) vs. Static Head + Friction Head (m)}$</p>	<p>Where:</p> <p>Static Head = Highest Point in Pressure (Rising) Main – Water Level in Wet Well</p> <p>Friction Head is derived from the Darcey-Weisbach formula</p> <p>C_1 = Peaking Factor from Table 7.2 of this Manual.</p>
11	Pump Selection	Select a pump that is capable of operating at both duty points and which operates within the range of the system resistance curves	The friction factors used in pump selection depend on Top and Bottom Water Level so as to ensure the fullest possible range of heads are

Item	Description	Adopted Design Parameter	Comments
		<p>that are determined by the Conditions detailed below:</p> <p>Where pressure sewers are allowed to interconnect with existing sewers (refer Table 7.15), pumps are to be designed to operate against the ultimate pressure in the receiving main unless otherwise approved by Council.</p> <p>Condition 1 – Normal Operating Condition lower limit system resistance curve:</p> <p>Static head corresponding to Top Water Level with pressure (rising) main friction factors as follows:</p> <p>C = 120 (dia. < 300mm) C = 140 (dia. > 300mm)</p> <p>Condition 2 – Normal Operating Condition Upper limit system resistance curve:</p> <p>Static Head corresponding to Bottom Water Level with pressure (rising) main friction factors as follows:</p> <p>C = 100 (dia.< 300mm)</p>	taken into account in the selection of the pumps
11	Emergency Storage	4 hours ADWF	May vary dependent on location of the overflow. Emergency storage may include gravity sewers, manholes and pump station wet well volume above TWL.
12	Duty Pump Capacity	Refer DERM Guidelines (or subsequent department)	Refer DERM Guidelines (or subsequent department)
13	Standby Pump Capacity	Refer DERM Guidelines (or subsequent department)	Refer DERM Guidelines (or subsequent department)
14	Total Pump Station Capacity	Refer DERM Guidelines (or subsequent department)	Refer DERM Guidelines (or subsequent department)

2. Pump Information

The following information shall be provided when the plans are submitted for approval:

- a. Preliminary pump selection
- b. Rating of the motor;
- c. Weight of the motor;
- d. Duty Point;
- e. Estimate of KWh/1000 litres pumped;

- f. Performance, power and efficiency curve.

D7.20 RISING MAINS

1. For detailed design of sewer rising mains (pressure mains) the requirements of Design Manual D6 Water Reticulation should be noted and the mains shall be designed as per the procedures relevant to Water Supply Mains with the exception of the following:
 - a. Air release valving should be provided to high points as required.
 - b. Scour valving should be provided to low points as required. Scouring must be to a scour manhole or adjacent gravity sewer system.
 - c. Thrust Block and Trenching Details shall be as per the Standard Drawings S2015 and S2016.
 - d. Line valves, scours and air valves are to be provided as required to reduce scour volume.
2. Consideration needs to be given to the potential for sulphide generation in rising mains.
3. Sewer rising mains shall be a minimum 100mm uPVC Class 12 unless approved otherwise by Council. Sewer rising mains shall be colour 'cream'.
4. All discharge manholes are to have a protective liner as approved by the local authority and installed in accordance with Manufacturers requirements. Sewer rising mains shall be designed in accordance with the minimum specific design criteria shown in Table 7.15 and WSA 04-2005.

Table 7.15 Rising Main Design

Item	Description	Adopted Design Parameter	Comments
1	Flow Equation	Darcey-Weisbach formula	
2	Minimum Diameter	100mm – unless approved otherwise by Council.	
3	Friction Factors	Refer Item 10 in Table 7.14	
4	Minimum Velocity (on a daily basis)	0.75m/s	To prevent the deposition of solid material such as grit
5	Preferred Minimum Velocity	1.5 m/s	To provide for slime stripping on a regular basis
6	Maximum Velocity	2.5 m/s	To prevent damage to pipe lining
7	Configuration	<p>Rising Mains should be sized to optimise the balance between reduction of detention times and life cycle cost. Factors to be considered include but not be limited to:</p> <ul style="list-style-type: none"> • Population growth • Staging • Operational features to provide for 	

Item	Description	Adopted Design Parameter	Comments
		maintenance and replacement activities <ul style="list-style-type: none"> • Minimisation of energy costs • Detention times (reduction of odours) 	
8	Interconnection of Rising (Pressure) Mains from Different Pump Stations	Only with the approval of Council. Generally interconnection of rising (pressure) mains from different pump stations will not be approved unless there are substantial economic and operational benefits.	Selection of the class of mains shall be for the maximum condition, refer pump selection, Table 7.14.

PRIVATE PUMP STATION AND RISING MAINS

D7.21 GENERAL

1. Sewage pumping stations serving more than one "Titled" property shall meet the requirements of this Manual and WSA 04–2005 Sewage Pumping Station Code of Australia.
2. Where the gravity sewer system cannot service or control a development site, Council may approve a private sewage pumping station on the site that would discharge into a manhole preferably within the site or as near as practicable to the site. The section of rising main in public land will be donated to Council as Council's infrastructure and a boundary kit is to be installed at the site boundary to delineate between Council and private owned infrastructure. A private rising main is not acceptable within a Council controlled road reserve
3. .
4. All costs associated with connection of a private rising main to an existing gravity sewer system (system analysis, design and upgrades to provide capacity) shall be met by the Developer.

D7.22 CONNECTION TO EXISTING GRAVITY MAIN

1. The approved connection point for a private rising (pressure) main shall be a discharge manhole that is connected to an existing gravity sewer manhole. Discharge manholes shall conform to Council's Standard Drawing.
2. Council may require the provision of a non corrosive pipe installed for the length of sewer to the next downstream manhole and will require the provision of an inert lining to all internal surfaces of the rising main discharge manhole.

D7.23 ALTERNATIVE CONNECTION POINTS

1. Council may consider an alternative connection point. Where an alternative is proposed, the Consultant shall request written approval from Council. The request shall outline the reasons for the alternative connection point and the connection methodology proposed.
2. **A private rising main is not permitted to inject into another private rising main.**
3. If Council approves the alternative connection to be a Council rising main, the conditions outlined in Table 7.15 Item 8 of that table shall apply.

D7.24 PRIVATE PUMP STATION SIZING AND OPERATION

1. Pumping stations shall be designed with sufficient in-system storage (in the well, upstream sewers or a dedicated self-draining high level storage) so that in the event of pump or power failure, 4 hours emergency storage is provided with inflow at average dry weather flow, provided the scheme is not a low rising sewer scheme or vacuum system.. In system storage shall be measured from duty start level to the level of the lowest relief point. Low rising sewer or vacuum schemes shall be looked at separately by Council.
2. Less than 4 hours of storage may be provided, as long as a standby generator is part of the sewer scheme
3. The pumps are to be set up to operate automatically as Duty/Standby and should be of the positive displacement electric type.

4. An alarm shall be provided in the form of a prominently positioned flashing red light set to activate at the invert level of the incoming Property drain. Where not a single dwelling, the proponent is to provide contact details of the property owner/manager and any maintenance contractor the owner has an agreement with in the event Council is notified of a red light/alarm.
5. Where not a single dwelling, an Emergency Response Plan (ERP) is to be prepared and included in the Operation and Maintenance Manual held on site and with the property owner. The property owner is responsible for maintenance of the private pump station and shall have a maintenance agreement in place with a suitably qualified contractor at the commencement of operation. Details of the ERP and maintenance agreement is to be supplied for council records at works completion.
- 6.

D7.25 PRIVATE RISING MAINS

1. Medium density polyethylene rising main class PN12 is approved for use with cream colouring.
2. If the rising main is not readily available in cream colour, the rising main shall be wrapped in cream coloured tape.

D7.26 SPECIFIC REQUIREMENTS

1. As the private sewage pumping station is a component of the internal plumbing and drainage, Council's Plumbing and Drainage Services Section shall check the design drawings for compliance with current legislation and relevant standards.
2. Owners of private pumping stations are responsible for all costs and charges associated with the installation, operation and maintenance. Council may consider entering into a service agreement with the owner of the pump station for the ongoing operation and maintenance of the pump station.
3. As constructed details and the location of the rising main shall be submitted to Council.
4. Where Council accepts a Maintenance Service Agreement with the owner of a private pump station, the following conditions will apply:
 - a. The pump station control panel should incorporate SCADA equipment for transmission of monitoring data and control of Council's existing master system.
 - b. Council requirements for integrating the SCADA equipment will not relieve the owner of the responsibility for the operation and maintenance of the pump station during a the agreed defect liability period
 - c. Council will not accept responsibility under the Service Agreement until the pump station has been accepted "off maintenance" with all defects rectified and the pump station is operating to the satisfaction of Council.
 - d. Notwithstanding b) and c) above, Council may monitor the operation and performance of the pump station during the defects liability period.
 - e. The following information shall be provided when the plans are submitted for approval:
 - i. Place of Manufacture of all components;
 - ii. Pump Manufacturer, Model, Type, and Impeller diameter (as a cut sheet)
 - iii. Rating of the motor;

- iv. Weight of the pump and motor;
 - v. Duty Points;
 - vi. KWh/1000 litres pumped;
 - vii. Performance curves;
 - viii. Guarantee;
2. Upon commissioning, the following information shall be provided to the Council for checking prior to survey plans being endorsed by Council.
 - a. Curves with at least four points plotted of the actual performance established in the field, or similar supervised works certificate;
 - b. Actual KWh/1000 litres pumped;
 - c. Complete wiring diagrams and details;
 - d. Mechanical details and parts list of pump and motor;
 - e. Maintenance catalogue showing daily, weekly, monthly and annual requirements;
 - f. A complete set of the manufacturers recommended spares delivered to Council.
 - g. A set of cover lifters delivered to Council.

TELEMETRY SYSTEMS AND MANAGEMENT PLAN

D7.27 TELEMETRY SYSTEMS DSC, CRC

1. All pump stations must be fitted with telemetry system in accordance with Council's Specification and any design guideline for Telemetry Systems. Council should be contacted to obtain a copy of their Technical Specification for Telemetry Systems.
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

D7.28 MANAGEMENT PLAN

1. Where required, a facility management plan is to be provided which will detail procedures and arrangements in place for routine operation and management of the facility (eg. Service Agreement). The Facility Management Plan shall include:
 - a. Details of proposed regular maintenance of private sewer systems
 - b. A bi-annual report of sewerage flows to Council's sewer and details of maintenance activities.

APPENDIX A

ADDENDUM TO CTM Water Services Design and Construction Code – Part C Sewerage

Version 1.0 Aug 2019

APPENDIX A - Addendum to CTM Water Service Design and Construction Code

- 1.1 Scope**
Any reference to South-East Queensland Service Provider (SEQ-SP) shall mean Cairns Townsville Mackay Servicer Provider (CTM-SP).
- 2.4.1 Loading per Serviced Property**
Refer to Section D7.08 - Design Criteria of this Manual
- 2.4.2 Estimating future catchment loads**
Refer to Section D7.08 - Design Criteria of this Manual.
- 5.1 Detail Design Process**
Property sewers are to be designed to the same standards as public sewers.
- 5.2.3 Sewer layout**
Refer to Section D7.09 – Standard Alignment of this Manual.
- 5.2.8 Easements**
Refer to Section D7.12 – Dedication of Land, Easements and Permits to Enter of this Manual.
- 5.3.8 Horizontal Curves in Sewers**
Horizontal curves in gravity rubber ring joint sewers are not permitted.
- 5.4.5.2 Clearance requirements**
The new sewer size in Table 4.2 shall be read as ≤300mm and >300mm instead of ≤200mm and >200mm.
- 5.5.3 Minimum Air Space for Ventilation**
Refer to Section D7.08 – Design Criteria of this Manual.
- 5.5.4 Minimum pipe sizes for maintenance purposes**
Refer to Section D7.14 – Property Connections in this Manual.
- 5.6.5.1 Minimum Depth of Sewer Connection Point**
The sewer shall be deep enough to drain the entire lot except where a private pump station is approved on the lot. PCB's are to be in accordance with FNQROC
- 5.6.6.1 General**
Drops to be in accordance with FNQROC
- 5.6.7 Vertical Curves**
Vertical curves are not permitted.
- 5.6.8 Compound Curves**
Compound curves are not permitted.
- 6.4.2 Multiple Occupancy Lots**
An application shall be made at design stage for determination of servicing method. CRC to own the Manhole or Maintenance Shaft at the point of connection.
- 7. MAINTENANCE STRUCTURES**

Table 7.1

The use of horizontal and vertical bends is not permitted.

7.3.2 Maintenance Structure Spacing – Reticulation Sewers

The maximum distance between any two consecutive maintenance structures shall be 100m.

7.4 Special consideration for location of maintenance structures

Delete the first sentence of the CTM Addenda.

7.6.2 Types of Manhole Construction and corrosion protection

Approved PE manholes may be used as a standard manhole for a pumping/lift station or as a discharge manhole for a rising (pressure) main. PE manholes are not permitted in the following locations:

- Within roadway central medians, roundabouts or within kerb & channel
- As the connection structure for future development stages
- In an area zoned Industrial or Commercial.

7.6.9 Ladders, Step Irons and Landings

Ladders, step irons and landings are not required.

7.7.1 MAINTENANCE SHAFTS

The use of maintenance shafts is permitted in reticulation sewers subject to the design parameters detailed in this Manual and WSA 02-2002.

7.7.2 Design Parameters for MSs and TMSs

The following design parameters apply to maintenance shafts and terminal maintenance shafts in addition to or instead of those detailed in WSA 02-2002.

- Sizing and installation of maintenance shafts to generally comply with the manufacturers recommendations.
- Maintenance shafts shall be graded to the intersection point of the sewer main and maintenance shaft coupling/ fitting.
- Maintenance shafts may be used on 100mm, 150mm and 225mm diameter sewer mains and Property connection branches only.
- Maintenance shafts shall be used to a maximum depth of 3.0m.
- Testing of maintenance shafts shall generally be carried out in conjunction with the testing of the sewer main.
- Property connection branch inspection tees shall be 2000mm clear of the centre of the Maintenance Shaft.
- Property connections must not be made into maintenance shafts.
- Maintenance shafts must be provided with a Council approved 600mm dia Ductile Iron Class B cover located within a precast surround. The trench bedding material shall extend below the shaft inspection opening surround.
- A maximum of five (5) Maintenance Shafts will be permitted between two conventional maintenance holes with a total length of sewer of not more than 300m between maintenance holes.
- Maintenance Shafts are to be located with a maximum spacing of 60 metres to a maintenance hole or shaft.

- The combined flow entering a MS will not exceed 22 L/s
- The flow to be redirected at an angle greater than 45 degrees will not exceed 12 L/s
- The vertical distance a sewer connection entering the riser and the invert of a MS will be a minimum of 1100 mm. Where this distance is less than 1100mm the incoming sewer will enter at the invert of the MS.

Maintenance shafts and terminal maintenance shafts are not permitted in the following locations:

- As the receiving manhole at a pumping/lift station;
- As a discharge manhole for a rising (pressure) main;
- Within roadway central medians, roundabouts or within kerb and channel;
- As the connection structure for future development stages;
- In an area zoned Industrial, Commercial, or Multi-unit.

8.2 WATER SEALS, BOUNDARY TRAPS AND WATER – SEALED MH'S

Water seals are not permitted.

8.2.3.3 GAS CHECK MH'S

Gas check MH's are not permitted.

10.2 Design Drawings

ADAC Schema is not currently required by Cairns Regional Council

21.3.3.1 Applicable pipe sizes

Compaction test is to also apply to reticulation size

21.3.3.2 Frequency and location of embedment tests

In the second paragraph, the CTM Alliance contains an error. The change should be from >375mm to >300mm.

APPENDIX B

ADDENDUM TO SEWERAGE CODE OF AUSTRALIA

WSA 02-2014

APPENDIX B - Addendum to Sewerage Code of Australia WSA 02-2014

- 3.2 Design Flow Estimation**
Refer to Section D7.08 - Design Criteria of this Manual, or CTM Table 10.1.
- 3.3 Design Flow Estimation Method**
Refer to Section D7.08 – Design Criteria of this Manual, or CTM Table 10.1.
- 5.2.1 Catchment Design**
The sewer design is to allow for connection and sewing of upstream properties.
- 5.2.8 Easements**
Refer to Section D7.12 – Dedication of Land, Easements and Permits to Enter of this Manual.
- 5.5.7 Minimum Grades for Self Cleansing**
Refer to Section D7.08 – Design Criteria of this Manual.
- 6.4 NUMBER OF PROPERTY CONNECTION POINTS**
- 6.4.2 Multiple Occupancy Lots**
An application shall be made at design stage for determination of servicing method. Council to own th Manhole or Maintenance Shaft at the point of connection.
- 7 MAINTENANCE STRUCTURES**
- 7.6.3 Design Parameters for MHs**
External drops are not permitted for use with precast or any other manholes unless otherwise approved by Council.
- 7.6.5 Connection of property connection sewers into MH's**
Property connections must not be connected into maintenance holes except at end of line.
- 7.7 MAINTENANCE SHAFTS**
- 8.5 VORTEX INLETS AND WATER CUSHIONS**
Prior approval must be obtained from Council for the use of water inlets and water cushions.
- 8.6 INVERTED SYPHONS**
The use of inverted syphons is not permitted.
- 8.8 FLOW MEASURING DEVICES**

Flow measuring devices are not required to be installed. Notwithstanding this provision shall be made in the design of the valve chamber to allow the future installation of an electromagnetic flowmeter.

8.9 WET WEATHER STORAGE

Prior approval must be obtained from Council for using wet weather storage as a means of reducing downstream infrastructure.

APPENDIX C

ADDENDUM TO SEWERAGE PUMPING STATION CODE OF AUSTRALIA

WSA 04-2005

APPENDIX C - Addendum to Sewerage Pumping Station Code of Australia WSA 04-2005

Part 3 – Construction

To the specification 25. Metalwork, add the following:

25.1 Pump Lifting Chains:

- Lifting chains shall be fitted to each pump and shall be in accordance with AS2321
- Eyebolts shall be in accordance with AS2317 – Stainless Steel
- Shackles in accordance with AS2741 - Stainless Steel
- Lifting eyes in accordance with AS 3776 - Stainless Steel
- Lifting chain to be grade L – Stainless Steel
- The lifting chain for pumps less than 1 tonne shall be 10mm link as a uniform standard
- Lifting chain for pumps weighing greater than 1 tonne shall be sized accordingly
- Provide a suitable bracket and hook in an out of the way location for hanging the chain
- For checking and chain replacement, each pump station shall have an easily visible plaque mounted adjacent to the wet well stating length and weight of chain and the weight of the pump to which it is attached.

25.2 Brackets

- Provide stainless steel brackets for mounting of floats
- Provide stainless steel brackets for fastening the level sensor stilling well.

APPENDIX D

ADDENDUM TO THE VACUUM SEWERAGE CODE OF AUSTRALIA

WSA 06-2008

APPENDIX D - Addendum to the VACUUM SEWERAGE CODE of Australia WSA 06-2008

PART 1 – PLANNING AND DESIGN

To the specification 5.3. VACUUM SEWER DESIGN FLOWS, amend the following

5.2.1 General:

Remove references to PVC-U and PVC-M – use PE pipe only.

Specification 6.6 VACUUM GENERATORS AND PIPE WORK

Clause 6.6.3, *Generator Types*, add the following:

In larger stations (>20 l/s), Liquid ring vacuum generators shall not be used. Oil filled vacuum generators are required. For stations < 20 l/s, dry run vacuum generators are preferred.

Add a new

Clause 6.6.9, *Air Handling Pipe Material*, as follows:

Any pipe within the Vacuum Station designated for the handling of air or air sewage/water mixture shall be Stainless Steel 316L with wall thickness designed for the application.

Specification 6.10 NOISE,

Add the following:

- In addition to noise environmental regulations to be met, the noise level in residential areas, measured as the Adjusted Maximum sound pressure level $L_{A10adj, 10mins}$ shall not be greater than the background noise level plus 3 dB(A) at the boundary of vacuum station lot;
- in Industrial or Commercial areas it shall not be greater than the background noise level plus 8 dB(A). It will likely be necessary to provide sound attenuation construction within the building, sound rated doors and mufflers on pipes leading to the exterior of the building in order to meet requirements.
- The developer shall perform noise studies before and after commissioning to demonstrate that requirements have been met.

Specification 6.11 ODOUR CONTROL,

Clause 6.11.2 *Biofilters*, add the following:

- The odour control bed shall be roofed.
- The odour control bed shall have fitted over it an automatic sprinkler system with moisture control, to ensure that the bed operates at an operator selectable moisture content.

Specification 8.3 ALARMS, TABLE 8.1,
add to the list of Alarms required,

- Vacuum Generator HIGH TEMPERATURE. Provide a high temperature sensor for each of the Vacuum Generators which will both alarm and shut down the unit in the event of the temperature rising to a manufacturer recommended maximum set point.

Specification 9.5 PIPEWORK AND FITTINGS FOR VACUUM SEWERS

Remove references to PVC-U and PVC-M – use PE pipe only.

Specification 16 SUPPORTING SYSTEMS,

16.1 SERVICES, add a new Clause:

16.1.5 Tool Kit and Special Tools, as follows:

Provide a tool kit with the station containing a range of tools which will allow the operator to perform the duties required to operate and maintain the system. Provide also any specialized tools required for the same purpose.

16.2 VACUUM STATION FIXTURES, add a new Clause:

16.2.4 Vacuum Testing Station as follows:

Provide a vacuum testing station on the workbench utilising the station vacuum in order to test valves and vacuum equipment after repair. Pipe and valve the test station appropriately.

PART 3 - CONSTRUCTION

Clause 26.2 SWITCHBOARD INSTALLATION, Clause 25.6.4.4 *Cubicle Labels*, add the following:

- Ensure pump labels match with the labeling of the pumps on the floor.

Clause 28.3 INSTALLATION OF PUMPING AND VACUUM GENERATOR UNITS, Clause 28.3.3 *Unit Numbers*, add the following:

- Ensure that Unit numbers match with the labeling numbers on the switchboard.

PART 4 – STANDARD DRAWINGS

Chamber series of drawings, VAC 1200, VAC 1201, VAC 1202, VAC 1203, VAC 1204 and VAC 1205: -

- Remove references to brickwork risers in the construction of the collection chambers. Brickwork is not permitted.
- To the vacuum layout series of drawings, VAC 1300 and VAC 1301, add the following: provide an appropriately sized suction line (minimum DN 200), from the Vacuum Vessel to the outside of the building for a sucker truck connection. The suction line shall be valved outside the building to permit the draining of the Vacuum Vessel without the operator of the suction truck having to enter the building.

