SEQ Water Supply and Sewerage Design & Construction Code (SEQ WS&S D&C Code)

Amendment to Sewerage Code of Australia

(WSA02 – 2002 V2.3)

June 2016

Document History

Version	Description	Date
1.0	Initial Publication	01 July 2013
1.1	Changes to the following clauses: 4.2.4.3, 4.2.5, 4.3.3, 4.3.4, 4.3.5 (Table 4.1), 4.3.7, 4.4.4, 4.4.4.1, 4.5.4, 4.5.7.2, 4.6.3, 4.6.4.1, 4.6.6.4, 4.6.4.5, 4.7.2, 5.1, 5.2, 5.5.2, 5.8, 5.9, 6.1(c), 6.2, 6.6.5, 6.6.8, 6.7.2, 8.2, 8.6.2, 8.10, 12.2, 13.5.2, 18.5, 18.8, 19.1, 20.3.2.2, 21.1.1, 21.1.2, 21.1.4, 21.2, 21.3, 22.3.1, 22.3.2, 22.3.3.2, 22.3.4.4, 22.3.4.5, 22.4.2.2, 22.6.2, 22.6.3, 22.7.1, 24.2	07 April 2016
1.2	Changes to the following clauses: 5.2, 22.3.4.4	30 June 2016

SEQ Amendment to Sewerage Code of Australia WSA02 – 2002 V2.3

Reference	Amendments to WSA02 - 2002 V2.3
ACKNOWLEDGMENT, FORWARD, PREFACE AND INTRODUCTION	
Scope of Code	**Insert the following at the end of the first paragraph.** Hereafter, reference to "Water Agency" or the like shall be taken to be a reference to the individual South East Queensland Service Provider (SEQ-SP) within whose service area the assets will be designed and constructed. **After the second paragraph insert the following.** SEQ Amendments sets out the SEQ-SPs requirements for sewerage reticulation mains up to and including 300 mm nominal bore. References to mains larger than 300 mm are provided for information only.
Code Purpose	**After the third paragraph insert the following.** The SEQ Design & Construction Code sets out SEQ Amendments to The Sewerage Code of Australia. The SEQ Amendments include: • The SEQ-SPs requirements for specific detail which the Code anticipates individual water agencies will address, and • Additions, deletions and variations to the Code where the Code's requirements are not compatible with the SEQ-SPs current requirements (due to local practice, climate, geographic and topographic conditions and statutory requirements, etc.) or where the Code is otherwise silent. Any reference to the Sewerage Code of Australia ("the Code") shall be deemed to refer to the SEQ Design & Construction Code which contains the SEQ Amendments. The Code specifies mandatory requirements for the design and construction of sewerage mains that are to become the responsibility of the SEQ-SPs. The SEQ-SPs reserve the right to specify or approve other design and/or construction requirements for particular projects and/or developments. Before commencement of any construction, the SEQ-SPs approval shall be obtained to any design and/or installation that does not comply with the Code.
After the section titled "Code Purpose"	**Insert a the following NEW titles and text** **<u>Drawings and Figures</u>** Drawing references are added throughout the Code. In the event of a clash between the standard drawings and the figures in the specification – details shown on the standard drawings take precedence **<u>Condition of Supply of SEW Design and Construction Code</u>** SEQ Design & Construction Code is supplied subject to the following understandings and conditions: • SEQ Design & Construction Code is copyright and apart from any use as permitted under the Copyright Act 1968, no parts of the documents may be sold, reproduced, stored in a retrieval system or transmitted in any form or by any means without the prior permission in writing of SEQ-SPs. • SEQ Design & Construction Code is intended for use in connection with SEQ-SPs related projects only. • SEQ-SPs do not warrant the applicability of SEQ Design & Construction Code to climates, topography, soil types, water and sewage characteristics and other local conditions and factors that may be encountered outside SEQ-SPs area of operations. • The holder of SEQ Design & Construction Code acknowledges that they may contain errors and/or omissions. • SEQ-SPs accept no responsibility for any works or parts thereof which may contain design and/or construction defects due to errors or omissions in any part of a SEQ Design & Construction Code which has not been prepared or formatted by SEQ-SPs. • SEQ-SPs accept no responsibility for the incorrect application of SEQ Design & Construction Code by the holder or any other party.

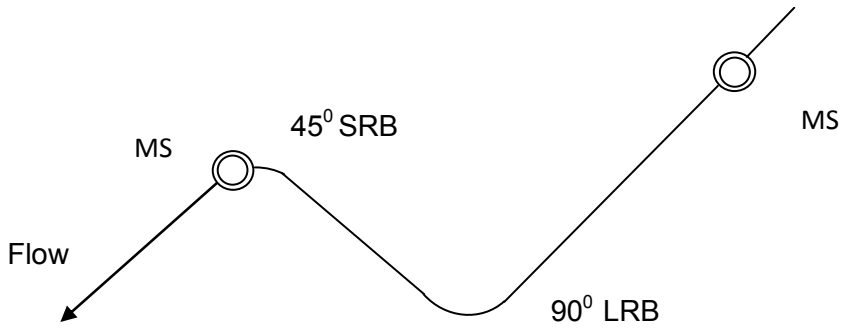
Reference	Amendments to WSA02 - 2002 V2.3
PART 0 – GLOSSARY OF TERMS, ABBREVIATIONS AND REFERENCES	
I Glossary of Terms	**Amend the following terms.** **Access Chamber** Add to the end of the definition "…and maintenance shaft and terminal entry point." **Average dry weather flow (ADWF)** Replace the last sentence with "ADWF is based on empirical evidence and is defined in the SEQ Design Criteria. **Branch Sewer** **Add the following definition at the end of the first sentence:** "For SEQ, a branch sewer may also define a sewer line of any diameter that joins another sewer line at a Maintenance Structure". **Insert the following terms into the Glossary** **SEQ Design & Construction Code** The SEQ Design and Construction Code is required by legislation and is an instrument— • made jointly by the SEQ-SPs; and • that provides for technical standards relating to the design and construction of water infrastructure in the SEQ region. **SEQ Service Provider (SEQ –SP)** Providers of water services to individual customers/groups of customers. Services to the South East Corner are specified in the South-East Queensland Water (Distribution and Retail Restructuring) Act and Natural Resources Provisions Act 2009 and service providers include Gold Coast City Council (GCCC), Logan City Council (LCC), Redland City Council (RCC), Queensland Urban Utilities (QUU) and Unitywater (UW). **Smart Sewers** Systems designed to modified design criteria which take advantage of modern materials and design and construction approaches to produce a lower cost collection system without any loss in the quality of service to customers. Smart Sewers include the PE based NuSewer and the PVC based RIGSS systems. NuSewers which comprise fully welded PE pipes, fittings and maintenance shafts. The elimination of rubber ring joints is designed to minimise ground water infiltration and tree root intrusion reducing maintenance and sewage treatment costs. RIGSS (Reduced Infiltration Gravity Sewerage Systems) which comprise RRJ PVC sewers with maintenance Shafts and Chambers and improved concrete Manholes combined with in-line bends and reinforced house connections that are proven to eliminate infiltration and root intrusion. Unless otherwise stated, for gravity sewers, "NuSewers" are the only acceptable solution for QUU; "RIGSS" are the only acceptable solution for GCCC, LCC and RCC, and UW may allow either option. **Terminal entry point** *See terminal maintenance shaft*
II Abbreviations	**Add the following new items** **ADAC:** Asset Design As Constructed **AWA:** Australian Water Association **SEQ-SP:** South East Queensland water services provider
III Reference documents	**Change drawing reference to SEQ-SEW-1307-3 for AS 1170.2.** **Change drawing reference to SEQ-SEW-1204-1 for AS 2159.** **Change drawing reference to SEQ-SEW-1401-1 for AS 4799.** **Change drawing reference to SEQ-SEW-1313-1 for AS/NZS 1260.** **Change drawing reference to SEQ-SEW-1405-1 and SEQ-SEW-1406-1 for AS/NZS 3679.1.** **Change drawing reference to SEQ-SEW-1500-1 for AS/NZS 4327.** **Insert reference to AS 4970 - Protection of trees on development sites**

Reference	Amendments to WSA02 - 2002 V2.3
PART 1 – PLANNING AND DESIGN	
1.1 Scope	**Add after first paragraph** *The nominated requirements of the SEQ-SPs planners and designers will be in accordance with the SEQ Water Supply and Sewerage Design Criteria and the Queensland Department of Environment and Resource Managements Planning Guidelines for Water Supply and Sewerage Schemes. The SEQ Water Supply and Sewerage Design Criteria takes precedence over all other planning advice.* **Add the follows at the end of the third paragraph.** *For Queensland, this option is defined in the Standard Plumbing and Drainage Regulation 2003 at Part 5, Division 1, Section 34 and Section 35.* **Insert the following at the end of the section** Smart Sewers are mandatory for all new developments as directed by the SEQ-SP for the Council area. In-fill areas shall also use Smart Sewers except that other materials may be used where specific approval has been obtained from the SEQ-SP. Gravity sewers are the preferred means for providing sewer service. Any other options require specific approval from the relevant SEQ-SP. Smart Sewers are designed on the basis that inspection will be undertaken with CCTV equipment and blockages cleared using jet rodders. This approach allows the sewer alignment to include both horizontal and vertical curves minimising the number of maintenance access structures compared to a traditional sewer system. With Smart Sewers, the majority of access structures will be maintenance shafts and chambers. However, MH's are still required for complex sewer junctions and at strategic locations for the removal of miscellaneous items that occasionally enter the sewer system.
1.3.2 Planning responsibilities	**Delete this clause and replace with the following** *The relevant SEQ-SP is generally responsible for overall planning for the provision of sewerage to its customers. Refer to SEQ Design Criteria for details.*
1.3.3 Design responsibilities	**Insert the following at the start of the second paragraph** The design of the works shall be carried out under the direction of, and certified by a Registered Professional Engineer of Queensland (RPEQ). The Designer shall obtain the written approval from the relevant SEQ-SP for any variations to the requirements of this Code (as amended) prior to the submission of the final design. **Add a new sub-clause (I) into the item (iii):** (I) The flow contributing to each section of sewer main including the design PWWF and the pipes capacity.
2.2.1 Planning horizon	**Remove existing reference to "10 – 30 years" in the advisory wording in the code** **Insert after the first paragraph the following** The SEQ planning horizon shall be the ultimate projected population under the Planning Scheme for the relevant Council Area that the works are being provided within. In the absence of a Planning Scheme horizon, the SEQ-SPs will provide guidance on the planning horizon to be used.
2.3.1 Loading per serviced property	**Change Sub-clause (c) as follows.** *(c) Average Equivalent Population (EP) per unit or per area rating, based on the loading rate nominated in the SEQ Design Criteria.*
2.3.2 Assessment of future loads	**At the end of the first sentence, change the "…of 180 L/EP/d." to "…based on SEQ Design Criteria."** **Change item (a) as follows** (a) Use the EP loadings per unit type listed in the SEQ Design Criteria.

Reference	Amendments to WSA02 - 2002 V2.3
2.4.2 **Sewage quality / Trade waste management**	**Add as the last sentence to 2.4.2** The EP loadings per unit type shall be as listed in the SEQ Design Criteria.
Insert a New Clause 2.4.3	**Insert the following after Clause 2.4.2** **2.4.3 - Swimming Pools** For operational reasons, swimming pool discharges including backwash from either commercial or domestic pools shall not be discharged to the sewerage reticulation system without the written consent of the relevant SEQ-SP.
3.2.1 **Design flow estimation method-General**	**Add the following mandatory sentence** Estimates of demand per land use type shall be in accordance with advice contained in the SEQ Design Criteria.
3.2.5 **Flow schedule**	**Add "…, refer Clause 1.3.3 herein." to the end of the sentence.**
4.1 **Detail design process**	**Add the following after item (f)** Multi-unit developments shall be serviced by a min 150 nominal bore (DN160 PE) diameter property connection. Internal works shall be constructed as private sanitary drainage. Multi-unit developments that are redeveloped under a future reconfiguration which is to have individual units located on a freehold title lot will require each of the lots to be serviced with a min 100 nominal bore (DN110 PE) diameter property connection. This may involve the construction of a sewerage reticulation system to provide a property connection to each lot. Where this could occur in the future, consideration should be given to constructing the private sanitary drainage to the sewer standards defined herein. Stubs shall be provided to accommodate future flow from upstream properties as necessary. To facilitate future Trade Waste management, for all commercial and industrial developments, property connections shall be connected to sewers through maintenance structures.
4.2.2 **Design accuracy**	**Replace the last paragraph with the following.** Refer Asset Information Specification for the details of level and location references.
4.2.3 **Sewer layout**	**Insert the following after paragraph 2.** The SEQ-SPs preferred location for sewers shall be within the service allocation in the road reserve. Where this is not practicable, the following alternatives may be considered: a) another service allocation, subject to the service owners approval; b) along drainage reserves subject to provision of vehicular access to sewer maintenance points; and c) in the road carriageway. **Insert before the final paragraph.** No junctions shall be provided on reticulation sewers that exceed 3 m depth to top of pipe without the approval of the relevant SEQ SP. Where a sewer is greater than 3 m deep, options may be either provision of a high level reticulation sewer that services the allotments within the 3 m constraint, or the use of maintenance structures.
4.2.4.1 **Environmental considerations-General**	**Insert the following at the start of Clause 4.2.4.1.** Full details of environmental mitigation works shall be shown on the Design Drawings and submitted to the relevant authority for approval. Prior to any works being accepted, the consulting engineer shall provide the relevant SEQ-SP with certification that the works have been carried out in accordance with any environmental requirements. The design submission for the pumping infrastructure and the receiving system shall be accompanied by the appropriate approvals and certificates (e.g. ERA 63) from the Queensland Department of Environment and Heritage Protection (DEHP) and an associated Odour Impact Assessment Report. Any odour impacts associated within the pumping system and within the receiving sewerage system shall be assessed to the requirements of the Environment Regulators *Guideline for Odour Impact Assessment from Developments*.

Reference	Amendments to WSA02 - 2002 V2.3
4.2.4.3 Vegetation	**Insert the following at the end of this clause** *Designers and constructors shall take early and due consideration of both the relevant SEQ-SPs requirements and AS 4970 Protection of Trees on Development Sites.*
4.2.4.4 Contaminated sites	**Insert the following at the start of this clause** A register of contaminated sites is held by the DEHP Contaminated Land Unit. Details of works to be carried out on a contaminated site shall be referred to the relevant Council Environmental Officer.
4.2.5 Easements	**Change the drawing reference in the first paragraph to SEQ-SEW-1100-1 and SEQ-SEW-1100-2.** **Replace the second paragraph with the following:** Easements shall be provided along the full alignment of any gravity sewers located on private property. Normally easements shall be wholly contained within the property in which the sewer is located and located centrally over the sewer. Where these criteria conflict, the SEQ-SP may permit the easement to be placed eccentrically over the sewer or the sewer to be placed centrally within a pair of parallel easements created over two adjoining lots. The minimum width of easements to be provided for gravity sewers shall be as specified in the table below and is dependent on the diameter and depth of the sewer. Where a maintenance structure (maintenance hole, maintenance shaft or terminal entry point) is located on private property, a minimum 1 m wide easement along the side boundary from the front boundary to the rear boundary, for sewerage purposes, is to be provided to facilitate access to the structure. However, in QUU and RCC areas only, easements are not required to be provided over gravity sewers of 300 mm diameter (DN315PE) or less. The minimum 1 m wide easement required for facilitating access to maintenance structures is to be provided for all maintenance structures on private property, irrespective of the diameter of the associated sewer, and is to contain the maintenance structure. For QUU area easements are generally not required for infrastructure located on Council land. **Minimum Easement Widths for Gravity Sewers** | Sewer Diameter (nominal internal diameter) | Sewer Depth (to invert level) | | | | | <=3 m | >3 m to <=5 m | >5 m | | <=300 mm | 3 m* | 6 m* | 10 m* | | >300 mm to <=600 mm | 6 m | 6 m | 10 m | | >600 mm | 10 m | 10 m | 10 m | *No easement over gravity sewers of 300 mm diameter (DN 315 PE) or less required in QUU and RCC areas.
4.2.6 Disused sewers	**Replace the first paragraph as follows** Where a design results in the disuse of an existing sewer, the Design Drawings and Specification shall detail proposed treatment such as demolition of top 300 mm of an MH top and/or capping both ends of the sewer at each MH or complete removal of the sewer and structures. Works to be undertaken on sewers and maintenance structures that are no longer required shall primarily be as advised by the relevant SEQ-SP. All AC sewers must be removed from site in accordance with SEQ-SPs requirements and all relevant safety requirements. For all other pipe materials, disused sewers are to be either removed, grout filled or plugged as advised by the relevant SEQ-SP. Disused sewer maintenance holes are to be removed or demolished in situ as advised by the relevant SEQ-SP. The works undertaken on disused sewers and MHs shall be recorded as part of the "As – Constructed" details.

Reference	Amendments to WSA02 - 2002 V2.3
4.3.2 **Road, reserves and public open space**	**Insert the following after paragraph 1** Wherever practicable, sewers shall be located in the sewer allocation on the high side of the road reserve. The designer is to check the details of the sewer allocation with the relevant road authority. Where there is a significant advantage in placing the sewer in another utility allocation, written approval shall be obtained by the designer from the relevant utility before this allocation is used. Sewers laid in the road carriageway shall be located in accordance with the relevant authorities' alignments/corridor allocations. The designer shall provide the SEQ-SP with written approval for the horizontal and vertical alignment from the relevant road authority. Wherever practicable, sewers in drainage reserves shall be laid parallel and adjacent to the drainage system and clear of grassed waterways to minimise the effect of pipe bedding material on ground water movement. The use of pipeline aqueducts across waterways shall be avoided where possible as they can impede stream flow and incur additional maintenance costs. Wherever practicable, maintenance structures shall not be located within any drainage infrastructure (e.g. swales, drains, detention and retention facilities). **Change the drawing references in the second paragraph to SEQ-SEW-1400-1, SEQ-SEW-1401-1, SEQ-SEW-1402-1, SEQ-SEW-1403-1 and SEQ-SEW-1404-1.** **Add "where required by the SEQ-SP" into the third paragraph to read as follows.** Where sewers cross freeways, arterial roads and other designated major road reserves, where required by the SEQ-SP, the following design criteria shall apply: **Change the reference in the last sentence from Clause 6.2 to Clause 6.3**
4.3.3 **Railway reserves**	**Amend second sentence on 1st paragraph to read** "Consultation and approval of the water Agency and railway owner shall be….". **Change the drawing reference in paragraph 1 to SEQ-SEW-1401-1.** **Add the following after paragraph 1** Where a sewer is to be located within a railway reserve, a Deed of Agreement between the Railway Authority and the relevant SEQ Service Provider will be required.
4.3.4 **Public and private property**	**Add the following text to the start of this clause** Sewers will not generally be allowed within industrial or commercial property. Sewers in industrial areas shall be located in the road reserve unless the topography does not permit such a location. Where the sewer is located along the side or rear boundary of an industrial property and it is possible that the sewer will be built over, the sewer should be positioned 2 m to 4 m from the boundary Where a new reticulation sewer in residential areas is to be located on private or public property, the designer will provide to the SEQ-SP written approval from the property owner. For the purposes of this clause, public property includes parks, reserves and land administered by a government authority. Such written approval is to be submitted with the design when an application is lodged for design approval. Sewers on residential properties shall be offset 1.0 m to 1.5 m from the property boundary, with preference for the larger offset. Sewers on-lot shall always be closer to the dwelling than the stormwater drainage system and shall be provided with an easement as per Clause 4.2.5. To avoid conflict with site improvements (e.g. landscaping etc), sewers shall generally not be located within the area between the front property boundary and the standard setback for building works. Where sewers are to be located within private or public property the designer shall ensure

Reference	Amendments to WSA02 - 2002 V2.3
	maintenance structures and property connections are located clear of structures, in locations vertically open to the sky, allow for future maintenance and operation, and have unrestricted access from the street frontage of the site at all times. No mains shall be located within the rear of a Canal estate allotment.
4.3.5 Changes in direction using an MH	**Change the MH to Maintenance Structure in the title of this clause. Change the first paragraph to read.** *Achievable changes in direction at a maintenance structure are dependent on the diameter of the sewer, the physical ability of the maintenance structure to accommodate the deviation in direction and the type of inlet / drop across the maintenance structure.* The maximum allowable deflection of a sewer through an MH, excluding horizontal bends external to the MH, shall be in accordance with Table 4.1. For MS arrangement, refer SEQ-SEW-1314-1 and SEQ-SEW-1315-1 for details. *Clause 4.3.7 specifies requirements for external horizontal bends.* **Insert the following as Note 4 of Table 4.1.** 4. QUU does not allow this configuration. The maximum allowed deflection for QUU is 120^{o}. **Update drawing number in Table 4.1 to SEQ drawing number format.**
4.3.6 Dead-ends	**Add "…terminating in a maintenance structure…" to read as follows.** Where a sewer is to be extended in the future, the end of the sewer shall terminate at least 1.0 m past the boundary of the development and terminating in a maintenance structure to ensure that a future extension of the sewer does not require the unnecessary excavation within lots or streetscapes already developed.
4.3.7 Horizontal curves in sewers	**Delete the drawing reference in the third paragraph.** **Replace paragraphs 4, 5 and 6 with the following:** Smart Sewers such as NuSewers and RIGSS may include horizontal curves to avoid obstructions and reduce the number of maintenance structures. For NuSewers this may include a combination of **Long Radius bends** (LRBs) and **Short Radius Bends** (SRBs) as prescribed below and for RIGSS the sewer line may include LRB's with SRB's at Rodding Ends. The maximum deflection angle for long radius bends shall be 90 degrees with this being achieved for RIGSS by the RRJ connection of two 45 degree bends and for NuSewers by the use of a continuous run of PE pipe as discussed below . The maximum deflection for a NuSewer short radius bend (SRB) shall be 45 degrees. Sections of a curve in a Smart sewer shall not be located under the road carriageway. For all **NuSewers,** a maximum of two long radius bends (LRB) may be used between adjacent maintenance structures. Curves in NuSewers may include both long and short radius bends. For NuSewers, a short radius bend (SRB), with a maximum deflection angle up to 45 degrees, may be provided immediately upstream of a maintenance structure. The standard radius for a SRB is 750 mm. Where a NuSewer approved SRB is provided, only one additional long radius bend up to 90 degrees may be included between maintenance structures. The minimum LRB radius for NuSewers shall comply with the POP202 requirements i.e. 35 times outside diameter for a SDR21 PE pipe. In curved streets, the bend radius shall match the road curvature provided the bend radius limitations in POP202 are not exceeded. An acceptable alignment for a NuSewers is shown below.  An acceptable alignment for a RIGSS sewer is shown in SEQ-SEW-1103-1.

Reference	Amendments to WSA02 - 2002 V2.3
	For DN150 **RIGSS installation** a maximum of two LRB's may be utilised along the sewer line between maintenance structures. However, additional LRB's may located directly at a maintenance shaft to achieve connection of the sewer line to fixed angle Moulded Maintenance Shaft bases to achieve the required horizontal alignment and vertical grade, refer to SEQ-SEW-1100 and SEQ-SEW-1101 drawing sets for details. Short Radius Bend shall only be used at a Rodding End. Horizontal curves are not permitted in RRJ sewers without the use of a LRB. For RIGSS, typically DN150 sewer LRBs are directly available from suppliers, refer to the drawing SEQ–SEW-1103-1 and SEQ-SEW-1314-3. DN225 and larger bends in RIGSS are either formed or fabricated bends from Plain Wall PVC-U DWV pipe to AS/NZS1260 and may require pre-ordering . Both fabricated and formed PVC long radius sweep bends are shown in SEQ-SEW-1314-3. Larger diameter sewer bends for RIGSS are detailed in SEQ-SEW-1310-1 and require Lead Time for delivery. DN225 and larger bends in RIGSS shall be fabricated bends from AS/NZS1260. Certified Fabrications as shown in SEQ-SEW1314-3. Sewer connection junctions shall be placed on straight sections of the sewer. Property connection sewers may incorpoarte sweep bends and sweep junctions as shown on SEQ-SEW-1106 drawing set. Sweep bends/junctions are factory fabricated bends/junctions with a shorter bend radius than SRBs. Sweep bends shall not exceed 45 degrees. The minimum radius of Sweep bends on NuSewer property connection sewers shall be as follows: • Nu Sewer (PE): For 110OD PE, the minimum radius shall be 270mm. For 160OD PE, the minimum radius shall be 460mm
4.4.3 **Clearances from transmission towers and power lines**	**Add the following as the last paragraph in this clause** Where the distance between a metal sewer and a power line or transmission tower falls within the distances stated above, a report on the procedures to be adopted for the construction and maintenance of the sewer shall be provided and signed by a RPEQ as conforming with all relevant regulations etc.
4.4.4 **Clearance from structures**	**Clause to read as follows** The design of new sewer infrastructure shall address the impact of the works on existing structures. The designer shall ensure that the proposed works will not adversely affect the structural integrity or performance of the structure. For sewers located close to structures such as foundations for brick walls and buildings, the sewer shall be located clear of the "zone of influence" of the structure foundations to ensure that the stability of the structure is maintained and that excessive loads are not imposed on the sewer. Refer to Clause 4.4.4.1 for the detail of SEQ-SPs building over or adjacent to assets (BOAA) requirements. The location of existing structures within the vicinity of the sewer shall be detailed on the design. Footings and retaining structures may need to be detailed in section views. Where the designer proposes underpinning, bridging or other works to protect the sewer, these shall be detailed on the sewer design. While the location and type of these works may be subject to agreement with the relevant SEQ-SP, the structural design remains the responsibility of the designer. Sewers shall cross retaining walls as close as practicable to right angles. Where the sewer crosses under a retaining wall, an RPEQ certificate shall be provided to the relevant SEQ-SP verifying the structural integrity of the sewer. Where the sewer crosses under a boulder retaining wall, a concrete bridging slab shall be placed over the sewer and a RPEQ certificate provided to the relevant SEQ-SP for the slab design and the integrity of the sewer.

Reference	Amendments to WSA02 - 2002 V2.3
Insert New Clause 4.4.4.1	**Insert new Clause as follows** **4.4.4.1 Building Over or Adjacent to Assets (BOAA)** Section 192 of the Water Supply (Safety and Reliability) Act 2008 makes it an offence to interfere with a water service provider's infrastructure without the written consent of the service provider. Activities that constitute interference include, but are not limited to: a) Building over infrastructure; b) Interfering with access to infrastructure; c) Increasing or reducing the cover over infrastructure; d) Changing the surface of land in a way causing ponding of water over an access chamber for infrastructure. e) Building near infrastructure in a manner that has the potential to cause damage to the infrastructure. However, the written consent of the service provider is not required for the carrying out of building work for a building or structure, as defined under the Building Act 1975. Building work on a lot that contains, or is adjacent to a lot that contains, a sewer or water main must be assessed against the Queensland Development Code Mandatory Part 1.4 - Building Over Or Near Relevant Infrastructure (QDC MP1.4). The building certifier will assess the building works against the QDC MP1.4 acceptable solutions. Where the building works do not comply with the acceptable solutions, the building development application must be referred to the relevant water service provider (owner of the infrastructure) for assessment as a concurrence agency. The relevant water service provider must assess the building works against the QDC MP1.4 performance criteria.
4.4.5.2 Clearance requirements	**Add the following before the first paragraph.** Where a sewer crosses over or under a water main > 300mm, the design details shall be submitted to the relevant SEQ-SP for approval. Where a stormwater drain >= 600 mm crosses over a sewer, the stormwater drain shall be supported by a bridge structure that spans the sewer trench. **Amend the Table 4.2 as follows.**

Reference	Amendments to WSA02 - 2002 V2.3

TABLE 4.2

CLEARANCES BETWEEN GRAVITY SEWERS AND OTHER UNDERGROUND SERVICES

Utility (Existing or proposed)	Minimum horizontal clearance mm		Minimum vertical clearance[1] mm
	New sewer size NB		
	≤ 200 mm	> 200 mm	
Water mains ≤ 375 mm	1000[5]/600	1000[5]/600	500[4]
Water mains > 375 mm	1000[5]/600	1000[5]/600	500[4]
Gravity sewers ≤ 300 mm	300	600	150[2]/300
Gravity sewers > 300 mm	600	600	300
Sewers – pressure	300	600	500
Sewers – vacuum	300	600	500
Gas mains	300[3]	600	500[4]
Telecommunication conduits and cables	300[3]	600	300
Electricity conduits and cables	500	1000	500[4]
Stormwater drains ≤ 300 mm	300[3]	600	150[4]
Stormwater drains > 300 mm	300[3]	600	300[4]
Kerbs	150	600[6]	150 (where possible)

Change Notes 3 and 4 as follows.

3 *Clearances can be further reduced to 150 mm for distances up to 2 m where mains are to be laid past installations such as concrete bases for poles, pits and small structures, providing the structure will not be destabilised in the process.*

4 *Sewers should always cross under water mains and stormwater drains.* For cases where there is no alternative and the sewer must cross over a water main, construction shall be in accordance with the Note 4 of Table 5.5 and Standard Drawing SEQ-WAT–1211-1 of the Water Supply Code.

4.5.3 Minimum air space for ventilation

This clause to be re-written as follows

To ensure the efficiency of natural ventilation of a sewer, an airspace shall be retained at design flow. At design flow, the depth of flow shall be not more than 75% of pipe diameter i.e. a minimum air space equivalent to 25% of pipe diameter at design flow. This criterion will also ensure that under peak dry flow conditions sewage will not contact the sewer obvert which can lead to a build-up of fat and subsequent blockages. This air space also reduces the chances of the sewer siphoning out the water seals or water traps within a connected dwelling or building ~~Water Agency shall nominate which of the following options shall be adopted:~~

~~Option A - Air space at peak dry weather flow (PDWF)~~

~~At PDWF, the depth of flow shall be not more than 60% of the pipe diameter i.e. a minimum air space equivalent to 40% of pipe diameter at PDWF.~~

~~Option B - Air space at design flow~~

~~*Catering for future growth or phased development may be achieved by providing an air space in the sewer at the design.*~~

~~At design flow, the depth of flow shall be not more than 70% of pipe diameter i.e. a minimum air space equivalent to 30% of pipe diameter at design flow.~~

<table>
<tr><th>Reference</th><th>Amendments to WSA02 - 2002 V2.3</th></tr>
<tr><td>4.5.4
Minimum pipe sizes for maintenance purposes</td><td>Replace Table 4.3 - Minimum Pipe Sizes for Reticulation and Property Connection Sewers as follows
<table>
<tr><th rowspan="2">Sewer</th><th colspan="2">Minimum size DN</th></tr>
<tr><th>NuSewers</th><th>RIGSS</th></tr>
<tr><td>-Property connection sewer servicing 1 residential premise on a single lot.</td><td>110</td><td>100</td></tr>
<tr><td>-Property connection sewer servicing ~~1 residential lot~~ 2 residential premises on a single lot or 2 adjoining lots.</td><td>110 (QUU), 160 (UW)</td><td>150</td></tr>
<tr><td>-Property connection sewer servicing more than ~~1~~ 2 residential premises on a single lot;
-Property connection sewer servicing commercial and industrial ~~lots ≤300 m^2~~ development;
-Reticulation sewers ~~servicing residential lots~~.</td><td>160</td><td>150</td></tr>
<tr><td>Reuse of existing property connections serving lots to be redeveloped: where the developer can demonstrate, to the satisfaction of the SEQ-SP, that an existing property connection sewer:
(i). is suitably located, and
(ii). meets hydraulic capacity requirements[1], and
(iii). is in sound condition assessed by CCTV, and
(iv). is of a material that is acceptable to the SEQ-SP, and
(v). has a remaining asset life expectancy in excess of 25 years.

NOTES:
1 CoGC will not permit more than 2 residential premises to be connected to an existing DN100 property connection sewer.</td><td colspan="2">Existing property connection sewers may be used</td></tr>
<tr><td>~~Reticulation sewer servicing commercial and industrial lots >300 m^2 and other complexes where large flows may be expected~~</td><td colspan="2">~~225~~</td></tr>
</table></td></tr>
<tr><td>4.5.5
Maximum EP for sewers – Table 4.4</td><td>Delete all text (And Table 4.4) and replace with the following

Sewers shall be sized to carry the design flow without exceeding the 75% flow depth (refer Cl4.5.3). The maximum EP figures in Table 4.4 do not apply.</td></tr>
<tr><td>4.5.7.1
Minimum grades for self-cleansing-General</td><td>Delete all text (including Tables 4.5, 4.6 and 4.7) and replace with the following

Minimum grades for self-cleansing are specified in the (separate) SEQ WS&S Design Criteria.</td></tr>
<tr><td>4.5.7.2
Reticulation sewers</td><td>Delete all text and replace with the following
Reticulation sewers shall be graded to achieve self-cleansing velocity at least once per day in accordance with Design Criteria D8 – Minimum Velocity of the SEQ WS&S D&C Code - Design Criteria. Where satisfying this requirement is in conflict with the objectives of the SEQ Sewerage Code in clause 1.4.2 , the SEQ-SP may permit sewers to be laid at gradients that do not achieve self-cleansing velocity provided that the Minimum Pipe Grades set out in Design Criteria D8 are met.</td></tr>
<tr><td>4.5.7.3
Property connection sewers and ends of lines:</td><td>Delete clause</td></tr>
<tr><td>4.5.9.1
Branch and trunk sewers</td><td>Adjust the second paragraph as follows.

The maximum grade shall be that for which the velocity of flow is 3.0 m/s for the sewer flowing full. The maximum grade shall be determined using the Colebrook-White equations for a roughness coefficient (ks) of 1.5 mm, or equivalent Manning “nM” value from the SEQ Design Criteria or as agreed by the SEQ-SP.</td></tr>
</table>

<table>
<tr><th>Reference</th><th>Amendments to WSA02 - 2002 V2.3</th></tr>
<tr><td>4.6.1 Vertical alignment of sewers - General</td><td>Add as the first sentence to this clause.

Sewers and property connections shall be constructed at the shallowest practicable depth, while ensuring that the critical factors described in the clause are achieved.</td></tr>
<tr><td>4.6.2 Long section design plan</td><td>Change drawing reference in paragraph 1 to “SEQ-SEW-1101 set”.

Add to the top of this clause

4.6.2.1 General

Add to the bottom of this clause

4.6.2.2 Deep Sewers
Sewers deeper than 5 meters require prior SEQ-SPs approval and will require specialist design. SEQ-SP may request that additional supporting documentation be submitted with the design.

The information required may include, but not be limited to:
• Suitable depth geotech boreholes and analysis of native soil modulus;
• Soils testing – Contaminated soils, acid sulphate soils etc.;
• Groundwater level and testing;
• Detailed cross sections; and
• Calculations on pipeline material and class selection.</td></tr>
<tr><td>4.6.3 Minimum cover over sewers</td><td>Amend Table 4.8 as follows to add QUU figures

<table>
<tr><th>Location</th><th>Minimum cover to top of sewer (mm)</th></tr>
<tr><td>Private residential property and public land not subject to vehicular loading</td><td>600 – new developments
450 – existing developments</td></tr>
<tr><td>Private residential property subject to vehicular loading</td><td>750</td></tr>
<tr><td>Footways, nature strips, industrial property, sealed road pavements other than arterial roads subject to vehicular loading</td><td>900
(1150 for QUU)</td></tr>
<tr><td>Sewer in a footway containing a 250 mm to 300 mm ID water mains</td><td>900
(1650 for QUU)</td></tr>
<tr><td>Unsealed road carriageways</td><td>1200</td></tr>
<tr><td>Arterial road carriageways</td><td>1200</td></tr>
<tr><td>Future road, rail and tram pavements</td><td>1200</td></tr>
</table></td></tr>
<tr><td>4.6.4.1 Lot servicing requirements - General</td><td>Amend the second sentence of the first paragraph to read as

This controlling depth is the highest level of the property connection point at which full drainage of the entire lot is provided by gravity via the customer sanitary drain laid in accordance with AS/NZS 3500.2.2.

Add after the first paragraph replaces previous insertion as follows:
For calculation purposes, the house drain alignment shall generally be 1 metre from side and rear boundaries and 6 metres from the front boundary (may vary in waterfront properties and reduced building alignments).

Add as the final paragraph

Where filling of a site is proposed as a way of controlling or increasing control of a lot, the filling will be subject to separate approval from the relevant authority.</td></tr>
</table>

Reference	Amendments to WSA02 - 2002 V2.3
4.6.4.2 Serviced area requirements for residential lots	**Delete this clause and replace with the following** For single residential lots, the property connection shall service the total area of the lot. For lots with multiple residential units, the relevant SEQ-SP may consider partial lot servicing. For "battle axe" blocks the serviced area may be considered to start at the end of the access way.
4.6.4.3 Serviced area requirements for industrial and commercial lots.	**Amend the first paragraph to read as follows** In general, the area to be serviced shall be the full area of the lot less any minimum setback distance. In suburban commercial areas where the sewers are located at the rear, the area to be serviced shall be the total area of the lot from the footway level of the frontage. **Add after the second paragraph** For industrial and commercial lots, the relevant SEQ-SPs may consider partial lot servicing.
4.6.4.5 – Servicing of Basements	**Add the following paragraph to the end of the clause:** "SEQ-SPs do not require sewers to be designed to provide gravity drainage for the first basement level in central business districts or any other areas. SEQ-SPs do not permit sanitary fittings in basements to drain by gravity to their sewerage systems. In accordance with the Plumbing Code of Australia, fixtures in basements or other locations, where sewerage system surcharge could damage the premises and contents, must be connected to the sewerage system by means of a pumping installation."
4.6.5.1 Minimum depth of sewer connection point-General	**Replace this clause with the following** The property connection point shall be at the upstream end of the property connection sewer, rather than at the main sewer. The depth of the property connection point shall be determined such that it provides for the physical losses from the controlling point on the lot to the property connection point and achieves the minimum cover requirements. The physical losses shall be calculated by assuming: a) the invert of the house drain at the controlling point is 0.5 m below the finished surface level (FSL); b) the longest run possible for the house drain around the perimeter of the serviced area; and, c) the grade of the house drain is 1:60 for 100 mm services and 1:100 for 150 mm services in compliance with AS/NZS 3500.2. The minimum depth of cover to property connection sewers shall comply with the requirements given in Table 4.8.
4.6.5.2 Soffit requirements:	**Delete the following text from this clause** With the approval of the Water Agency, the soffit requirements of 750 mm and 900 mm may be reduced by 150 mm where: (i) the number of properties connected upstream of the subject property does not exceed 10 or the equivalent loading; or (ii) the grade of the sewer downstream of the property connection is steeper than 3.0%.
4.6.5.4 Depth of connection point	**Add the following to the end of second last paragraph.** SEQ-SPs will only accept the provision of connections that comply with case (a) and case (c). **Replace the drawing references in the last paragraph to SEQ-SEW-1104-1, SEQ-SEW-1105-1 and SEQ-SEW-1106 set.**
4.6.6.1 Grading through MHs-General	**Replace the second paragraph with the following.** The maximum and minimum fall through a MH shall comply with the tables in SEQ-SEW-1301-2, SEQ-SEW-1301-4 and SEQ-SEW-1303-1. **Change the drawing reference in the third paragraph to SEQ-SEW-1301 set, SEQ-SEW-1302-1, SEQ-1304-1 and SEQ-SEW-1305-1.**

Reference	Amendments to WSA02 - 2002 V2.3
4.6.6.2 Internal fall through MHs joining sewers of same diameter	**Delete the Table 4.9.** **Replace the "…Table 4.9" at the end of the first paragraph with "…tables of SEQ-SEW-1301-2, SEQ-SEW-1301-4 and SEQ-SEW-1303-1".**
4.6.6.3 Internal fall through MHs joining sewers of different diameters	**Add the following at the end of this Clause.** **For QUU**, refer SEQ-SEW-1301-10.
4.6.6.4. Large falls at MHs.	**Replace drawing references in both paragraphs with SEQ-SEW-1301-2, SEQ-SEW-1301-4 and SEQ-SEW-1303-1.** **For NuSewers, replace Table 4.10 with the following.** **For NuSewers,** no internal drops are permitted in a 900 mm MH. A maximum of one internal drop is permitted in a 1200 mm MH (for existing manholes only). Refer SEQ-SEW-1301 set. *Table 4.10 is not used for NuSewers.*
4.6.7 Vertical curves	**Insert the following after first paragraph.** Smart Sewers may include vertical curves where a significant cost benefit can be achieved and the depth to invert is greater than 1.5m. Vertical curves are not permitted in RRJ sewers except through the use of a long radius bend as shown in the standard drawings. **Adjust the third paragraph as follows.** Where vertical curves are specified, no more than two (2) LRBs may be included between adjacent Maintenance Structures. The bend radii shall comply with the requirements given in CL 4.3.7. Manufactured bends shall be placed on the upstream and/or downstream side of the MS/MH immediately adjacent to the structure i.e. one at the outlet of an MH/MS and one at the inlet of a downstream MH/MS. The maximum deflection at each bend is 30°. **Replace the last two (2) paragraphs of this clause with drawing reference "Refer SEQ-SEW-1100 and SEQ-SEW-1101 sets".**
4.6.8 Compound curves	**Replace the last paragraph with the following.** Excluding bends used immediately adjacent to Maintenance structure, a maximum of one compound long radius bend is permitted between adjacent maintenance structures in accordance with the limitations set out in Clauses 4.3.7 and 4.6.7. Refer SEQ-SEW-1100 and SEQ-SEW-1101 sets.
4.7.2 Internal corrosion	**Insert the following to the ends of the clause** *Reticulation sewers with no pump system discharges entering the system generally do not require management for internal corrosion.* Where a pump station discharges into a receiving maintenance structure, internal corrosion protection shall be provided in accordance with the standard drawings and the network checked downstream for potential corrosion hazards (e.g. drop pipes and cement based pipes and pipe linings) All Maintenance holes, regardless of whether they received a pump station discharge, require protection coatings in the following circumstances: (a) All 1500 mm dia and larger maintenance holes; (b) Maintenance holes greater than 4 m in depth; (c) Maintenance holes on sewers > 300 mm nominal bore; (d) Maintenance holes servicing industrial estates; (e) SPS collection maintenance holes; (f) All maintenance holes for 100 m downstream of a Discharge Maintenance hole; and (g) Where additionally required by the Odour Impact Assessment Refer to Clause 18.8 for the types of coating required by SEQ-SPs.

Reference	Amendments to WSA02 - 2002 V2.3
4.7.3 **External corrosion**	**Insert at the end of this clause** Where concrete structures and pipes are installed in acid sulphate soils or within soils affected by the tidal zone, the provision of an acid resistant coating to the exterior of the structure or pipe shall occur prior to installation. Plastic pipes including NuSewers (PE) and RIGSS (PVC) shall not be used in ground likely to be contaminated with hydrocarbons. In cases where hydrocarbons are likely to be encountered, possible alternatives may be discussed with the relevant SEQ-SP.
4.8 **Steel sewers**	**Change the whole clause to informative.** **Change the drawing reference in Clause 4.8.2 to "SEQ-WAT-1408-1 of Water Supply Code".**
Insert a new clause (informative) **4.8.5**	**New Clause** **4.8.5 Coating and lining** *Steel pipe shall be coated and lined with a fusion bonded polyethylene material approved by the SEQ-SP.*
5.1 **Property connection-General**	**Replace the drawing reference with SEQ-SEW-1104-1, SEQ-SEW-1105-1 and SEQ-SEW1106 set.** **Add a new paragraph into Clause 5.1 as follows:** "Property connection shall be sized in accordance with SEQ Code."
5.2 **Limitations of connection to sewers**	**Adjust the last paragraph as following.** *Special precautions such as water seals may be required on these connections (refer to Clause 7.2).* **Add the following exception at the end of the clause:** "Where LCC permits property connections into sewers of DN300 or above, these must be into a Maintenance Hole, which may also require incorporation of a water seal or other odour prevention measures if so directed."
5.3.1 **Methods of the property connection, General**	**Delete the drawing references in (a) and (b).** **Insert at the end of this clause the following.** Sewer connection details shall comply with the standard drawings SEQ-SEW-1104-1, SEQ-SEW-1105-1 and SEQ-SEW1106 set.
5.3.2 **IO interface method**	**Add "Not used by SEQ-SPs" at the start of this clause.**
5.3.3 **Buried interface method**	**Add "Refer formats in SEQ-SEW-1104-1, SEQ-SEW-1105-1 and SEQ-SEW1106 set" at the start of this clause.**
5.4 **Maximum Depth of Property Connection**	**Insert the following at the end of this clause** The maximum depth to invert of a property connection for a single residential lot shall be 1.5m. Where the sewer is 1.5 to 3 m deep, a vertical riser (jump up) or slope up connection is required. For multi- residential, commercial and industrial developments, the maximum depth to invert of the property connection shall be 3 m. No connections shall be specified to sewers at depths greater than 3 m. In such cases, connections shall be made to a maintenance structure or to a higher level secondary sewer. Clearances around property connections shall comply with the requirements stated for maintenance structures in CL. 6.4. Where a concrete slab is to be constructed over a property connection, a 0.9 m square removable section with suitable lifting lugs shall be provided centrally over the connection as required under the "Building Over Assets" policy.

Reference	Amendments to WSA02 - 2002 V2.3
5.5.1 **Single occupancy lots**	**Insert the following at the end of this clause.** A maximum of two single residential connections may be installed with a vertical riser or sloped connection. For RIGSS, a maximum of possible four single lot connections (two Dual House Connections) may be installed on a vertical riser. Refer SEQ-SEW-1104-1, SEQ-SEW-1105-1 and SEQ-SEW-1106 set.
5.5.2 **Multiple Occupancy Lots**	**Change the second paragraph to non—italicised.** **Amend the last paragraph as follows** Only option a) will be permitted by the SEQ-SPs . This Option shall only apply……..
5.6 **Location of Connection Points**	**Insert the following to the end of this clause.** Property connections shall not be located within 1.5 m of existing or proposed structures.
5.6.1 **Undeveloped lots**	**Adjust the first sentence as following.** The location of property connection points on undeveloped lots shall be as shown in the Standard Drawings. Where this cannot be achieved, the connection point may be: **Change the drawing reference in the last paragraph as "SEQ-SEW-1104-1, SEQ-SEW-1105-1 & SEQ-SEW-1106 set".**
5.7 **Y – Property connections**	**Amend the clause as follows.** Each lot will have a separate property connection. *Where permitted by the Water Agency, consideration may be given to "Y" property connections i.e. those providing for connection of two lots where cost savings would result and the property owners would not be disadvantaged.* No more than two (2) properties shall be connected to a single point on the reticulation/property connection sewer (Refer SEQ-SEQ-1106 set). For RIGSS, a possible four single lot connections may be made to a vertical riser as discussed in Clause 5.5.1 herein. With "in-fill" lot developments where one lot is divided into two, an existing property connection may, subject to approval by the relevant SEQ-SP, have a branch to service the additional lot.
5.8 **Length of property connection sewers**	**Add the following at the end of item (a):** (may be increased to up to 25 m for connections in brownfield developments at the discretion of the relevant SEQ-SP)". **Change item b)** to state that the maximum length of a 150 mm property connection sewer shall be 30 m. **Replace the drawing reference with SEQ-SEW-1106-1.**
6.1 **Types of Maintenance Structures**	**This clause to read as follows** This Code addresses three (3) types of maintenance structures: (a) Maintenance Holes (MHs) - which are applicable to either RIGSS sewers and NuSewers and shall comply with the details on Standard Drawings SEQ-SEW-1300-1; 1301 set, 1302-1; 1303-1; 1303-3; 1304-1; 1305-1; 1306-1; 1307 set; 1309-1; 1310-1; 1311-1; and 1312-1 inclusive. For discharge manholes, refer to SEQ-SPS–1406-1 to 1406-5 inclusive. All MHs allow personnel and equipment access to the sewer system; (b) Maintenance Shafts (MSs) - which are for both RIGS sewers and NuSewers are available up to and including 225 mm ID sewers. The details shall comply with the Standard Drawing SEQ-SEW-1314-2 and SEQ-SEW-1315-1 and are currently only applicable to 150 mm ID and 225 mm ID sewers and only allow equipment access to the sewer system; and (c) Terminal Entry Points (TEPs) - to comply with the details shown on Standard Drawings SEQ-SEW-1314-1 and SEQ-SEW-1315-1 which and are currently only applicable to 150 mm and 225 mm sewers and only allow equipment access to the sewer system. In some situations, a TEP may be used in lieu of the external drop type MH subject to the agreement of the SEQ-SP.

<table>
<tr><th>Reference</th><th>Amendments to WSA02 - 2002 V2.3</th></tr>
<tr><td>6.2
Locations of maintenance structures</td><td>Add a sub-clause (k).

(k) at Pump Stations all flows into the station shall be through a single Manhole.</td></tr>
<tr><td>Table 6.1</td><td>Amend Table 6.1 – Acceptable MH,MS and TEP options for reticulation sewers, as follows
<table>
<tr><th rowspan="2">APPLICATION</th><th colspan="3">ACCEPTABLE OPTIONS [1]</th></tr>
<tr><th>MH</th><th>MS</th><th>TEP</th></tr>
<tr><td>Intersection of reticulation sewers—≤2 inlets at same level</td><td>YES</td><td>YES.</td><td>YES[2] for RIGSS
NO for NuSewers</td></tr>
<tr><td>Intersection of reticulation sewers—≤3 inlets at any level</td><td>YES</td><td>YES[3].</td><td>NO</td></tr>
<tr><td>Reticulation sewers / change of grade at same level</td><td>YES</td><td>YES ≤225 mm pipe only and using vertical bend</td><td>NO</td></tr>
<tr><td>Change of grade at different level</td><td>YES
MH with internal/external drops</td><td>YES
≤150 mm (RIGSS)

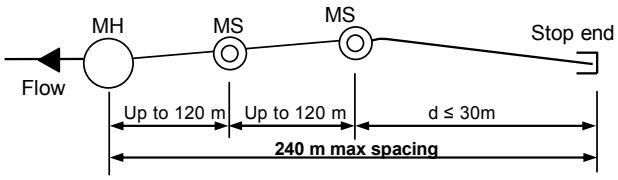
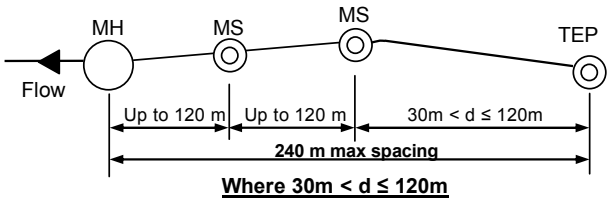
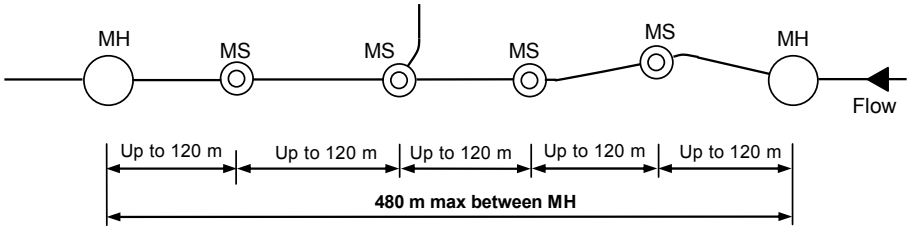
≤225 mm (NuSewers)</td><td>YES for RIGSS (≤150 mm pipe)

NO for NuSewers</td></tr>
<tr><td>Change in sewer size</td><td>YES</td><td>YES</td><td>NO</td></tr>
<tr><td>Change in sewer horizontal direction</td><td>YES
Within permissible deflection at MH</td><td>YES
MS prefabricated units or MS used with horizontal bend-deflect to permitted limits</td><td>YES for RIGSS for DN150 pipe only

No for NuSewers.</td></tr>
<tr><td>Change of pipe material</td><td>YES</td><td>YES</td><td>NO</td></tr>
<tr><td>Permanent end of a reticulation sewer</td><td>YES</td><td>YES</td><td>YES</td></tr>
<tr><td>Permanent end of a property connection sewer</td><td>NO</td><td colspan="2">Refer to specific Water Agency requirements for RIGSS.

NO for NuSewers.</td></tr>
<tr><td>Sewer pressure main discharge point</td><td>YES
MH is the only option and must include a vent</td><td>NO</td><td>NO</td></tr>
<tr><td>Junction of reticulation sewer and property connection sewer—same size sewers</td><td>YES</td><td>YES
Maximum 2 high level inlets into shaft</td><td>YES for RIGSS-Maximum 2 high level inlets into shaft.

NO for NuSewers</td></tr>
<tr><td colspan="4">NOTES:
1 Where personnel entry is required down to the level of the sewer, an MH is the only option.
2 Not at same level. In lieu of a drop MH subject to approval by the Water Agency
3 The permissible combinations are:
i. 3 (or less) inlets into base, none into riser
ii. 2 (or less) inlets into base + 1 x DN150 into riser
iii. 2 (or less) inlets into base + 2 (or less) x DN100 into riser</td></tr>
</table></td></tr>
</table>

Reference	Amendments to WSA02 - 2002 V2.3
6.3.1 Spacing of Maintenance Structures	**Add the following to the end of second paragraph** The design preference is that access to every part of the sewer can be achieved with jet rodder equipment assuming the service vehicle is fitted with pressure hoses with a maximum length of 150 m.
6.3.2 Maintenance structures spacing – Reticulation sewers	**Amend this clause as follows** For reticulation sewers, the maximum distance between any two consecutive maintenance structures shall be 120 m and subject to the provisions of Clause 6.3.1 (Refer Figures 6.1 and 6.2). Where the upstream end of the sewer line is equal or less than 30 m to the nearest downstream maintenance structure, the sewer is permitted to terminate in a stop end. For NuSewers the stop end shall be an electrofusion or butt welded end cap. For RIGSS the stop end shall be as shown for a "Dual House Connection outside Private Property", see SEQ-SEW-1104-1. Where the end of the line is further than 30 m to the nearest downstream maintenance structure, a maintenance structure (terminal entry point/rodding end) shall be installed at the end of the line as shown on SEQ-SEW-1314-1 and SEQ-SEW-1315-1. At the permanent end of line sewers, where the end of line is not a MH, the distance from the end of line maintenance structure/end cap to the nearest downstream MH shall not exceed 240 m, (Refer to Figure 6.1). Where the end of line maintenance structure is a MH, the distance from the end of line MH to the nearest downstream MH shall not exceed 480 m as shown on Figure 6.2.  **Where d ≤ 30m**  **Where 30m < d ≤ 120m** **FIGURE 6.1 MULTIPLE MS BETWEEN MH AND "LAST" MH/MS/TEP (diagrammatic only)** Where a combination of MHs and MSs is used along the same sewer, the maximum spacing between any two consecutive MHs shall not exceed 480 m irrespective of how many MSs are used between the two MHs (Refer to Figure 6.2).  **FIGURE 6.2 MULTIPLE MSs BETWEEN CONSECUTIVE MHs (diagrammatic only)**

Reference	Amendments to WSA02 - 2002 V2.3
6.3.3 Maintenance structures spacing – Branch and trunk sewers	**Change the first paragraph as following.** Only MHs shall be used for branch and trunk sewers of sizes 375 mm and greater. The maximum distance between any two MHs shall be 180 m. For 300 mm sewers, only MHs shall be used and the distance between any two MHs shall be 120 m as specified in Clause 6.3.2. **Insert the following informative paragraphs at the end of this clause.** *MH spacing for large diameter trunk sewers (>300mm), which are generally installed by tunnel boring techniques, may be increased to achieve significant cost savings and reflect current trenchless technology capabilities. Specialist equipment is available for inspecting and cleaning sewer lengths of 500 m or more without requiring personnel entry to the sewer.* *Therefore, for sewers of 1000 mm or larger, the MH spacing may be up to 500 m subject to a suitable project specific risk assessment being undertaken at the feasibility stage and confirmed at the detailed design stage. This risk assessment must ensure that serviceability needs are met by the proposed sewer configuration and adequate secure access to MHs is provided. If necessary, easements should be provided to ensure secure long term access to MHs. Access must allow for large cleaning vehicles to park in close proximity to MHs and manoeuvre as required.*
6.4 Special Considerations in Locating Maintenance Structures	**Replace the first paragraph with the following.** Clearances to maintenance structures, ends of line and property connections shall be in accordance with the relevant SEQ-SPs Building Over or Adjacent Assets Policy. They shall not be located within a building, or underneath a building overhang. **Delete the last paragraph of this clause.**
6.5 Special considerations for connection of new sewers to existing sewers	**Replace the drawing reference in (a) with "SEQ-SEW-1301-4, SEQ-SEW-1303-1, SEQ-SEQ-1306-1, SEQ-SEW-1307-2, SEQ-SEW-1307-3 and SEQ-SEW-1307-4".** **(b) is not for NuSewers.** **Replace the drawing reference in (c) with SEQ-SEW-1502-1.**
6.6.1 General	**Add the following to the end of the clause** Concrete Maintenance Holes (MHs) shall be provided at the following locations: • Intersection of more than 3 incoming sewers, • At complex sewer junctions, such as where the entry angle exceeds 90^0, • At a maximum spacing of 480 m. Convenient vehicular access must be available to all concrete maintenance holes.
6.6.2 Types of MH construction	**Add "Not for QUU" to sub-clause (b).** **For NuSewers, Pre-cast MH's are not acceptable (except as formwork).** **For RIGSS, external drops are not permitted for use with pre-cast MHs.** Concrete for MH construction shall be special class to WSA PS-358 with requirement of calcareous aggregates. **Replace the drawing reference in the second paragraph with SEQ-SEW-1300 to SEQ-SEW-1307 sets.** **Replace the drawing reference in the last paragraph with SEQ-SEW-1309-1, SEQ-SEW-1310-1, SEQ-SEW-1311-1 and SEQ-SEW-1312-1.**

<table>
<tr><th>Reference</th><th>Amendments to WSA02 - 2002 V2.3</th></tr>
<tr><td>6.6.5
Diameters of MH's</td><td>
Delete the first paragraph and replace with the following

Suitable Maintenance Hole sizing is addressed in standard drawing sets SEQ-SEW-1301 and 1303.

Insert a table at the end of this clause to show the relationship between MH sizes, MH depth and sewer sizes.

<table>
<tr><th rowspan="3">Sewer size (mm, NB)</th><th colspan="3">MH diameter (mm, ID)</th></tr>
<tr><th rowspan="2">NuSewers (Only cast-in-situ)</th><th colspan="2">RIGSS</th></tr>
<tr><th>pre-cast</th><th>cast-in-situ</th></tr>
<tr><td rowspan="2">Up to 225</td><td>900, MH depth ≤ 3 m (G type)</td><td rowspan="2">1000</td><td rowspan="2">1050</td></tr>
<tr><td>1200, MH depth > 3 m (F type)</td></tr>
<tr><td>300 to 600</td><td>Min 1200 (F or X type)</td><td>Nominated by SEQ-SP</td><td>1500</td></tr>
<tr><td>675 to 900</td><td>Min 1200 (X type)</td><td>Nominated by SEQ-SP</td><td>1800</td></tr>
<tr><td>Larger than 900</td><td>Min 1200 (X type)</td><td colspan="2">Nominated by SEQ-SP</td></tr>
</table>
* For RIGSS, The use of the above reticulation access structure shall generally be based on the following percentages per development population: manholes at 1050 mm diameter minimum shall be 35% of structures; refer clause 6.7.2 for residual population percentages for other access structure and alternative types.
</td></tr>
<tr><td>6.6.8
Ladders, Step Irons and Landings</td><td>
Replace the clause by the following paragraph.

Either ladders or step irons shall be specified for MHs depth from top of coping to bench exceeds 0.85 m (Refer to Standard Drawings SEQ SEW–1301-2 and SEQ-SEW-1301-4). For deeper MHs where the depth from ground level to sewer invert exceeds 4.25m, ladders shall be specified (Refer to Standard Drawings SEQ SEW–1301-6 and SEQ-SEW–1301-12).

Insert the following at the end of this clause

<u>For UW, GCCC, LCC and RCC</u>: Ladders, step irons and landings are not to be provided within maintenance holes.
</td></tr>
<tr><td>6.6.9
MH covers</td><td>
Delete the first line and replace with:

MH covers and frames shall comply with the details shown on the SEQ-SEW-1308 drawing set.

MH covers shall generally be located over the downstream sewer outlet as shown in SEQ-SEW-1301-3, SEQ-SEW-1301-5, SEQ-SEW-1301-8 and SEQ-SEW-1307-1 with covers for Maintenance Shafts and trunk sewer MHs to be as shown in the drawings.

Adjust the last paragraph to the following.

In sewers subject to surcharging, the design shall specify "tying together" of MH components to the cast in-situ riser e.g. restrained precast concrete cover slab and ductile iron frames with bolt down or hinged covers, to avoid the possibility of various components separating in the event of a sewer surcharge (Refer to drawing SEQ-SEW-1301-1).
</td></tr>
<tr><td>6.6.10
Cross-fall on MH covers</td><td>Change the drawing reference in the bracket to "SEQ-SEW-1308-1 for RIGSS".</td></tr>
<tr><td>Insert New Clause 6.6.11</td><td>
Insert a new clause as follows.

6.6.11 Modifications to Existing Maintenance Holes

When undertaking work within existing service areas, modifications to existing maintenance holes are to meet the specific requirements of that SEQ-SP.

For QUU when undertaking modification work to existing maintenance holes the following are to be met.
</td></tr>
</table>

<table>
<tr><th>Reference</th><th>Amendments to WSA02 - 2002 V2.3</th></tr>
<tr><td></td><td>
Where existing MHs do not have the current top slab, cover and frame and changes to surface levels or loading conditions are proposed, the modifications in following two tables shall be applied.

Changed Surface Level – No increase in loading conditions
<table>
<tr><th>Existing cover type</th><th>Modification</th></tr>
<tr><td>Triangular or rectangular</td><td>Replace top slab, install 600 mm cover</td></tr>
<tr><td>Circular</td><td>Reuse top slab and cover</td></tr>
<tr><td>“A” and “B”</td><td>Reuse top slab, install 600 mm cover</td></tr>
</table>
Changed Surface Level – Increased loading conditions
<table>
<tr><th>Existing conditions</th><th>Modifications</th></tr>
<tr><td>MH type “G” or “F”</td><td>Replace top slab, install 600 mm cover</td></tr>
<tr><td>MH type “E”</td><td>Replace with appropriate MH.</td></tr>
</table>
Where existing MH’s have damaged components the modifications in following table shall be applied.

MH with damaged top slab, cover and frame
<table>
<tr><th>Existing conditions</th><th>Modifications</th></tr>
<tr><td>Damaged cover and frame to MH type “G” or “F”</td><td>Reuse top slab, install 600 mm cover</td></tr>
<tr><td>Damaged top slab to MH type “G” or “F</td><td>Replace top slab, install 600 mm cover</td></tr>
<tr><td>MH type “E”.</td><td>Replace with appropriate MH.</td></tr>
</table>
Should any works be undertaken on a lamphole, the lamphole shall be replaced with an appropriate maintenance structure.
</td></tr>
<tr><td>6.7.1
Maintenance shafts (MS)- General:</td><td>
Replace the clause by the following.

MSs and TEPs may be used on reticulation sewers of 150 mm and 225 mm sewers as an alternative to some MHs (Refer to Table 6.1 and Standard Drawings SEQ-SEW–1314 and SEQ-SEW–1315 sets).

MSs are manufactured with a range of inbuilt horizontal deflections (0° to 90° generally and in some instances 120°) and may be used with or without variable bends. (Refer to SEQ-SEW-1314-1 and SEQ-SEW-1315-1).
</td></tr>
<tr><td>6.7.2
Design parameters for MSs and TMSs</td><td>
Delete clause and replace with the following.

MSs and TEPs shall only be used at the design locations detailed in Table 6.1.

The design of NuSewers MS shall comply with the following criteria (Refer SEQ-SEW-1315 set):

(i) The combined flow entering a MS shall not exceed 22 L/s.

(ii) The flow redirected at a deflection angle greater than 60° shall not exceed 12 L/s.

(iii) Where the deflection angle is more than 60° and the flow exceeds 12 L/s, the incoming sewer configuration shall be a 45° stub inlet with a SRB or a LRB.

(iv) The MS shall be designed to allow the entry of jet rodder cleaning nozzles and CCTV equipment, the PE riser shall be PE100 SDR21 and fabricated to DN250.

(v) Maintenance shafts shall only be installed on DN160 and DN250 sewers. Where the diameters of the inlet and outlet sewers are the same, the inlets shall be installed 20 mm above the MS invert. Where the outlet diameter is larger than the inlet, the obvert levels shall be common.
</td></tr>
</table>

Reference	Amendments to WSA02 - 2002 V2.3
	(vi) The maximum grade of an inlet connection to the MS shall be 1 in 10. Where the incoming grade is steeper than 1 in 10, the sewer shall be regraded or vertical curves to be included. (vii) The top section of the riser shall comprise a rubber ring seal PE/PVC connector. The cap for the riser shall comprise a rubber ring seal push on cap to allow for surcharge relief of sewers. (viii) The maximum depth to invert for maintenance shafts with standard construction conditions shall be 5 m. (ix) The vertical distance between a sewer connection entering the riser and the invert of a MS shall be a minimum of 750 mm. Where this distance is less than 750 mm the incoming sewer shall enter at the base of the MS with 20 mm invert offset or obvert to obvert. The entry grading may be achieved by either adjusting the sewer grade or using long radius vertical curves. (x) All MSs and TEPs shall have DI covers and frames that comply with the requirements in Cl 6.6.9. For **RIGSS** installations, the following criteria shall apply (see SEQ-SEW-1314 set): (a) Maintenance shafts are limited to DN150 and DN225 sewers with the flow exiting the structure to not exceed 22 L/s. (b) Directly opposing sewer inlets into a MS are permitted. (c) DN225 shafts are permitted only where a single upstream sewer is connecting to the base and there are no connections to the shaft. (d) Where the MS base supports/permits upstream sewers entering the base from between 60 degrees to 300 degrees from the downstream outlet, these formats are permitted. (e) Where there are two or more upstream sewers entering the base the shaft shall be a minimum of DN300. (f) Where there are Z Drop house property connections to the shaft, the shaft shall be a minimum of DN300. (g) Where there are Z Drop sewer line connections to the shaft, the shaft shall be DN600 for LCC, RCC and Unitywater and a shaft of DN300 is permitted for GCCC. (h) 100-150 property connections may use all MS Types with the House Connection Inspection Tee to be located a minimum of 2.0 metres from the MS centre. (i) 150-225mm sewers may use Type ‘G’, ‘H’, ‘J’ and ‘K’ maintenance shafts with shafts sized as defined above. (j) 150-225 mm sewers may use pre-cast concrete maintenance shaft (Quicktee or approved equal), shaft shall be minimum of 600 mm diameter. (k) Rodding ends shall be minimum size of 150 mm diameter and only on 150 mm sewers to a maximum depth to sewer invert of 2.0 metres. (l) The use of the reticulation access structure shall generally be based on the following percentages per development population. And the following population are rounded out by in-line bends being approximately 15% of structures: (A) maintenance shafts shall generally be 40% of structures, (B) rodding ends or as appropriate HCB terminal ends shall be 10% of structures,

Reference	Amendments to WSA02 - 2002 V2.3
	(C) those listed in Clause 6.6.5. (m) Dimension A Drops through Type 'G', 'H', 'J' and 'K' maintenance shafts shall be as per the manufactured form of the structure. (n) For Type 'J' maintenance shafts and their equals, the upstream sewer lines shall be graded only to the bottom centre invert and shall transition to this invert via the ball radius to a maximum of 1 in 1 grade. (o) For LCC, RCC and Unitywater, the maximum depth to invert for maintenance shafts shall be 2.0 metres. (p) For GCCC, the maximum depth to invert for maintenance shafts with standard construction conditions shall be 4.0 m to top of pipe (q) For GCCC, maintenance shafts shall be limited to one 'Z' drop for sewers up to 2.5 metres deep and a maximum of two 'Z' drops for sewers between 2.5 and 4.0 metres deep. For LCC, RCC and Unitywater, a maximum of one 'Z' drop is permitted for maintenance shafts. (r) Where the outlet diameter is larger than the inlet, the obvert levels shall be equal. (s) The maximum grade of an inlet connection to PVC and Polypropylene MS's and the maximum grade of an outlet connection to a Concrete, PVC, PE and Polypropylene MS's shall be 1 in 10. Where the incoming or outgoing grade is steeper than 1 in 10, the sewer shall be provided with long radius curves to align to the set outlet and the set inlet/s. (t) For MS's that accommodate grade at the inlet and/or outlet, where the sewer grade exceeds the factory capability of the inlet and/or outlet, the sewer shall be provided with long radius curves to align to the factory made outlet and inlet/s. (u) For MS with DN600 risers, due to the pipe connection format only either 1 sewer main or 1 property connection sewer may enter the MS riser as shown in SEQ-SEW-1314-2. In these instances, there is no requirement for a drop fitting and drop pipe to be installed. (v) The surface finish of the MS shall be as shown in SEQ-SEW-1308-1. Due to safety issues, surcharge relief shall be provided for the maintenance shaft from the sewer via a 20 mm hole drilled into the top of the cap (following pressure testing) and a 20 mm-25 mm rubber bung placed within the drilled hole. (w) All MSs and TEPs shall have covers and frames that comply with the requirements in SEQ-SEW-1308-1. (x) The vertical distance between a sewer connection entering the riser and the invert of a MS shall be as Tabled in SEQ-SEW-1314-1. Where this distance is less than the nominal for the type of structure, the incoming sewer design shall be graded so that the upstream sewer enters the base of the MS. Plastic maintenance shafts for PE shall comply with WSA PS-322, and for PVC shall comply with WSA PS-321.
6.7.3 Property connection sewer into MSs and TMSs	**Change the drawing reference to "SEQ-SEW-1314-1 and SEQ-SEW-1315-1".** **Insert the following RIGSS exception to the end of this clause.** **For RIGSS**, a rodding end as shown shall be used, refer to Clause 6.3.2 herein.

Reference	Amendments to WSA02 - 2002 V2.3
7.2 Water seals, boundary traps and water sealed MHs	**Delete this clause and replace with the following** *Water seals are a means of preventing noxious gases or persistent odours back-venting into a customer sanitary drain. Water seals are generally not required by SEQ-SPs.* **For GCCC**, where advised by SEQ-SP to provide water seals as shown on SEQ-SEW-1408 set. **For QUU**, where advised by SEQ-SP to provide water seals as shown on SEQ-SEW-1307-2 to 4.
7.3 Gas check MHs	**Delete Clauses 7.3.1 and 7.3.2. Add the following at the start of this clause.** *A gas check MH is a combination of two MHs separated by a water seal. Gas check MHs are generally not required by SEQ-SPs.*
7.4 Vertical and near vertical sewers	**Delete Clauses 7.4.1 and 7.4.2. Add the following at the start of this clause.** *At steep rock faces or high retaining walls, vertical or near vertical pipe structures, may be used in lieu of MHs with the approval of the Water Agency.* SEQ-SPs will not approve this format of sewer installation.
7.5.2 Design parameters for vents	**Replace the last paragraph with the following.** Educt vents are shown as Standard Drawing SEQ-SEW-1307-3. Induct vents are shown as Standard Drawing SEQ-SEW-1407-1. The final locations and types of vent shafts to be used shall be decided in consultation with the SEQ-SPs.
7.6 Near Horizontal Boreholes	**Change the Title to "Near-Horizontal Boreholes and Horizontal Directional Drilling (HDD)".**
7.6.2 Design requirements	**Change the reference in sub-clause (A) from Table 6.1 to Table 7.1.**
Insert New Clause 7.6.4	**Insert New Clause.** **7.6.4 Horizontal Directional Drilling – Acceptance criteria** HDD may be approved by the SEQ-SPs delegate subject, but not limited, to the following criteria: (a) Preferred pipe material is PE100. Mechanical or E-F couplings shall not be used within boreholes. (b) Diameter to be 1 size larger than that determined by the following the requirements of Section 3 and 4. (c) Pipe class to be minimum 2 classes up than that determined by the following the requirements of Section 3 and 4. Consulting engineers/contractors are responsible to ascertain & confirm pipe classes to suit required construction forces according to the pipe length, pipe diameter, pipe construction wear & tear and equipments etc. (d) Minimum grade to be the value given in Table 4.6 plus 0.5%. (e) The full pipe length shall be pressure tested as per Clause 22.4.2. (f) Check for ponding with water followed by CCTV inspections, ponding or backfill is not acceptable. (g) If there is a sag area found by CCTV, consulting engineers/contactors shall carry out a calculation to ensure that the ultimate PDWF level as designed will not exceed 75% of the pipe diameter at the sag section in depth. (h) If above requirements are not met, consulting engineers/contractors shall excavate & make good or abandon the pipes and start the installation again. Before any approvals can be granted, the consulting engineer/contractor shall agree in writing to accept the requirements as per points (f), (g) & (h) above.
7.8.2 Design parameters for inverted syphons	**Replace the sub paragraph (ix) with the following.** (ix) The inlet structure shall be designed so that only the primary barrel comes into operation for flows up to PDWF (with a provision of freeboard), and the secondary barrels are brought into service for increased flows i.e. PWWF.

Reference	Amendments to WSA02 - 2002 V2.3
7.9.2 Design parameters for ERSs	**Replace the drawing reference in the bracket of the second paragraph with "(Refer to Standard Drawings SEQ-SEW-1409 set, SEQ-SEW-1410 set, SEQ-SEW-1411 set, SEQ-SEW-1412 set and SEQ-SEW-1413-1 as appropriate for the SEQ-SP)".**
8.1 Structure design-General	**Adjust the last second paragraph as follows.** Sewers shall not be laid within railway reserves unless it is necessary to cross that land, in which case, the crossing shall be in accordance with AS 4799 and to the details of SEQ-SEW-1401-1.
8.2 Products and Materials	**Insert the following as the second last paragraph.** Specific requirements for **NuSewers** are as follows: All PE - PE connections in the PE sewer system shall be welded. Welding shall be in accordance with the following: **Factory welds:** (i) butt welding preferred; (ii) electro-fusion welding is acceptable; (iii) where butt or electro-fusion welding is not possible extrusion hot air welding is permitted. **Site welding**: (iv) butt welding preferred; (v) electro-fusion welding is acceptable. Only approved fittings shall be used, refer to SEQ accepted civil products & materials list. All pipes and fitting for NuSewers shall comply with AS/NZS 4130 and AS/NZS 4129. All site and factory welding shall be carried out by a person who has completed the Nationally Accredited Training Courses for Butt welding or Electro-fusion and must hold a valid welding certificate as per AS/NZS 2033. Refer to PIPA website for the training course details. The manufacturer's printed instructions on the electro-fusion welding procedure (in particular, the surface preparation requirements) are to be strictly adhered to. A mechanical/rotational scraper shall be used to remove oxidised layers during electro-fusion joint preparation. The use of hand scrapers is not permitted. De-beading is not to be carried out for butt welded joints unless otherwise specified by SEQ-SPs. PE sewers (NuSewers) shall be used in residential, commercial and industrial areas except where there is a possibility that the sewer flow or surrounding ground may contain certain forms of hydrocarbons or other chemicals which may have an impact on the PE material, refer to manufacturer for information on PE chemical resistance. For contaminated lands or old landfills, this requires special considerations in pipe material selection and approval from the relevant SEQ-SP. For **RIGSS**, all products and materials shall be selected from the SEQ Accepted Civil Products and Materials List.
8.6.1 Geotechnical considerations-General	**Replace the drawing reference in the last paragraph with "SEQ-SEW-1200 set".**
8.6.2 Sewers in Engineered or Controlled Fill	**Amend point g) ii) of the clause with the addition of the following:** "or in accordance with design Drawings and/or Specification"
8.6.7 Water-charged ground	**Replace the drawing reference with "SEQ-SEW-1202-1 and SEQ-SEQ-1203-1".**
8.7 Above ground crossings	**Replace the drawing reference with "SEQ-SEW-1404-1, SEQ-SEW-1405-1 and SEQ-SEQ-1406-1".**

<table>
<tr><th>Reference</th><th>Amendments to WSA02 - 2002 V2.3</th></tr>
<tr><td>Insert New Clause 8.7.1</td><td>Insert New Clause.

8.7.1 Creek Crossing

Where approved by relevant SEQ-SP, sewers shall be designed such that any sewer crossing a creek shall be located below the creek bed. This requirement will provide a critical control point in the network layout design.

However, where this requirement cannot be met the sewer shall be located above the Q100 flood level (i.e. aerial crossings or bridge crossings). If this cannot be achieved and the aerial crossing sewer is located below the Q100 flood level, the sewer shall be designed for Q100 flood force loadings.

Where the sewer crosses a tidal creek, the sewer shall be located below the creek bed on “at grade” crossing or where this is not possible alternatives shall be agreed with the relevant SEQ-SP.

For creek crossings, the designer shall obtain the approval of the relevant authority responsible for management of the waterway e.g. DEHP, and/or relevant road authorities/bridge owners.</td></tr>
<tr><td>8.8
Pipe cover</td><td>Replace the drawing reference with “SEQ-SEW-1200-2”.</td></tr>
<tr><td>8.9
Trench design</td><td>Replace the drawing reference with “SEQ-SEW-1200-2”.</td></tr>
<tr><td>8.10
Bulkheads and trenchstops</td><td>Amend the first paragraph to read:

Bulkhead and trenchstop requirements shall be detailed in the Design Drawings and shall be in accordance with Standard Drawings SEQ-SEW–1206-1 and SEQ-SEW-1207-1. Where located adjacent to a road crossing, bulkheads or trenchstops shall be placed adjacent to the kerb as shown in Standard Drawing SEQ-SEW–1206-1. Spacing of bulkheads and trenchstops shall be in accordance with Table 8.1. Bulkheads may also be required adjacent to the kerb of sealed roads to support the edge of the road formation.

Amend the fourth paragraph to read:

In addition to the grade of the sewer, when determining the use of bulkheads and trenchstops, trench location, annual rainfall, native soil permeability, natural water table, the occurrence of underground streams and other Water Agency criteria shall also be taken into consideration. Where wide trenching with step batters is used, Trenchstops and Bulkheads should not extend above the lowest un-stepped trench section.

Insert the following after paragraph 4:

Where it is possible, bulkheads on PE pipe shall be located on electro-fusion couplings. Where there is no electro-fusion couplings, factory made puddle flanges shall be used for the required bulkheads. Intermediate trench stops shall comply with the requirements of Table 8.1.

Replace Table 8.1 – Requirements for Bulkheads and Trenchstops with the following.

<table>
<tr><th>Grade
%</th><th>Requirement</th><th>Spacing S
m</th></tr>
<tr><td>5<Grade<15</td><td>Trenchstops</td><td>S=100/Grade%</td></tr>
<tr><td>15≤Grade<30</td><td>Concrete bulkhead</td><td>S=L/Grade%, where
L = 80xPipe length*, m (450 m max)
Where L>100 m – use intermediate trenchstops at spacing <100/Grade</td></tr>
<tr><td>30≤Grade<50</td><td>Concrete encasement (continuous) and concrete bulkheads</td><td>S = 100/Grade(%)</td></tr>
<tr><td>Grade ≥ 50</td><td>Special design</td><td></td></tr>
<tr><td colspan="3">*Pipe length is the standard pipe length installed.</td></tr>
</table></td></tr>
</table>

Reference	Amendments to WSA02 - 2002 V2.3
9.2 **Design Drawings**	**Replace all of clause 9.2 with the following.** All drawings are to be provided to the water authority in accordance with the SEQ Asset Information Specification and ADAC schema.
9.3 **Drafting Standards**	**Amend Clause to read.** Drawings shall be prepared in accordance with the SEQ Asset Information Specification and ADAC schema.
9.3.1 **Scale**	**Clause Deleted.**
9.3.2 **Recording of As constructed information:**	**Insert new line.** "As Constructed" information shall be provided in accordance with the SEQ Asset Information Specification and ADAC schema.
PART 2 PRODUCTS & MATERIALS	
10.1 **Purpose**	**Insert the following text at the end of this clause.** Critical products for which inadequate performance or premature failure may jeopardise the meeting of the relevant SEQ-SPs "Standards of Service" or the economic life of the system must be authorised for use by the relevant SEQ-SP before incorporation into the works. A list of accepted products and materials or suppliers of critical products is available separately from each SEQ-SP. Other products referred to on the WSAA web site, given below, may be used in specific projects subject to the approval of the relevant SEQ-SPs.
10.6 **Selection Guide for Pipeline systems**	**Adjust the title of Table 10.1 as following.** **PRINCIPAL GRAVITY SEWER PIPELINE SYSTEMS** **Informative** **(Refer SEQ Accepted Products & Materials List)** **Insert the following at the end of this clause.** <u>Applicability of PE pipes:</u> Polyethylene (PE) pipes shall be used for all new developments that using NuSewers. PE pipes shall be PE100 with minimum class of SDR21. Higher pipe classes may be used (higher pipe class means lower SDR e.g. SDR17 or lower values.) in accordance with in-situ conditions e.g. low strength soils. The standard pipe sizes are DN110, 160, 250 and 315 (reflect 100mm, 150 mm, 225 mm and 300 mm nominal bore respectively). For sewers larger than reticulation, DN400, 500, 630, 800, 1000 and 1200 may be used. The DN for PE pipes refers to outside diameters as per AS/NZS 4130. Pipe colour shall be: • External light grey—solid or striped. • Internal white or light colour to facilitate CCTV inspection. Internal white or light colour is mandatory as CCTV inspection forms part of the gravity sewer asset acceptance requirements. Pipe welds shall be butt welding or electro-fusion types. Where this is not possible factory applied extrusion hot air welding is acceptable. <u>Applicability of PVC pipes:</u> PVC pipes shall predominantly be used for all new developments that using RIGSS. Only rubber ring jointed PVC pipes may be used. <u>Other materials:</u> Use of other materials for pipes and fittings may be appropriate in some circumstances and requires specific approval by the relevant SEQ-SP.

Reference	Amendments to WSA02 - 2002 V2.3
PART 3: CONSTRUCTION	
11.2 Interpretation	**Replace the Standard Drawings as following.** **"Standard Drawings"** means the SEQ Standard Drawings in the SEQ WS & S Design and Construction Code.
12.2 Personnel Qualifications	**Insert the following text at the end of this clause** During any construction activity at least one person on site must have completed a pipe laying training course approved by the supplier and appropriate to the pipeline under construction. The training course must have been completed within the last ten (10) years The contractor will provide documented evidence of such qualification prior to commencement of the works.
13.1 General	**Insert the following line at the end of this clause** NuSewers shall be installed in accordance with the requirements of AS/NZS 2033.
13.2 Order of construction , testing and commissioning	**Replace the sub-clause (e) with following.** (e) Connect to the live sewer after all other Works have been constructed as specified. Make application to the SEQ-SP for the Live Connection and provide all required certifications for Vacuum, Pressure and Ovality tests.
13.5.2 Protection of Other Services	**Change the first paragraph to:** The Developer or its Contractor/s shall be responsible for any damage they cause to existing services. If the Developer or its contractor damages any existing services, they shall arrange for the relevant service provider to make good such damage and the cost thereof shall be borne by the Developer or its contractor. If in the opinion of the relevant SEQ-SP, the failure or damage causes an emergency situation, then remedial action will be taken by the relevant SEQ-SP and the full cost of such action shall be borne by the Developer or its Contractor. **Add as the last paragraph in this clause:** Where a development is approved for full site coverage and foundation works require excavations on-site, the use of temporary Earth Anchors requires extreme caution as the anchors placement within the verge/footway or even into the roadway may impact on the existing sewer or other services. Where a development causes damage to the service, the responsible person for the works shall be liable for the full cost of restoration including all diversion and tankering cost.
13.5.3 Disused/Redundant sewers	**Amend the clause to read.** Take action regarding disused sewers e.g. removal or capping at points of disconnection and /or grout filling the pipe and also removing surface fittings and parts of access structures as specified.
14.1 Authorised Products and Materials	**Amend the second paragraph to read.** Use only products and materials accepted by the SEQ-SPs. **Replace the last paragraph with the following.** A list of the accepted items is included in the "SEQ Accepted Products and Materials List". Where items are required but not included in the List, those items shall be referred to the relevant SEQ-SP for appraisal.
15.2 Limits of Excavation	**Add the following to the end of this clause** Where a sewer or property connection sewer is located in rock and has the potential to be extended, the excavation shall be extended 1.0 m or as directed by the superintendent.

Reference	Amendments to WSA02 - 2002 V2.3
15.3 **Excavation across improved surfaces**	**Change the second sentence of the third paragraph to the following.** Saw cut neat straight lines, at the distances shown in the SEQ-SEW-1205-1 beyond the outer limits of the excavation through bitumen, asphalt and concrete.
15.8 **Foundations and foundation stabilisation**	**Replace the drawing reference in the second paragraph with "SEQ-SEW-1200-1".**
16.3 **Placement of bedding**	**Replace the drawing reference with "SEQ-SEW-1200-2 and SEQ-SEW-1201-1".**
16.4 **Special pipe support for non-supportive soils**	**Replace the drawing reference with "SEQ-SEW-1202-1, SEQ-SEW-1203-1 and SEQ-SEW-1204-1".**
16.5 **Bedding for maintenance shafts and bends**	**Replace the drawing reference with "SEQ-SEW-1314 set and SEQ-SEW-1315-1".**
16.6 **Bedding for maintenance holes**	**Replace the drawing reference with "SEQ-SEW-1200-1" in the second paragraph** **Replace the drawing reference with "SEQ-SEW-1200-2 and SEQ-SEW-1203-1" in the last paragraph.**
17.1.3 **Polyethylene**	**Add the follows at the end of this clause.** Debeading is not required unless otherwise specified by SEQ-SP.
17.1.4 **Laying**	**Replace the drawing reference with "SEQ-SEW-1103 set and SEQ-SEW-1200-2"**
17.2.2 **Methods of deflection**	**Replace the drawing reference in sub-clause (c) with "SEQ-SEW-1314 set and SEQ-SEW-1315-1"** **Insert the following after (c).** **NuSewers** permits the 'methods' discussed in (b) or (c) above. **RIGSS** only permits the 'method' discussed in (c) above. **Change Table 17.1 as following.**

Reference	Amendments to WSA02 - 2002 V2.3

TABLE 17.1
METHODS OF ACHIEVING CURVED SEWERS

Curve type	Material and joint	Deflection at joint	Pipe size DN	Pipe length m	Minimum horizontal and vertical curve radius m
Cumulative deflection at joints	VC Socket - Spigot	Yes	100 – 1400	Up to 2.5– varies with DN	Note 1
	VC PE coupling	Yes	100 – 300	Up to 2.5– varies with DN	Note 1
	PVC elastomeric seal jointed (RRJ)	Yes	100 – 375	3.0 – 6.0	Note 1
	Profiled wall PE Socket - Spigot	Yes	375 – 2100	2.4 – 6.0	Note 1
Manual cold bending	PVC solvent cement jointed	No	100 – 300	Not dependent	Note 3
	PE welded joints SDR ≤21	No	160 – 355	Not dependent	Note 3
Manufactured bends	PVC	Yes RRJ only	100 – 375 Note 2	Not dependent	Note 3
	GRP	Yes	300 – 1200	Not dependent	As manufacture requirement
	Profiled wall PE	No	Up to 1500	Not dependent	Note 3
	PE short radius bend (up to 45°)	No	110 – 250 Note 4	Not dependent	0.75
	PVC variable bend	No	150 – 225	Not dependent	0.9

NOTES:

1 *The minimum radius for solvent cement welded PVC pipes and welded PE pipes is based upon:*

(a) the deflection that may be achieved without overstressing the pipe or pipe joint; and

(b) ensuring that the necessary restraint of the pipe and joints around the curve is readily achievable based on manually cold bending the pipe in the field.

2 Manufactured bends for RIGSS are available at DN150 with other sizes to be individually fabricated to AS/NZS1260.

3 Refer to POP202 for minimum acceptable radii for manufactured bends and manual cold bends.

4 Short Radius bend for PE are available for DN110, DN160 and DN250, up to 45 degree. Larger sizes of PE or greater degrees shall use long radius bends as per Note 3.

Reference	Amendments to WSA02 - 2002 V2.3
17.2.3 Horizontal curves	**Adjust the third paragraph as following.** Place bends or initiate curves in the sewer as per Clause 4.3.7 and as shown on the Standard Drawing SEQ-SEW-1314 set and SEW-SEW-1315-1.
17.2.4 Vertical curves	**Replace the 5th and 6th paragraph with the following.** Place vertical bends as per Clause 4.6.7.
17.2.5 Compound curves	**Replace the clause with the following.** Place the compound bends as per Clause 4.6.8.
17.4 Flotation control	**Replace the drawing reference in sub-clause (a) with "SEQ-SEW-1206-1".**
17.5 Trench Stops	**Add the following after the first sentence** Trench Stops are to be used only where specified on the Design Drawings or shown on the Standard Drawings or where an underground water path is encountered during construction. **Replace the drawing reference with "SEQ-SEW-1206-1 and SEQ-SEW-1207-1".**
17.6 Bulkheads	**Change first sentence to read as follows** Construct concrete bulkheads with trench drainage as specified on the Design Drawings or shown on the Standard Drawings or where an underground water path is encountered during construction. **Replace the drawing reference with "SEQ-SEW-1206-1 and SEQ-SEW-1207-1".**
17.7 Property connection sewers	**Replace the drawing reference with "SEQ-SEW-1104-1, SEQ-SEW-1105-1 and SEQ-SEW-1106 set".**
17.8 Dead ends	**Replace the drawing reference with "SEQ-SEW-1104-1, SEQ-SEW-1105-1, SEQ-SEW-1106 set, SEQ-SEW-1314-1 and SEQ-SEW-1315-1".**
17.9 Marking of Property Connections and Dead Ends	**Replace the clause as following.** Mark the position of each dead end and location of each property connection point using identification formats as shown in the Standard Drawings. Reference: Standard Drawings SEQ-SEW-1104-1, SEQ-SEW-1105-1 and SEQ-SEW-1106 set as appropriate.
17.11.1 Non-detectable marking tape	**Replace the drawing reference with "SEQ-SEW-1200-2".**
17.11.2 Detectable Marking Tape	**Change the first paragraph as following.** Detectable marking tape shall be laid above all buried non-metallic pipes along the top of the embedment zone or at 1 m below the surface (whichever is the closer to ground surface) for: **Replace the drawing reference with "SEQ-SEW-1200-2".**
17.12 Bored Pipes under Roads, Driveways and Elsewhere	**Add the following as the first paragraph:** Proposed methods and materials for bored pipelines shall be approved by the relevant SEQ-SP before commencement of boring. Contractor shall carry out a risk analysis of any piling works adjacent to buildings, bridges and other structures and this analysis shall be included in the proposal. **Add the following after the third paragraph.** Where plastic pipes are grouted within the encasing pipe, the approved work method statement shall detail the controls to prevent either floatation or thermal reversion of the carrier pipe (the sewer). **Replace the drawing reference with "SEQ-SEW-1400-1, SEQ-SEW-1401-1, SEQ-SEW-1402-1 and SEQ-SEW-1403-1".**

Reference	Amendments to WSA02 - 2002 V2.3
17.13 Aqueducts	**Replace the drawing reference with "SEQ-SEW-1404-1 and SEQ-SEW-1405-1".**
17.14 Bridge crossings	**Replace the drawing reference with "SEQ-SEW-1406-1".**
17.16.1 Welding of steel pipelines-General	**Replace the drawing reference with "SEQ-WAT-1400-1 to SEQ-WAT-1408-1 within SEQ Water Supply Code".**
Insert New Cluse 17.16.3	**Insert New Clause** **17.16.3 Reinstatement of linings and coatings** The requirements of Clauses 15.20.3 to 15.21.1 within the SEQ Water Supply Code shall apply.
18.1 Maintenance Holes (MHs)-General	**Replace the clause with the following.** Construct MHs and install covers, surrounds, step irons and ladders as specified. **For UW, GCCC, LCC and RCC:** Ladders, step irons and landings are not to be provided within maintenance holes. Reference: Standard Drawings SEQ-SEW-1300-1, SEQ-SEW-1301 set, SEQ-SEW-1302-1, SEQ-SEW-1303 set, SEQ-SEW-1304-1, SEQ-SEW-1305-1, SEQ-SEW-1306-1, SEQ-SEW-1307 set, SEQ-SEW-1308 set, SEQ-SEW-1309-1, SEQ-SEW-1310-1, SEQ-SEW-1311-1, SEQ-SEW-1312-1 and SEQ-SEW-1313-1.
18.2 MH base	**Replace the drawing reference with "SEQ-SEW-1304-1, SEQ-SEW-1305-1 and SEQ-SEW-1306-1" in the first paragraph.** **Replace the last two paragraphs with the following.** For precast MHs, form the channels after the first component has been placed where pre-benched or bowl benched bases are not used. Reference: Standard Drawings SEQ-SEW-1301 to SEQ-SEW-1312 as appropriate.
18.3 Trench drainage around MHs	**Replace the drawing reference with "SEQ-SEW-1207 set".**
18.4 Precast concrete MH systems.	**Add as the first sentence of this clause** **QUU:** Precast MHs are not accepted for use within QUU service areas. **Replace the last three paragraphs with the following.** For precast MHs that are using cast in-situ MH bases, secure the hydrophilic seal at the locations shown in the Standard drawings and prime the lower 200 mm of the precast component with a wet to dry bonding agent or cement slurry before placing the component onto the wet concrete base. Embed the component 50 mm into the wet concrete base, then build up and compact a 150 mm concrete fillet on the outside to seal against infiltration. Form channels in the base in accordance with Clause 18.2. Do not place other shaft sections until the concrete base has set. For pre-benched or bowl benched precast bases, install in accordance with the manufacturer's instructions. Reference: Standard Drawings SEQ-SEW-1300 to SEQ-SEW-1306.

Reference	Amendments to WSA02 - 2002 V2.3
18.5 **Cast in-situ concrete MH**	**Replace the second and the third paragraphs with the following.** All construction joints shall include either PVC water stops or hydrophilic seals installed in accordance with the manufacturer's instructions At each construction joint, place water stops and dowels, remove laitance and prime with a wet and dry bonding agent or cement slurry before pouring the next lift. Where hydrophilic seals are to be used in lieu of water stops, place these after the laitance removal. Where a water stop is used at any construction joint, support it in such a manner that it will retain its position during the pour. **Replace the drawing reference with "SEQ-SEW-1301 and SEQ-SEW-1307 sets".**
18.8 – Internal Coating of Concrete MHS:	**Delete existing text and replace with the following.** Where required by the SEQ-SP (refer to Clause 4.7.2), MH's shall have all internal surfaces coated with a protective coating system as detailed below. The DI cover and frame does not require coating. Where shown in the drawings, internal neck, converter slab, and wall surfaces shall be coated with either a PE lining system or a two part solvent free 100% solids epoxy protective coating system. The benching and flow channel are to be left uncoated and finished off in accordance with Clause 18.6 with the typical form and profiles. **PE lining system** - Internal surfaces shall be lined with a PE cast in place lining system with details as per SEQ-SPS-1407 drawing set. Note: Where there is no sewage sitting in the maintenance holes then the lining shall extend to the base of MH and would be covered by the benching. **Epoxy coating system** –Internal surfaces shall be coated with SEQ-SPs approved two part solvent free 100% solids epoxy protective coating system at 2.0mm thick and suitable for application to damp concrete as follows: (a) The protective coating system shall be installed to the manufacturer's requirements and the application shall be carried out by an accredited applicator approved by the manufacturer and the Superintendent (b) The two part solvent free epoxy protective coating system suitable for wastewater works, shall be a chemical resistant two part epoxy primer/ sealer (if specified by the manufacturer) with a high build capability, resistant to Sulphuric Acid and abrasion with a minimum two coat dry film thickness of 2000 microns that excludes the required primer/sealer thickness (c) The pot life of the mixed coating shall be a minimum of 40 minutes with a colour when dry of either light grey, white or off white (d) The protective epoxy coating system may include Quartzite aggregates and where used the minimum dry film thickness shall be 4000 microns (e) Prior to the application of the coating system the new concrete surface shall be pressure blasted or scabbled so as to remove any laitance, loose or porous material leaving a clean, rough, hard concrete surface. The Contractor shall: (f) certify to the Superintendent (in a manner approved by the Superintendent) that: (i) the protective coating has been applied in accordance with the manufacturer's recommendation (ii) the protective coating has been applied by an accredited applicator and that the tests required by the manufacturer have: (A) been carried out; and (B) met the manufacturer's requirements; and (C) passed all necessary tests. (g) Provide to the Superintendent a joint manufacturer's and applicators written warranty (in favour of the SEQ-SP) covering the protective coating for a minimum period of 10 years. LCC, QUU and UW require PE lining systems only as described above. GCCC and RCC require either PE lining systems or epoxy coating systems as described above.

Reference	Amendments to WSA02 - 2002 V2.3
18.9 Covers	**Change the first line from:** "…as specified" to "…as specified on Standard Drawings". **Replace the drawing references with "SEQ-SEW-1300-1, SEQ-SEW-1301-1 and SEQ-SEW-1308 set".**
18.10 Connections to Manholes	**Change the first line from :** "…as specified" to "…as specified on Standard Drawings" **Replace the drawing references with "SEQ-SEW-1301 set, SEQ-SEW-1302-1, SEQ-SEW-1303-1, SEQ-SEW-1307-4 and SEQ-SEW-1313-1".**
18.11 – MH Drops	**Change the first line from :** "…as specified" to "…as specified on Standard Drawings" **Replace "…Superintendent" in the second paragraph with "…relevant SEQ-SP".** **Replace the drawing references with "SEQ-SEW-1301 set, SEQ-SEW-1303-1, SEQ-SEW-1306-1 and SEQ-SEW-1307-2".**
19.1 MAINTENANCE SHAFTS (MS AND TEPS) AND INSPECTION TEES	**In the title replace the "TMS" and "Inspection Openings (IO)" with "TEPs" and " Inspection Tees"** **Remove the words "Sediment Trap" from the heading and first two paragraphs in the clause.** **Change the first paragraph to read as follows:** Install MSs, TEPs and Inspection Tees as specified on Standard Drawings. Where the manufacturer's printed installation instructions vary from the Design Drawings, refer to the Superintendent for written instructions. Embed and surround MSs, TEPs and Inspection Tees with embedment materials as specified for the reticulation sewer. Compact embedment as specified for reticulation sewer trench fill. Provide and install covers and surrounds as specified. Reference: Standard Drawings SEQ-SEW–1104 to 1106, SEQ-SEW-1308-1 and SEQ-SEW-1314 to 1316.
19.2 Sealing caps	**Amend the clause with the following.** Cut the MS/TEPs shaft to provide the access cover clearance as specified on Standard Drawings. Seal the shaft with a cap in accordance with the manufacturer's printed instructions. Reference: Standard Drawings SEQ-SEW–1314 set, SEQ-SEW-1315-1 and SEQ-SEW-1316-1.
19.3 Covers	**Amend the clause with the following.** Install covers and frames as specified on Standard Drawings. Clean sealing surfaces of covers and frames. Apply grease to seating surfaces where specified in accordance with manufacturer's printed instructions. Reference: Standard Drawings SEQ-SEW-1308-1, SEQ-SEW-1314-1 to 2 and SEQ-SEW-1316-1.
19.4 Connections to MSs and TMSs	**In the title change TMSs to TEPs and replace the clause with the following.** Make connections of sewers to MSs and TEPs as specified on the Standard Drawings and in accordance the manufacturer's printed instructions. Reference: Standard Drawings SEQ-SEW–1314 set, SEQ-SEW-1315-1 and SEQ-SEW-1316-1.
20.1 PIPE EMBEDMENT AND SUPPORT-GENERAL	**Insert the following after second paragraph** Bedding material shall be screeded and compacted to grade before the pipe is laid making provision for sockets. Embedment material shall be rodded into haunch area to provide continuous support.

Reference	Amendments to WSA02 - 2002 V2.3
20.2 **EMBEDMENT DETAILS**	**Delete this clause and the Table 20.1, and replace the clause with following.** Use embedment materials that: (a) Are single sized materials with nominal sizes of 5 mm or 7 mm; and (b) Comply with the Purchase Specification for embedment materials as nominated in the SEQ Accepted Products & Materials List. Reference: Standard Drawings SEQ-SEW-1104-1, SEQ-SEW-1105-1, SEQ-SEW-1106 set, SEQ-SEW-1200-2, SEQ-SEW-1201-1, SEQ-SEW-1202-1, SEQ-SEW-1314 set and SEQ-SEW-1315-1.
20.3.2.2 *Test method*	**In the third paragraph replace the words "spring line" with "completed embedment zone".**
20.4 **SPECIAL BEDDING AND EMBEDMENTS/ GEOTEXTILE SURROUND AND PILLOW**	**Change drawings References to Standard Drawings SEQ-SEW–1202-1, 1203-1 and 1204-1.**
20.6 **CONCRETE EMBEDMENT AND ENCASEMENT**	**Change first sentence to read.** Concrete embed or encase pipes as per engineered design solution in accordance with Clause 14.5. **Change drawing references to Standard Drawings SEQ-SEW–1203-1, 1400-1, 1401-1, 1402-1 and 1403-1.**
21.1.1 **TRENCH FILL - GENERAL**	**Replace the whole clause with the following paragraph.** *Placement and compaction of trench fill is critical to avoiding subsidence over or near the trench and consequential damage to pavements and structures*.
21.1.2 **Material requirements**	**Replace the whole clause with the following.** Comply with the Specification and relevant Design Drawings. **21.1.2.1** *Trafficable areas* *Trafficable areas include:* (a) *The full width of any existing or proposed road carriageway plus shoulders and extending to 1 m beyond the shoulders or kerbs.* (b) *The full width of any property access driveway and extending 1 m either side.* (c) *The full length of any constructed footway including, but not limited to, concrete, asphalt and crushed rock pavements.* (d) *The full width of any median strip.* (e) *Any other areas subject to vehicular traffic.* Where the filled trench will be subjected to traffic loading, ensure the fill material complies with the road Owner's specifications or Water Agency nominated specifications. In the absence of a directive, obtain approval to use one of the following: (i) For trenches in trafficable areas other than footways less than 1.5 m deep, 20 mm Class 2 plant mixed wet mix crushed rock, for the full depth or a suitable equivalent; (ii) For trenches in trafficable areas other than footways that are 1.5 m deep or greater: (A) 20 mm Class 2 plant mixed wet mix crushed rock for the top 600 mm; or (B) 20 mm Class 4 (or better) crushed rock for the remainder, or other trench fill material specifically approved by the road Owner. (iii) For trenches under footways, 20 mm Class 4 (or better) crushed rock, or other trench fill material specifically approved by the road Owner.

Reference	Amendments to WSA02 - 2002 V2.3
	The specification of trench fill material will vary throughout Australia. To address this issue, WSAA has prepared more than one product specification for trench fill material to accommodate different Water Agency requirements, locally available rock types quarried and processes used to produce these materials. Water Agencies should nominate product specifications that are approved for use. **21.1.2.2** *Non-trafficable areas* Use a trench fill material complying with the Specification. Where well-graded granular materials (e.g. crushed rock) are specified, seek guidance from the Superintendent in relation to moisture conditioning. If the Specification permits excavated material to be used as trench fill, ensure it is free of organic material and that it contains no rock or hard clay greater than 75 mm and that it can be compacted to the required degree of compaction. Where excavated material is a cohesionless soil (e.g. clean sand, silty sand and poorly graded sand and gravel mixtures) use only in those areas where the natural soils within which works are being undertaken are also cohesionless. Where cohesionless soil fill is proposed in areas where the natural soils are cohesive (e.g. clayey) do not use unless approved by the Designer, in which case comply with any additional requirements for placement and compaction.
New Clause 21.1.3 Placement	Place trench fill in accordance with the Design Drawing(s). Place marker tapes as shown in the Standard Drawings Use appropriate methods of compaction to achieve the compaction requirements of the Design Drawings and Specification and to prevent settlement or subsidence over the trench. *The contract for the works may require the constructor to make good damage caused as a consequence of subsidence (e.g. damage to, including tilting of, fences, buildings and pavements).* Avoid impact loading of the sewer during placement of trench fill material. Do not place trench fill material within 24 h of placing concrete embedment or encasement, or longer period if shown in the Design Drawings or Specification. Fill voids behind timber ground support in close-timbered tunnels, drives and shafts by pressure grouting or other approved means. Take special care to prevent displacement of access cover assemblies or supports. Correct any deficiencies of trench filling exposed by settlement. Raise the fill evenly around maintenance and inspection structures and compact in shallow layers to avoid unbalanced lateral loading.
21.1.4 Compaction of trench fill	**Renumber the existing clause from 21.1.3 to 21.1.4** **Replace the first three paragraphs with the following two paragraphs.** Ensure trench fill compaction satisfies the requirements of Tables 22.1 and 22.2 and Clause 22.3.4. Compact trench fill material in layers to achieve the required density uniformly throughout the depth of each layer. **Insert the following paragraph at the end of this clause.** Compact trench fill uniformly and carefully around maintenance and inspection structures.

Reference	Amendments to WSA02 - 2002 V2.3
21.2 **EMBANKMENT FILL**	**Replace the whole clause with the following.** Where the route of a sewer requires filling or construction of an embankment, undertake in accordance with the Design Drawings and/or Specification. Consult the Superintendent to ascertain if supervision is required by the geotechnical specialist (Designer). Where filling or construction of an embankment is required and is not defined in the Design Drawings and/or Specification, consult the Designer to provide: (a) the degree of clearing required to establish an embankment foundation; (b) the level of compaction of embankment fill material required; (c) the preferred method of placement and compaction; (d) any placement and/or compaction limitations over the top of the pipeline; and (e) any special conditions associated with placement and/or compaction of the remainder of the fill in layers. NOTE: Geotechnical assessment prior to commencement and subsequent supervision of the work may be required at the request of the SEQ-SP.
21.3 **DRIVES AND TUNNEL FILL**	**Add the following sub-clause to the end of this clause.** (d) Sand bags hand placed and rammed.
22.3.1 **COMPACTION TESTING– General**	**Replace the whole clause with the following.** *Tables 22.1 and 22.2 specify the default methods of compaction testing and required results that demonstrate adequate pipe support and stable trench fill*. The Contractor/consulting engineer shall adopt: (a) alternative test methods and more stringent values specified in the Design Drawings and Specification; and (b) for trafficable areas, the road Owner's specification over the default methods of compaction testing and required results specified in Tables 22.1 and 22.2. **Delete Table 22.3.** **Replace Tables 22.1 and 22.2 with following two tables including notes.**

Reference	Amendments to WSA02 - 2002 V2.3

TABLE 22.1

FLEXIBLE PIPES - MINIMUM COMPACTION EMBEDMENT, TRENCH FILL AND EMBANKMENT

Material type	Test method	Minimum value (%)			
		Trafficable areas		Non-trafficable areas	
		Embedment	Trench/ embankment fill	Embedment	Trench/ embankment fill
Non-cohesive	Density index (I_D) AS 1289.5.6.1	70 (Note 1)	70 (Notes 2, 3)	60 (Note 3)	60 (Notes 4, 5)
Cohesive	Dry density ratio or Hilf density ratio (R_D) AS 1289.5.4.1 and AS 1289.5.1.1 (Note 6)	95	95	90	90 (Notes 5, 6)

NOTES:

1. Single size coarse aggregates of sizes 5, 7, 10 and 14 mm shall be deemed “self-compacting” and do not require compaction testing when used for pipe embedment (Refer to Clause 20.3.2).
2. The road Owner may specify alternative values.
3. Degree of compaction of the trench fill in trafficable areas depends on:
   a. the backfill zone – higher degrees of compaction is required in the zones closer to the surface; and
   b. the road type – freeways and arterial roads carrying greater loads require higher degrees of compaction.
4. The value given is a default where excessive initial surface settlement is not permitted. Specification of an alternative degree of compaction of the trench fill in non-trafficable areas depends on the site requirements.
5. Compaction shall be to the degree specified in the Project Specification or the default value in Table 22.1 if not specified.
6. Graded gravels and sands having fines (silts and clays) greater than 5% shall have their compaction determined by dry density ratio test method.

Reference	Amendments to WSA02 - 2002 V2.3

TABLE 22.2

RIGID PIPES - MINIMUM COMPACTION EMBEDMENT, TRENCH FILL AND EMBANKMENT

Material type	Test method	Minimum value (%)			
		Trafficable areas		Non-trafficable areas	
		Embedment	Trench/ embankment fill	Embedment	Trench/ embankment fill
Non-cohesive	Density index (I_D) AS 1289.5.6.1	60 (Note 1)	70 (Notes 2, 3)	60 (Note 3)	60 (Notes 4, 5)
Cohesive	Dry density ratio or Hilf density ratio (R_D) AS 1289.5.4.1 and AS 1289.5.1.1 (Note 6)	90	95	90	90 (Notes 5, 6)

NOTES:

1. Single size coarse aggregates of sizes 5, 7, 10 and 14 mm shall be deemed "self-compacting" and do not require compaction testing when used for pipe embedment (Refer to Clause 20.3.2).
2. The road Owner may specify alternative values.
3. Degree of compaction of the trench fill in trafficable areas depends on:
   a. the backfill zone – higher degrees of compaction is required in the zones closer to the surface; and
   b. the road type – freeways and arterial roads carrying greater loads require higher degrees of compaction.
4. The value given is a default where excessive initial surface settlement is not permitted. Specification of an alternative degree of compaction of the trench fill in non-trafficable areas depends on the site requirements.
5. Compaction shall be to the degree specified in the Project Specification or the default value in Table 22.2 if not specified.
6. Graded gravels and sands having fines (silts and clays) greater than 5% shall have their compaction determined by dry density ratio test method.

Adopt test methods for determining the degree of compaction that comply with the appropriate part of AS 1289.

The Contractor (or the consulting engineer for development works) shall be responsible for all compaction testing and shall arrange for the testing to be carried out by a NATA certified Test Laboratory. Modified compaction tests to be used.

Prior to commencing work the Contractor/ consulting engineer shall prepare test plan showing the number of tests and depths in each zone where tests are to be carried out.

The Laboratory shall randomly select test locations in each zone. The road authority supervisor may direct the Laboratory to undertake additional tests in any zone. The test locations shall be uniformly distributed over the works.

Testing shall not be clustered within a zone or at boundaries of a zone. In deep trenches where more than 1 layer is to be tested, the test locations shall, where practicable, be staggered from those layers above or below by at least 5 m for sewers and 2 m for property connections.

The compaction tests including retests shall be carried out at the Contractors/Consulting Engineers' cost until satisfactory compaction levels are achieved.

Reference	Amendments to WSA02 - 2002 V2.3
22.3.2 **Compaction testing requirements**	**Change the clause title to "Compaction testing requirements".** **Replace the whole clause with the following.** Undertake field density testing of engineered or controlled fill, pipe embedment, trench fill and embankments in accordance with the methods specified in Tables 22.1 and 22.2. Test at locations representative of the fill, embedment, trench or embankment. Accept fill, embedments, trench fill and embankments with test results conforming to the requirements of Tables 22.1 and 22.2. *Drives and tunnel fill do not require compaction testing.*
22.3.3.1 ***Applicable pipe sizes***	**Replace the drawing reference in sub-clause (a) with "SEQ-SEW-1200-1".**
22.3.3.2 ***Frequency and location of embedment tests***	**In the first paragraph change "spring line (±50 mm)" to "completed embedment zone".** **In the second paragraph change ">375mm" to "> 300 mm", and change "spring line (±100mm)" to "completed embedment zone".**
22.3.3.3 **Retesting**	**Adjust the second sentence as the follows.** If one or more of the repeat tests does not comply, re-do the embedment/fill and re-compact the full zone and continue repeat testing on the full zone. **Replace the drawing reference in the Table 22.1 and Table 22.2 Notes with "SEQ-SEW-1201-1".**
22.3.4.1 *Trafficable test zone*	**Change drawing reference to "…SEQ-SEW – 1200-2".**
22.3.4.5 *Retesting*	**Replace the reference of "Table 22.3" with "Tables 22.1 and 22.2".** **Delete Table 22.3**
22.4.1 **Air pressure and vacuum testing of sewers- General**	**Delete the "…or air pressure…" at the start of paragraph 2 to read as follows** Vacuum test all sewers ….. **Delete "…air pressure and…" in paragraph 5 to read as follows** Make calibration certificates for all vacuum testing equipment…… **Add the following informative text to the end of this clause.** *The SEQ-SP may permit sewers 1050 mm ≤ diameter ≤ 1500 mm to be tested by the method defined in Clause 22.5 as an alternative to the vacuum testing.*
22.4.2.1 **Vacuum testing**	**Change the Heading of this clause to read** **22.4.2.1 Vacuum testing – RRJ Sewers** **Add the following as the first line of this clause:** All components of the sewer including MS's and property connection sewers shall be subject to a vacuum test.

Reference	Amendments to WSA02 - 2002 V2.3
22.4.2.2 **Low pressure air testing**	**Replace clause (including title) as follows.** **22.4.2.2 Vacuum testing – Welded jointed PE sewers** All components of the sewer including MS's and property connection sewers shall be subject to a vacuum test. Plug all sewer inlets and outlets and cap and seal all MS risers in the test length of sewer. The vacuum test for **Welded jointed PE sewers** shall be carried out in accordance with the following procedure: • apply a negative pressure of approximately 50kPa; • close the valve, shut off the pump and allow the pressure to stabilise for 3 minutes; • when the pressure has stabilised at or below the starting test vacuum of 45kPa, commence the test by allowing the pressure to drop to 45kPa at which point the time recording begins; and • record the vacuum drop over a 20 minute period. The sewer is acceptable under test if the vacuum loss is less than 2kPa. If the test fails, re-apply the vacuum to identify leaks and rectify all defects prior to conducting further tests.
22.4.4.1 **Testing of concrete MHs-General**	**Replace the first two paragraphs with the following.** Vacuum test all concrete MHs regardless cast in-situ MHs or precast MHs. **Delete Table 22.5**
22.6.2	**Add the following to the bottom of the clause;** Where the infrastructure includes long-radius bends, the proving tool shall be a rigid non-adjustable spherical ball. Where the infrastructure does not include long-radius bends the proving tool shall have an effective length of more than the sewer's nominal diameter, have an odd-numbered minimum of 9 legs and be rigid and non-adjustable.
22.6.3 **Flexible sewers ≤ 300mm**	**Replace the drawing reference with "SEQ-SEW-1201-1".** **Add the following to the bottom of the clause** **GCCC and UW**: require all flexible gravity sewers where □DN300 to be ovality tested using ovality proving tool as defined in Clauses 22.6.2 & 22.6.4.
Insert New Clause 22.7.1	**Insert New Clause.** **22.7.1 CCTV Inspection Requirements** All sewers and maintenance structures shall be inspected by CCTV after all backfilling operations have been satisfactory completed and all junctions are installed. This inspection is required to ensure that the pipe is without any construction defects, the pipe has no internal flow obstructions and all approved junctions are in right location. Further the inspection will verify the information provided with the 'As Constructed' drawings. A secondary inspection is also required prior to but not more than two (2) weeks before on-site inspection for off maintenance certification. The sewers and maintenance structures shall be cleaned prior to the CCTV inspection. All CCTV inspections in general shall be carried out in accordance with the latest version of the WSAA Conduit Inspection Reporting Code of Australia WSA 05. The operator shall use Appendix F to highlight all unacceptable defects in the CCTV report. In addition to the WSAA WSA 05 requirements the CCTV surveys shall comply with the following additional requirements: a) All CCTV surveys shall be accompanied by an inclination report in the form of a scaled graph that plots the pipe's altitude over the distance travelled. The inclinometer shall be accurate to +/-1%. The inclinometer reading shall be on screen display at all times during the recording of the CCTV survey.

Reference	Amendments to WSA02 - 2002 V2.3
	b) The CCTV survey shall be carried out from the centre of the start maintenance structure to the centre of the finish maintenance structure. Each maintenance structure shall be fully scanned using the pan/tilt and zoom functions of the CCTV camera and the video footage recorded as part of the overall CCTV survey. c) All pipe joints shall be scanned by a 360 degree pan. d) Additional welding defects to be coded for PE sewers with electrofusion joints: a. A PE pipe end not cut square in a joint shall be coded as circumferential welding defect (Code WC) b. Visible welding wires in a joint shall be coded as circumferential welding defect (Code WC) c. Partially melted fusion couplings in a joint shall be coded as circumferential welding defect (Code WC) e) All changes in horizontal and vertical direction of the pipe along the survey shall be coded using the appropriate WSA 05 codes. a. A number of general photographs shall be taken along the sewer surveyed, as a minimum to satisfy the requirements of this standard: b. one photograph in each maintenance structure showing the condition of the structure above the pipe obvert level c. one photograph each showing the connection point between the maintenance shaft/maintenance hole and the incoming/ outgoing pipes d. a general photograph every 20-25 m of the pipe condition not related to any defect over the distance surveyed e. a photograph of each junction installed; and f. photographs of all welding defects identified. Information from the CCTV inspections shall be provided in accordance with clause 4.2 of the SEQ Code Asset information Specification prior to the commissioning of the assets.
23.3 **Tolerance on Finished Surface Structures and Fittings**	**Delete existing clause and replace with the following.** For structures and fittings designed to finish flush with the ground/pavement surface or proud of the surface, the following tolerances to the design shall apply: a) +/- 5 mm, for all constructed pathways, b) +10 mm high, -5 mm low in road reserves including sealed pavements, and driveways, c) +15 mm high, -5 mm low in sealed vehicular and pedestrian areas within private property, d) +20 mm high, -5 mm low including garden areas, unsealed areas, non- trafficable or occasional trafficable areas.
24 **Connection to Existing Sewers**	**Insert before the first paragraph, the following sub-heading for the existing text.** **24.1 – General**
24.2 **Live Works**	**Add the following text under this clause.** All works undertaken within SEQ – SPs service area which involve connection to, or modification of, the existing sewerage system are known as ”Live Sewer Works” and shall be undertaken by the SEQ - SP. Should an SEQ-SP permit a developer/contractor to carry out live connection works, the administrative procedures, method, protocols, inspection and supervision requirements for a live sewer connection shall be agreed with the relevant SEQ-SP prior to the works being carried out.
26 **Work As - Constructed Details**	**Amend this clause to read as follows.** Prepare and submit asset as-constructed data and asset manuals to the SEQ-SP in accordance with SEQ Asset Information Specification.